



DURHAM
Health
INNOVATIONS

THE DURHAM HEALTH INNOVATIONS PROJECT

THE DUKE-DURHAM RESPIRATORY PARTNERSHIP **BREATHE EASY TEAM**

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I. HEALTH NEEDS & METRICS

A. The Burden of Asthma and Chronic Obstructive Pulmonary Disease (COPD) is increasingly common worldwide with significant associated morbidity and mortality. The impact of asthma and COPD in Durham County is concerning, as demonstrated by data made available through the North Carolina Behavior Risk Factor and Surveillance System (BRFSS)(1) and the 2007 Durham County Health Assessment. Middle school asthma prevalence is much higher in Durham County middle school students (15.4%) and especially high in Durham African-American middle school students (27.5%) as compared to 7% nationally (2). Additionally, the 2007 Durham County pediatric asthma admission rate was 109.5/100,000, the third highest county in North Carolina (1).

Pediatric asthma patients account for over 19,111 inpatient or outpatient visits to Duke or Durham Regional Hospitals between December, 2006 and December, 2008. Approximately 3,777 visits were either to the Emergency Department (ED) only or to the ED with hospital admission.

Approximately 54% of these visits were from residents of Durham County, 58% of these patients Medicaid recipients or uninsured. Demographics show that 48% of these patients were black, 41% white and 10% Asian/American Indian or not known. Five percent of these patients were identified as Hispanic/Latino. Asthma is a common disease in children, with increased prevalence and increased morbidity in Durham as compared to other counties in North Carolina, or to nationwide statistics.

Among adults (> 18 years), asthma was diagnosed in 56% during childhood, and 44% during adulthood (1). These statistics contrast from the national average, where 10-20% of asthma is diagnosed in adulthood. Of note, a diagnosis of asthma in adults was also present in 35% of patients with COPD, suggesting an overlap between these two diseases in the adult population in North Carolina. Of the adults with asthma, 20% experienced at least one exacerbation requiring an urgent care/Emergency Department visit, and 15% lost between 1 and 7 days of work (1). Interestingly, healthcare utilization and the burden of cardiovascular disease and related risk factors are substantially greater among persons with concurrent COPD and asthma as compared to those with COPD or asthma alone (1).

Similar to the pediatric cohort, the adult asthmatics utilized the Duke University Health System significantly: between December 2006 and 2008, there were 34,635 visits to either the inpatient or outpatient setting of Duke or Durham Regional Hospitals. Of these visits, 11,522 were either to the ED only, or ED followed by hospital admission. The demographics of these patients were 66% women and 33% men, as asthma is more common in women, consistent with national trends; 51% were African-American, 43% Caucasian and 6% Asian or Multiracial. Six percent of patients were identified as Hispanic/Latino. Similar to the pediatric population, approximately 58% of the patients reside in Durham County (using zip codes) and 57% of these patients were insured by Medicaid, Medicare or uninsured. At Durham Regional alone, **59%** of adult asthmatic subjects were uninsured. In total, asthma among children and adults resulted in 49,369 visits within a two-year period to where approximately 53% of patients were residents of Durham County. These data suggest that asthma is a common disease with a substantial burden of disease in Durham.

While COPD is the fourth leading cause of death nationally, it is the **second** leading cause of death in Durham from 2001-2005, suggesting considerable morbidity and mortality associated with this disease. Surprisingly, the prevalence of COPD in Durham per the 2007 BRFSS data is only 2%! However, 10.5% of all BRFSS respondents stated that they experienced an Emergency Department visit in the past 12 months due to emphysema or bronchitis. This discordant information, coupled with the significant mortality data, highlights the under recognition of COPD in Durham County. An important risk factor for COPD is cigarette smoking; in Durham County, the prevalence of any smoking is 36% and 21% of respondents consider themselves current smokers.

These patients with COPD also interact significantly with the Duke University Health System, accounting for 31,517 visits to Duke or Durham Regional Hospitals in either the inpatient or outpatient setting from December, 2006 to December 2008. Of these visits, there were 7,365 visits to the ED, or ED followed by hospital admission. Approximately 30% of these patients reside in Durham County overall, but 75% of patients who utilize Durham Regional Hospital for their respiratory care emergencies live in Durham County. Of Durham County residents with COPD, 67% are Caucasian, 32% are Black with a small proportion Asian or the data are unavailable. Five percent of the population was identified as Hispanic/Latino. Approximately 75% of Durham County residents with COPD are covered by Medicare. Approximately 24% receive Medicaid or are uninsured. These statistics change significantly when only Durham Regional Hospital is evaluated in that 46% of patients with COPD are uninsured, 21% are Medicaid recipients and, only 14% are covered by Medicare.

Given the significant burden of asthma and COPD in Durham County, particularly among those who are uninsured or insured by federal programs, the question arises of how to provide quality care that can alter relevant outcomes: ED visits, hospital admissions, urgent physician visits, and loss of time from work and/or school. Approximately 50-60% of healthcare dollars spent on asthma and COPD are to care for patients during an exacerbation. Despite the presence of federally funded clinics and several community programs in which patients with respiratory disease with Medicaid and Medicare are eligible to participate such as the Durham Community Health Network/Carolina Access, Local Access to Coordinated Health Care (LATCH), Just for Us, Project Access and School nurse programs, morbidity remains high. We believe that the discordance between prevalence data and morbidity and mortality (especially with COPD) is secondary to under-recognition of disease and lack of coordination between primary care clinics, community resources and transition from inpatient to outpatient settings after discharge. In this proposal, we present a strategy to identify and care for children and adults with asthma, and adults with COPD who represent this high-risk cohort. In addition, we present a model that can be expanded to the greater Asthma and COPD populations and potentially other chronic conditions. Geospatial mapping has provided additional insight into the characteristics of our at-risk population. Those areas with the highest density of both outpatient and emergency department utilization for either asthma or COPD care were consistently localized to a small number of zip codes. These areas were also notable for also having a higher percentage of minority population, higher percentage of poverty and an overall lower median household income. These findings provide a distinct opportunity for our model, as this helps us to localize our interventions to those health centers, primary care clinics and care programs in those highest risk zip codes. Additionally, this will help to form the basis for our analysis of health metrics and monitoring the effectiveness of our intervention.

B. Health Metrics:

1. What are the key health metrics proposed to measure the current state of health of patients with asthma and COPD in Durham County?
 - Outpatient, inpatient, and emergency department visits to Duke and Durham Regional Hospitals
 - Specific demographics to define which patients are pediatric asthmatics, adult asthmatics, have COPD, or both conditions
 - Further identifying information including payor mix, gender, race, and ethnicity
2. What health metrics will be used to evaluate the impact of our proposed model of care?
 - Reduction in outpatient, inpatient, and emergency department visits to Duke and Durham Regional Hospitals
 - Increased adherence to controller medication as evidenced by pharmacy database analysis
 - Improved disease-specific patient education as evidenced by reduced rescue inhaler usage and reduced usage of oral corticosteroids
 - Improved compliance with standardized treatment regimens and improved Quality of Life (QOL) measures

Appendix I provides a detailed data file complete with tables and graphs which further demonstrates the importance and the current state of the disease from Duke and Durham Regional. This proposal provides information on the types of additional information that have been and will be needed in order to further quantify the impact of the program and the proposed interventions on the targeted group(s).

The burden of disease for Duke Hospital and Durham Regional is significant. The following tables and charts demonstrate the high percentage of total ED, OP and IP visits from Durham County as compared to all patient visits with our targeted disease.

Durham Zip Code Patients vs. All Patients Seen at DUH - By Disease								
	COPD		Asthma		Pediatric Asthma		Adult Asthma	
	All	Durham	All	Durham	All	Durham	All	Durham
ED only	600	400	2252	1875	1164	1001	1088	874
outpatient	22008	8189	36042	18189	15284	8117	20758	10072
inpatient	4041	1391	5444	2187	1034	366	4410	1821
visits to Duke	26649	9980	43738	22251	17482	9484	26256	12767

Durham Zip Code Patient vs. All Patients Seen at DRH - By Disease								
	COPD		Asthma		Pediatric Asthma		Adult Asthma	
	All	Durham	All	Durham	All	Durham	All	Durham
ED only	769	606	5144	4326	1561	1358	3583	2968
outpatient	2134	1572	2405	1534	50	35	2355	1499
inpatient	1965	1300	2459	1591	18	14	2441	1577
visits to DRH	4868	3478	10008	7451	1629	1407	8379	6044

Appendix II includes a wide variety of geospatial mapping completed for the team which further demonstrates the need for a new model of care for Durham and isolates key ideas for intervention strategies as it relates to population density, access to community centers, access to clinics, and co-location with local schools.

Our team reviewed the various geospatial maps provided and reached the following conclusions:

- ED Visits and hospitalizations localize predominantly to a handful of zip codes
- The density of the visits evaluated against poverty indicates a fairly significant correlation
- Density of outpatient visits is more widespread but still correlates with household income
- Distinct opportunities for interventions exist when comparing density of activity with location of health care centers, although Duke Primary Care appears to be located in close proximity to some of the highest density zip codes

II. BUILDING THE TEAM & COMMUNITY ENGAGEMENT

A. Creation of the Team

The process of developing the Breath Easy Team began long before the DHI project was introduced. In 2004, Dr. Monica Kraft was recruited to Duke. Dr. Kraft has significant expertise in research and clinical care with a strong interest in creating new solutions related to care of Asthma and COPD in Durham and North Carolina. After Dr. Kraft's recruitment, the Duke Asthma, Allergy and Airway Center (DAAAC) was created in leased space located off Ben Franklin Blvd. in Durham, N.C. A distinguishing feature for the DAAAC was its plan to reach out and focus on community needs, to create synergies for research patients and provide improved integration of care, advocacy and research after the initial ramp up of the clinical enterprise.

Appendix III includes excerpts from the original business plan demonstrating the early concepts to integrate program planning into the Durham Community.

The evolution continued with the recruitment of Dr. Peter Michelson and Dr. Katharine Kevill. This collaboration began as the faculty of the AAAC, working with Jessica Simo from the Division of Community Health initiated outreach to those care providers supported by the center. It was at one of the events that Dr. Betty Masten (Lincoln Community Health Center) became more involved in these efforts. Over the years, more opportunities developed for collaboration, but the DHI initiative provided a springboard for the high degree of coordination and the delineation of a specific program which all providers could enthusiastically endorse and move forward in the community.

Dr. Kraft and Dr. Masten become co-leads in the project and dinners were held prior to and after the DHI project initiated to solicit team participants and/or invite others to contribute to the team. During that time, broad representation was encouraged and involvement with Lincoln was heavily promoted. The early "vision" for the program was to use the Lincoln Community Health Center (LCHC) as a pilot site with quality improvement (QI) measures driving further community expansion. Dr. Kshitij Mistry was recruited to help guide these QI initiatives. Two school nurses from Durham County (Catherine Medlin, RN and Clementine Buford, RN) and an asthma educator (Laura Malcolm, RN) were also recruited and have provided valuable insight into the dynamics of the community and specific areas of need regarding school age children.

B. Soliciting Input from Community Stakeholders

The team met on a monthly basis throughout the project in order to review progress, brainstorm additional opportunities and ideas, and create the venue for valuable input. Meetings with community activists early in the process supported the potential benefit of focus groups. Initially, our group planned to meet with specific focus groups throughout the Durham area but quickly encountered hurdles to this process and determined that a representative sampling of focus group inputs would not be feasible. Instead, the use of focus groups was incorporated into the team's overarching quality improvement process.

To engage the community, the team decided to create and put forth for IRB approval three different survey tools; one for providers, one for patients, and one for community leaders. It was quickly discovered that even once IRB approval was achieved, the logistics of administering the surveys presented unique challenges. Survey instruments were successfully completed by a number of providers, but patient and community leader representation was less representative of a broad community sample. Despite this, we were still able to collect approximately 100 surveys. **Appendix IV** contains samples of the three surveys. Although the rate of sampling is not what the team would like for the long-term success of the project, there were a number of key concepts derived and utilized for the development of the model. The use of continued surveys is also a part of the overarching quality improvement component of the project. A list of key concepts from each survey type is summarized below.

Community Leader Surveys: (included administrative staff at LCHC, as well as team member contacts)

- When asked to rank the importance of various interventions in health care all respondents ranked "community health worker" as the *least or less important* and "health management utilizing information technology (e-mail, text messaging)" as *more or most important*. Subsequent surveys received from community leaders ranked community health care worker as a higher priority
- All respondents agreed that patients are very likely to seek medical information or support from a family member; and most agreed that patients would seek medical information and support from a health care provider, but there were diverse answers on whether patients would seek information support from church members, community leaders, neighbors, or alternative medicine healers.
- The respondents from LCHC were similar in their responses to questions concerning barriers to healthcare (# of providers, lack of money, transportation, insurance, not knowing where to go, not being able to take time off from work, distrust of the health care system, being afraid, etc. The consensus was that these things were minimal barriers to healthcare.
- In contrast, other community leaders contacted by Jessica Simo, agreed or strongly agreed that these amongst low income populations, many of these factors, i.e. transportation, insurance, the ability to find the clinics and to get off work were indeed barriers to healthcare.

Guardian Surveys: LCHC, Duke Live For Life Health Fair, Duke Asthma Center

- All respondents agreed that their healthcare providers were easily contacted with questions or concerns, that their provider discussed their child's asthma at every visit, and that they had received instructions on how to administer their child's medication.
- Approximately 60% said they did not think a community health worker or coach would help them keep their child's appointment, or provide education about their child's asthma.
- (The team later determined that this question may have been worded poorly. The role of the health coach was only focused on keeping appointments and education. As noted above, all agreed that their providers were providing education sufficiently).
- Approximately 60% said their child had daily cough or wheezing, had cough/wheezing when exercising, and/or had missed school due to cough/wheezing. Only one respondent who reported that his/her child had daily cough/wheezing, etc. agreed that a community healthcare worker might help with missed appointments and education.
- 75% of respondents reported that their child had visited the ER or been admitted to the hospital for asthma.
- 83% of respondents reported that their provider had told them how to better control their child's symptoms due to asthma.
- 83% of respondents reported that their child took daily medication for asthma.
- 83% of respondents reported that their child regularly saw a provider for asthma.
(For future surveys, more accurate definitions of "regularly" will be needed.)

Patient Surveys: Lincoln, Duke Live For Life Health Fair, Duke Asthma Center

- 68% of respondents reported either daily symptoms (cough, wheezing), or missing work due to symptoms.
- 76% of respondents reported that they could contact their provider "very easily" and/or that their provider talked with them about their asthma/COPD "at every visit."
- 62% reported a co-morbid disease with "obesity" overwhelmingly being the most often reported, followed closely by diabetes and high blood pressure.
- 62% did not feel a community health care worker would help with missed appointments and/or education. However, subsequent surveys in the community reflect agreement with the need for community health care workers.

Provider Surveys: Lincoln, Duke Asthma, Allergy and Airway Center (DAAAC)

- The respondents from LCHC overwhelmingly agreed that a community health care worker would be helpful "to a great extent" or "somewhat helpful." One reason for this degree of acceptance is that Lincoln has an existing case worker from DCHN so they are familiar with this concept.
However, subsequent surveys received indicate community providers also agree with the need for more community health care workers.

- The DAAAC provider respondents were in favor, but not overwhelmingly so, to the community health care worker concept.
- DAAAC and Lincoln respondents reported similar numbers of patients seen per day and number of new patients seen in a week. Amount of time spent with returning and new patients was also about equal for both groups.
- The majority of patients seen by Lincoln providers were insured by Medicare, Medicaid, or uninsured, whereas about 50% of patients at DAAAC have private insurance.
- Responses varied among providers for both groups on whether they had effective ways to measure compliance. Results were not conclusive in either group.
- Both groups report that their mid-level providers see patients with MD supervision. More autonomy was given to the Lincoln mid-level providers; whereas more direct MD supervision was employed at DAAAC.
- Neither group reported utilizing group visits.

C. Interaction of Our Model with Existing Community Resources

A wide variety of existing services and programs are already available to assist in delivering services to the targeted populations. As proposed in other chronic care models (5), the present state of Durham respiratory care does not effectively treat the target population. Our Breathe Easy Model will address the linkages that need to be created to better coordinate all aspects of care. Well-established programs in Durham County which are currently offering services including case management, education, home visits, and advocacy for Medicaid recipients and the uninsured. These programs include the Durham Community Health Network (DCHN), Local Access to Coordinated Healthcare (LATCH), Just for Us, Project Access of Durham County, and the Medical Legal Partnership for Children (MLPC). These agencies provide case management, education, home visits, and advocacy for Medicaid recipients and the uninsured. All of these programs have links to both Duke and to Lincoln Community Health Center, and so are well positioned to support our initiative to better coordinate care between the Duke and LCHC since they often share the care for the same patients. For example:

- The Division of Community Health within the Department of Community and Family Medicine oversees and administers DCHN, LATCH, Project Access and Just for Us.
- The DCHN offers coordinated, community-based health care to Medicaid recipients in Durham County and is administered by the Division of Community Health within the Duke Department of Community and Family Medicine. DCHN has the ability to assess use of health care resources via Medicaid billing data and is thus well positioned to monitor our target outcomes for patients within its program.
- LATCH, another program administered by the Division of Community Health within the Duke Department of Community and Family Medicine, strives to improve health, access to health care and facilitate appropriate use of health services for the uninsured Durham County residents.
- The Project Access of Durham County, launched in July of 2008, enables uninsured low-income patients to receive specialized medical care in Durham. These patients receive their primary care from LCHC, and the care from participating physicians is donated by groups such as the Duke PDC or funded by grants.
- Just for Us is a comprehensive medical care program which offers in-home services for older adults and adults with disabilities in about 10 specific areas within Durham's public and subsidized housing facilities. Of particular relevance to our application, is their contract with Independent Respiratory Consultants, Inc. who provides a Respiratory Therapist in the community to facilitate a unique COPD support/educational COPD educational group several times per month. The Respiratory Therapist partners with a Physicians' Assistant to conduct these "shared visits" within one of the housing developments.
- The Medical Legal Partnership for Children (MLPC) is a grant-funded organization that receives referrals from health care professionals who identify at risk children. The MLPC can assist families faced with denial of public benefits such as Medicaid and food stamps, possible eviction from their home, living in a home infested with mold, roaches, etc.

- Durham Public Schools house five school-based wellness centers, all of which are staffed by nurse practitioners (NPs). Four of these centers are linked to Duke Community and Family Medicine and one is linked to LCHC. NPs at all of these centers have access to the Duke eBrowser system. All of the Durham public schools have access to nurses employed by the Durham County Health Department between one and five days per week. The school nurses can also provide monitoring and education for children with asthma and are already involved with some asthma education efforts.

Throughout the planning process, there were a number of key lessons that the group learned, both about the problem, the project, and about the different organizations. Below are some highlights:

- Although the Durham community is receiving excellent services, the overall effectiveness of these programs is still sub-optimal, as prevalence of asthma and COPD remains high
- All participants shared a common philosophy and goals.
- Each participant had a strong commitment to making change and creating an innovative model.
- Barriers were encountered at many levels along the way, especially as it relates to securing data, analyzing data, sharing and comparing information, collecting surveys, etc.
- Overall survey and/or focus groups were felt to be beneficial but time did not allow this to take place.
- The existing/historical distrust between the community and Duke is a significant barrier that will continue to be difficult to resolve without continued effort and recognition of the issue.
- Individually, participants had strengths that were valuable to the team, but it was the overall synergy of the team that led to unique ideas and collaboration.

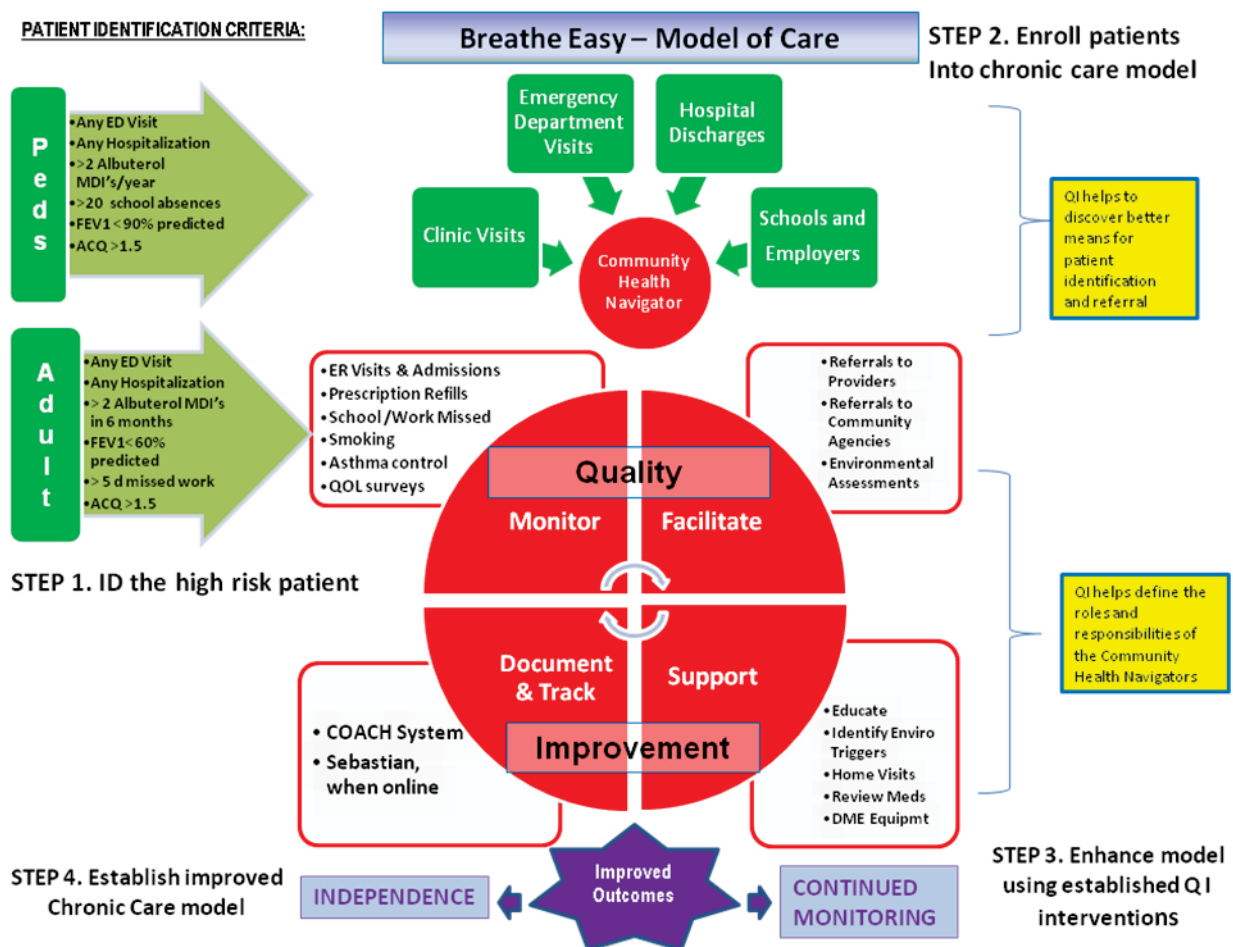
III. MODELS OF CARE FOR 10 EMPHASIS AREAS

A. Key Concepts

Our innovative proposal will target the underserved patients in Durham County with asthma and COPD and expands upon a foundation of care already present in Durham and the Duke University Health System. There are seven key aspects of our model of care:

1. A short-term (**Initial Model of Care**) and a long-term plan (**Ideal State Model of Care**)
2. Continued oversight by a project team with **System and Community Advisors**
3. **Partnerships** with existing agencies throughout the community, especially Lincoln Community Health Center
4. The use of **COACH** expanded to include patients at Lincoln from all financial status types for the initial model with expansion to include improved decision-support tools when available
5. A strong **Quality improvement Program** incorporated into the project
6. Long-term **technological solutions** including the use of a rules engine
7. External agency to coordinate information sharing between all parties (i.e. **Independent Monitoring**)

B. The Proposed Model – a Schematic



C. Overall Philosophy of the Model

Throughout the planning process, it became evident that identifying barriers and breaking them down relative to sharing information would be an enormous task and require significant time and effort well beyond the scope of this project. However, ours is a multi-pronged approach which incorporates a health care team to identify high-risk patients in the inpatient and outpatient settings. A critical part of our long term vision is a registry/clinical decision support program and the ability to maintain community integration with existing programs in Durham County to coordinate care. The Asthma/COPD registry will expand upon what is currently available through the Chronic Disease Management Program of the Department of Community and Family Medicine at Duke as described by Kawamoto et al. (3). Our model would meet criteria as a chronic care model, as described by Wagner et al. (4), as it is multi-component, involves education and self-management, clinical decision support, delivery system design/proactive care, clinical information systems, several health care organizations and community resources.

In light of these many variables, we propose a **short-term or initial model** that allows for improvements and coordination to take place prior to implementing all the desired technological solutions. The initial model and the evolution into the long-term solution will take place with oversight from a committee of Duke and Durham Community participants. The initial model involves a **partnership with the Lincoln Community Health Center (LCHC)**. Participation of LCHC, a federally funded clinic is critical as the vast majorities of the patients are Medicaid recipients or uninsured, and utilize the Duke University Health System through sub-specialist evaluation, Emergency Department visits or inpatient admissions. However, despite LCHC's activity within the Duke Health System, there is incomplete communication and coordination of care between these two systems. We propose a means to unite and coordinate the care of patients with chronic respiratory disease by using a model that can accomplish this goal. In addition, to partnering with Lincoln we also propose to utilize the Community Oriented Approach to Coordinated Healthcare, or "**COACH**" system currently in place for NC Medicaid patients and apply those same concepts and tools to the entire Asthma and COPD populations at Lincoln.

D. Incorporation of On-going Quality Improvement

Another key component of our initial model is the inclusion of a **strong on-going quality improvement** component. The oversight group will continue to meet with LCHC providers and staff for implementation of our model at this site, with the ultimate goal to extend the model throughout the Durham Community. With the assistance of Earl Phillips, Vivian McCoy and Rowena Dolor and their expertise regarding community-based care models, we will utilize continued focus groups composed of key community members as we evaluate our initial model and enhance the processes and programs on a regular basis. We also plan to integrate with other groups, particularly, the Adolescent Health Collaborative, the Vascular Intervention Project, the Healthy Body/Healthy Minds Team and Helping Everyone Achieve Lifetime Health Team. The goals of these projects interface well with our goals, as there is significant overlap of patients that could participate in all of these models given the high prevalence of asthma in adolescents in Durham County, the association of asthma with obesity and association of COPD with cardiovascular disease.

As mentioned throughout the report, the strength of our Quality Improvement concept is a critical aspect of both the short-term and long-term model. At the general model level, we plan to use Quality Improvement to evaluate survey and focus group activities, to evaluate effectiveness of overall navigator efforts, and to enhance education. Further, we believe that we will use Quality Improvement concepts at the clinical outcome level by determining the specific drivers of our outcome measures (such as a patient's inability to refill chronic asthma medications).

Before implementing change in the current delivery of health care, we first plan to focus on understanding the present process through "value-stream mapping." This approach will analyze the

flow of information commonly required to care for individuals with asthma (13). This important step ensures that process improvements are developed and adapted for the ‘local’ environment; namely, Lincoln Community Health Center. In addition, by identifying barriers frequently encountered by LCHC providers, the team will be able to generalize findings to other patient populations or clinical settings; a similar approach identified barriers to a provider’s adherence to clinical practice guidelines (6).

Process measures evaluate whether particular steps in a process are accurately completed; they identify inconsistencies in a patient's current care and enable the team to prioritize areas of improvement. In addition to evaluating each care step, we will assess whether a patient receives *all* aspects of the intended care; this is often referred to as an "all-or-nothing" metric (for example, how many times does a patient receive the recommended beta-agonist AND inhaled steroid). This appraisal will help to quantify the often-described gap between intended care and delivered care. We anticipate process improvement will positively impact clinical measures and result in a reduction of asthma symptoms.

Using this approach, we can evaluate process measures that may be associated with clinical outcomes. As an illustration, in the example of chronic medical refills, we can utilize PDSA (plan-do-study-act) cycles to incrementally assess interventions that improve the refilling of chronic medications. The foundation and reason for success of this rapid-cycle improvement technique is starting the intervention on a small, granular scale before progressing to a larger population such as Lincoln.

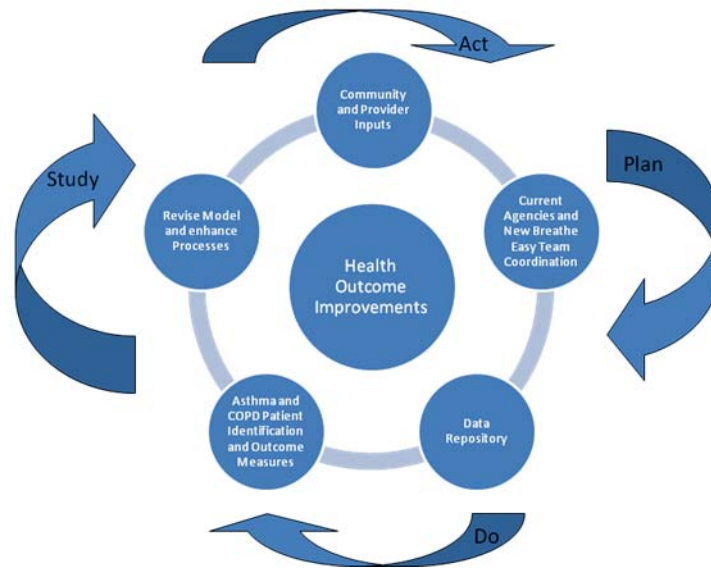
Other opportunities for interventions come from “debriefing” of patients participating in the project, survey results or interviews. Once a driver demonstrates effectiveness in reaching our process’s aim (such as 80% of patients filling chronic medications in a timely fashion), the process’ reliability is graphed against the clinical outcome of reduced ED visits. The use of annotated, run/control charts is a standardized method to depict results, helps to evaluate an interventions success over time and is a method to be employed in our proposed model.

Balancing measures focus on making sure changes to one part of the care delivery system are not creating new problems in other parts of the organization. As such, we propose to examine that reductions in acute care visits at LCHC are not associated with increased ED visits or hospital admissions. Monitoring the downstream effects of this innovative program on the Duke Health System includes both examining for improved efficiencies in clinical operations as well as the cost savings associated with reduced ED visits, hospital admissions and acute care visits.

The success of an intervention relies not only on the *quality* of the intervention, but also on its *acceptance* by staff. As such, the Breathe Easy team will adhere to concepts of ‘change management’ in which solutions are generated by engaging front-line providers. Furthermore, changes in health care delivery will be implemented through an iterative approach and modified via a Rapid Cycle Improvement technique; this model is commonly employed in CQI models and championed by healthcare groups like the Institute for Healthcare Improvement (IHI) (14).

Finally, quality of life measures will also be monitored by using established, validated measurement tools. The Asthma Control Questionnaire will be administered at each clinic encounter and evaluated by way of a trend analysis over the course of the data recovery period [10]. Additionally, we will measure functional impairments as they pertain to both adult and children using the Asthma Quality of Life Questionnaire (AQLQ) [10, 11], which is also available in Spanish. These measures will be also used to contrast the qualitative measures to the clinical parameters listed. The collected data will also be used to address the costs associated with our intervention.

Incorporating Quality Improvement



E. Use of Community Health Navigators in Identification of High Risk Patients

Similar to other care models that incorporate continuous quality improvement as reported by Fox et al., and Bodenheimer et. al. (5, 15), we would support the use of case management. For our care delivery system, we would support the identification of **community health care navigators** in appropriate numbers to handle the volume of patients to be served by our initial partner, Lincoln Community Health Center. The specific roles and responsibilities of the health care navigators are depicted in the Breathe Easy Model with key categories to monitor, support, facilitate, and document/track activities. This will be done in close collaboration with physician and PharmD champions that are a part of the clinical care team. We call our team the “**Breathe Easy Team**”. Similar to our existing outpatient health care workers, these navigators could interface with all designated care providers to provide a consolidated approach to inpatients. These individuals would provide education and instruct in the self-management of asthma and COPD using well established methodologies to determine control of airway disease and assess whether intervention is necessary.

Criteria for identification of patients in our model i.e. high risk will be similar to the guidelines put forth by the National Asthma Education and Prevention Program (NAEPP) Guidelines for asthma and the NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD (6, 7). In brief, pediatric patients will be considered high risk if they have any ED admissions, any inpatient admissions, use > 2 canisters of albuterol per year, miss more than > 10 school days per year, have an FEV1 <90% predicted or an Asthma Control Questionnaire (ACQ) score >1.5. Adults will be high risk if they have similar admission criteria but are considered at risk if they only miss 5 days of work/year (adult), use more than 6 inhalers per year or have an FEV1 <60% predicted and ACQ score >1.5. We anticipate that the number of community health care navigators necessary to provide case management in our initial model will evolve and close monitoring of the load for each individual and the potential for shared resources with other chronic diseases will be a part of our quality improvement efforts. Preliminary analysis of inpatient and outpatient visits to DUHS from individuals in Durham County with airway disease suggests a high burden of disease.

Once high-risk patients are identified, this Breathe Easy team with health care navigators at the center would then coordinate with specific asthma and COPD programs currently in place in the community to develop a collaborative respiratory health care alliance. Their focus would be to interact with programs

where patients are eligible, such as LATCH and/or the Durham Community Health Network (DCHN) and allow their case managers to monitor medication refills, coordinate care with regard to clinic appointments and participate in programs such as Project Access of Durham County, if specialist input is required, pulmonary rehabilitation and/or “Just for Us”, the latter a program for home-bound adults. In the situation where a patient is not eligible (uninsured, private insurance), the health care advocate would perform these functions.

F. Incorporation of a Patient Registry for Asthma and COPD

The novelty of our model is the long term vision and the extension from these team-based systems to one that **incorporates technology** as a means to advance care delivery. In our model, high-risk patients identified by the Breathe Easy Team directly or through interaction with Durham community programs will be interviewed by the team, given disease-specific education, and consent would be obtained for participation in our Asthma/COPD registry, which also includes a decision support application. This registry/clinical decision support program will assist the Breathe Easy Team, care providers and associated support staff in monitoring patients for compliance with treatment recommendations and providers with regard to adherence to practice guidelines.

The asthma/COPD chronic disease registry will utilize the health information already present in the Duke Data Repository and is similar to that already developed and in use by the Department of Community and Family Medicine for chronic disease management (3). Rules Engines for Asthma and COPD are currently under construction by the Department of Family and Community Medicine and Duke IT. These should be operational within a year. Drs. Monica Kraft and Peter Michelson are currently working with Dr. Kim Yarnall to finalize the metrics and prompts used for these programs. The metrics will include such parameters as lung function assessment, questionnaires to assess asthma/COPD control, frequency of rescue bronchodilator use, smoking status and immunization status. Additional information such as ED visits and hospital admissions will be obtained separately via Howard Shang and the Duke Data Repository.

The rules engine will produce reports that would identify patients who are non-adherent, but also would identify situations in which providers may not be following the recommended guidelines. These reports would then prompt a dialogue with the primary care team to better understand the obstacles to adherence on the part of the patient, and the decision-making by the primary care physician. It would also facilitate specialist referral, again based on guidelines, and if necessary, these visits could occur through interaction with Project Access.

All patients with a Duke medical record number (MRN) and a diagnosis of asthma or COPD will be entered in the registry; reports will be generated and sent to primary care practices, the community health navigators and additional care providers so they may evaluate these metrics in aggregate. Our model will interface with this framework by tagging the high risk patients and ultimately sending an individual report to the patient’s primary care provider and identified sub-specialist physician. The patients followed at LCHC who are identified as high risk but do not have a Duke MRN will receive one and then be entered into the registry manually from the LCHC site. Using this procedure, we can extend the number of patients from Durham County that can be incorporated into our registry if they can receive a Duke MRN.

Community health navigators monitoring the disease registry would facilitate referrals to providers and/or community resources that would in turn then monitor their population’s respective level of adherence which would be assessed by performing real-time data analysis of patient compliance with established treatment protocols. These data would then be incorporated into the Continuous Quality Improvement (CQI) process to identify further opportunities for improvement. As discussed above, this registry could ultimately address several chronic medical issues through integration with the listed programs providing care management of this high risk cohort, including obesity, cardiovascular disease and diabetes.

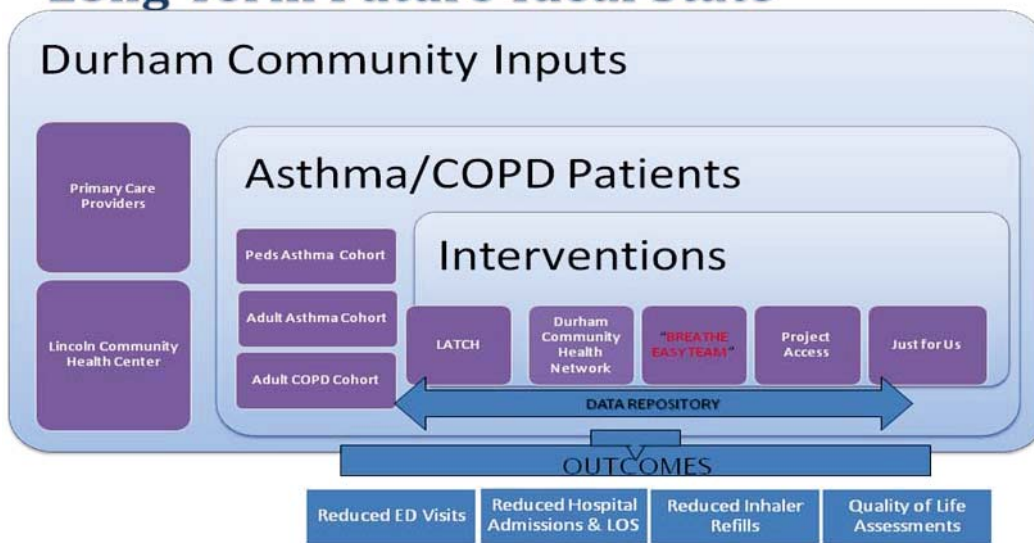
We propose to add **two additional technology components** that would interact with the registry: electronic prescription services available to Durham County primary care practices and measurement of lung function via spirometry. Electronic prescriptions are now becoming available at many clinics in

the Duke system and at LCHC. Monitoring of prescribing practices by providers and of refill activities by patients offers an effective and convenient means to monitor adherence to therapy and to treatment guidelines. As an example, this will be facilitated by the fact that Duke’s Ambulatory Electronic Medical Record (EMR) and LCHC’s EMR, Practice Partner, are products of the McKesson Corporation which will aid in data integration. The inability of access medication information has prevented the development of chronic disease registries to date. The availability of information surrounding medication usage will have a profound impact and should allow us to overcome this previously unavoidable hurdle.

Additionally, regular assessment of lung function via spirometry is considered standard of care for patients with asthma and COPD (6, 7). There are several types of spirometers available that can interact directly with an electronic medical record, and are easy to use. Our Breathe Easy Team would provide training of support staff and physicians in the use of e-prescribing and spirometry to streamline the process and reduce the burden upon the primary care staff. At the Duke Asthma, Allergy and Airway Center, the vast majority of patients evaluated undergo spirometry that is performed by nurses and respiratory therapists. This Center could provide training support; perform quality control and assistance with interpretation if needed.

Ultimately, our innovative model proposes that electronic medical records within Durham County be merged or at least allowed to interact to create a common EMR. We feel this common EMR with its associated registry should be monitored by an outside party to insure confidentiality and handle access issues. For our particular model, this would improve our ability to utilize the registry as not all patients followed at LCHC and in Durham County have Duke MRNs. In addition, the rules engines would not have access to the Lincoln EMR, and thus data would have to be entered manually, increasing the burden upon the health care staff. Discussions with Duke IT including Howard Shang, Dwight Smith and Dr. Michael Russell have highlighted the challenges associated with this endeavor. They were unable to provide an estimate of the cost required to merge the LCHC and Duke EMRs at this time. This endeavor affects all the models and is outside the scope of the proposal. However, we discuss it as a long term goal that will ultimately allow all models to interact effectively and is an issue worthy of future discussion.

The Innovative Model of Care Long-Term Future Ideal State



G. Feasibility

Evidence of the feasibility of our model in Durham County exists based on several factors. First, many of the agencies mentioned within this report already exist and are making positive impacts on the care provided. Specifically CCNC has been caring for Medicaid patients using COACH with reported successes in a variety of areas including Asthma. Expanding the concept outlined in our initial model to all Asthma and COPD patients at Lincoln is both practical and feasible. Second, the significant presence of Duke University Health System and its associated entities (Duke Hospital, Durham Regional Hospital, Duke Primary Care Network, Duke Private Diagnostic Clinic to name a few) provides the highest potential level of collaboration possible in an existing system of care that is ripe for further collaboration. The ability to implement both a short term and a long term solution for the care of Asthma and COPD patients provides immediate benefits to these associated entities in terms of the outcome measures established by our team. [APPENDIX V](#) includes illustrations of the success realized by CCNC to date.

Similar chronic care models have been instituted incorporating aspects of our model but not in its entirety. We feel that despite the novelty of our model of connected care, the resources in the community combined with the technologic advances available at Duke make this project feasible.

H. Long Term Outcomes

Early in the planning stages our team established an overall goal to demonstrate an improved control of asthma and COPD symptoms as manifested by reduced exacerbations resulting in acute care visits, ED visits and hospitalizations.

Long-Term Health Outcomes:

1. Decreased incidence of acute care visits for asthma or COPD by 10%
2. Decreased requirement for treatment with oral prednisone, as either acute or chronic therapy
3. Decreased visits to the ED for asthma or COPD exacerbations by 10%
4. Decreased hospital admissions and decreased length of stay for admissions for asthma and COPD by 10%
5. Increased chronic care visits resulting in Improvement in asthma control:
 - a. rescue inhaler refills \leq 1x month adults, 6x year peds
 - b. improved compliance refilling controller medications (inhaled corticosteroid, leukotriene-modifier and long-acting beta agonist); $>$ 8/year (average # refills of inhaled corticosteroids per month is 4/year)
 - c. Asthma Control Questionnaire score reduction by $>$ 0.5 points
 - d. improved quality of life as measured by score on Asthma Quality of Life Questionnaire
 - e. greater adherence to clinical practice guidelines by both patients and providers
6. Improvement in COPD disease status as demonstrated by:
 - a. decrease in exacerbations
 - b. improvement in quality of life as quantified via the St. George's Respiratory Questionnaire
 - c. improved BODE index
 - d. improvement of ability to perform ADL's

Our model of care is specifically aligned with these outcomes. However, it is recognized that only a small portion of these can be identified, monitored and tracked in the initial model. It is critical for us to implement a pilot project that demonstrates early success and allows for the evolution of greater collaboration while incorporating further quality improvement efforts to both improve and sustain our model over the long term. On the other hand, the full potential of the model is highly contingent on the implementation of our long term vision of incorporating technology to enhance the process. It is this long term goal that will continue to be the focus throughout the initial model and allows for the development of the appropriate infrastructure to share information.

I. Stakeholders

There are numerous stakeholders involved in our project, including but not limited to,

- Durham County residents
- Participating physicians and health care workers
- Duke University Health System and its related entities
- Community programs, organizations, and school wellness centers
- COPD and Asthmatic patients
- Administrators and managers
- DHI Respiratory Partnership team members
- Lincoln Community Health Center

All stakeholders will play an important role in our model, leading to optimum collaboration in a community to impact the health of a specific patient population. As articulated previously, the continued existence and expansion of an oversight team that has representatives from each of the stakeholders will be a critical component of the future success of the project. Specifically, the oversight team will ensure the use of quality improvement throughout the project while planning for the long-term phase of the project which involves technological integration.

J. DSR Data

Although there were delays in obtaining data from the DSR, our team received critical information relative to our project in the form a variety of tables a couple of weeks prior to final report delivery.

APPENDIX VI Includes tables of demographic and financial data requested and received for 2007, 2008 and 2009.

Our team reviewed the data provided and established the following conclusions:

1. The data for multiple years supports the original concepts that a large proportion of asthma patients are concentrated in a handful of zip codes in the Durham area.
2. The data supports the idea that the burden of care is significant on Duke Hospital and Durham Regional in terms of hospital admissions and Emergency Department visits.
3. The data supports the idea that the burden of care is significant on the outpatient side at the Children's Health Center, the Asthma Allergy and Airway Center, and various Duke Primary Care settings.
4. The data reveals that nearly 60% of the Pediatric Asthma patients were black and slightly more than 41% of the Adult Asthma patients were black.
5. The financial data provided indicates the Reported Revenue falls short of Reported Costs for Adult and Pediatric Asthmatics in both ED visits and Hospitalizations.

There is a significant amount of additional work needed surrounding existing data, especially obtaining similar demographics and financial indicators for Lincoln Community Health Center patients. Our project team made multiple attempts to secure this data, but due to historical issues and concerns about HIPPA, as well as time tables, we were unable to obtain Lincoln information. As the project evolves beginning with the short-term model, Lincoln information systems staff indicated a willingness to discuss the best mechanism to pull data that can serve to inform the interventions further (i.e. Quality Improvement) and baseline measurements of success.

There are a myriad of regulatory/policy changes (national/state/local) that would facilitate our proposed alternative model of care

- Reimbursement for preventive care, especially pediatrics
- Air quality standards
- Environmental Home Assessments
- Home care coverage
- Alternative medical/school leave policies

However, neither the short term nor our long term vision for the project is dependent on these changes. If they were to occur they would simply enhance the financial viability and potential outcomes of the project.

K. Current Economic Modeling for Asthma/COPD Treatment

Our project team identified the financial burden of our disease (and other chronic illnesses) in three categories; burden on patients, burden on providers, and burden on general community/society.

Economic burden on patients:

- A. Direct costs (co-payments, co-insurances, deductibles, general out of pocket expenses)
 - ED Visit Costs
 - Other OP Hospital Costs
 - IP (Admission) Costs
 - Primary Care Clinic Visit Costs
 - Specialty Care Visit Costs
 - Medication Costs
 - Health insurance costs
 - Transportation Costs associated with care
- B. Indirect costs:
 - Costs of caring for sick family members
 - Lost time from work (income)
 - Lost time from school
 - Secondary illness due to primary chronic condition
 - Ancillary therapies (non-traditional medications)

Economic burden on Providers:

- A. Direct costs (staff, equipment, space, supplies)
 - ED Visit costs,
 - Other OP Hospital costs
 - IP (Admission Costs)
 - Primary Care Clinic Visit Costs
 - Specialty Care Clinic Visit Costs
- B. Indirect costs:
 - Care Coordination costs due to lack of EMR (info sharing)
 - Cost of No Shows in Clinics (due to poor compliance)

Other Economic burdens: (Insurers, Community, Society)

- Overall opportunity costs of utilizing system resources for other health care
- Duplication of care costs due to lack of EMR (info sharing)
- Overall opportunity costs of less than optimal contributions to society from chronically ill patients and their families

The Value Proposition

Although the long-term model we propose will require a robust analysis of the financial impact of our new care delivery system, our short-term model could be evaluated using a “value proposition” concept which is articulated as an illustration ONLY as follows:

Part I – Population

The population that we intend to serve is those in the Durham area (defined by zip code) who have utilized services (ED Visits, Admissions) at Duke Hospital or Durham Regional Hospital. The 2008 data indicates that the total number is over 6,300 patients. Approximately 2,500 of these patients had ED visits or admissions. If our project is able to serve 8-10% of these patients, then we will target approximately 150-250 patients to be served in our first year with modifications based on volumes.

Part II – Price

Our project proposes to add components to Asthma and COPD care that will require investment/resources. Initially, expenses for year one have been estimated in the following table:

Component	Number	Amount
Oversight Activities	Varies (Quarterly meetings)	\$ 40,000
Quality Improvement	4 Teams (monthly meeting refreshments)	\$ 20,000
Health Care Navigators	1 Per 50 pts enrolled Yr 1 at 4 FTE's overall	\$ 200,000
Miscellaneous – Education, social marketing, program evaluation)	Varies	\$ 60,000
TOTAL		\$ 320,000

Part III - Value

The Breathe Easy Team proposes to impact/decrease the number of Asthma ED Visits and Hospital Admissions by 10%. It is assumed for the purposes of our model that a reduction in these visits will be desirable in that they can/will be replaced by more profitable patients that drive business in key service lines.

Part IV – Program Components

Reductions in ED Visits and Hospitalizations will occur due to the development of patient identification criteria, assignment to health care navigators, referral to appropriate resources, education on use of inhalers, medication compliance (as shown in the proposed model).

Part V – Cost Structure

Management/Oversight Functions = \$60,000
 Program Elements = \$ 200,000
 Evaluation/Misc = \$ 60,000
 TOTAL = \$320,000

Studies have shown that the level of investment indicated above is relatively easy to recoup through reductions in ED Visits, hospitalizations, and/or length of stay especially where systems are currently at capacity. The Health System subsequently benefits via relief in ED capacity which allows for additional capacity including trauma referrals that might otherwise be diverted and additional inpatient bed days are welcome and additional financial benefits. The additional investment in the form of technology for the long-term solution may be more significant, however, applicability across multiple chronic conditions allows for “economies of scale” when evaluating the economic impact of a new connected care model.

IV. Key Elements of a Connected Care Model for Success of Proposed Team Model of Care

The most notable attributes of our connected care model are that we implement with an initial, practical care process, we involve health care navigators to manage patients, and we incorporate quality improvement both in the evolution of the program and as a mechanism to assure community input and long term sustainability. Later, our model evolves into a long-term delivery system that incorporates technological solutions. Most importantly, we believe that our model can be applied across chronic care conditions and ultimately epitomizes the care across entire populations while addressing specific chronic conditions most prevalent in society.

Our team would require a number of critical functions in a connected care model

1. Use of health care navigators in adequate numbers to address the populations to be served
2. Community engagement and stakeholder involvement through an oversight committee
3. Active utilization of quality improvement
4. Information sharing across organizations created and monitored by a 3rd party

The work flow for our model is illustrated in Breathe Easy Model and would be indicative of our vision for initial start up; however, our program also recognizes the critical importance of quality improvement especially as it relates to identifying improvements in work flow processes. As a result, our initial focus is on the use of health care navigators to help identify, facilitate, monitor, and educate patients either with specific chronic conditions or across entire populations. In the short-term this is a high resource intensive solution that creates connections between existing agencies but is limited in its ability to expedite the care and ultimately provide health outcome improvements in the most cost effective fashion.

There are several critical components in assuring that residents and patients remain engaged in the connected care model. First, they must be able to participate in the design and evolution of the delivery system and the process involved, confirming the need for an oversight committee of Duke and community representatives. As mentioned previously the use of quality improvement throughout all aspects of the model will provide opportunities to continually understand the needs of residents and the model interventions that will most appropriately address their needs. This continued input process will help to ensure enthusiasm for the evolution of the model. Second, they must be comfortable that the new connected care model will not be a “passing fad” that is funded initially but then fades away quickly.

Residents and patients will only be able to gain a thorough understanding of health care treatment options and how individual behavioral choices affect individual outcomes with dedicated resources for technology, health care navigators, and processes that reach into the communities. The use of navigators and/or educators will contribute to this understanding. However, our model also anticipates creating an educational component of the breathe easy team that addresses not just patient education, but reaches out into the community and provides education to school nurses, case workers, other providers in a “train-the-trainer” type concept.

A truly effective connected care model will ultimately need to utilize technology to provide the most cost effective connections among those providing care to Asthma and COPD patients. Our model would propose a long term technology solution as previously discussed using sophisticated rules engines and a data repository. In order to share information effectively a third party agency would be beneficial. Components of information sharing specific to our needs, as well as other chronic conditions are:

- Use of e-prescribe
- Shared Medication Lists
- Refill Histories
- ED Visits
- Hospital Visits
- Pulmonary Function Test Results
- Measurements for FEV1
- Measurements of asthma control via validated questionnaires
- Data on Missed School and Missed Work
- Quality of Life Survey Results

Our proposed model, by utilizing Quality Improvement throughout, will allow for the maximum opportunity to identify changes that will meet resident and patient needs. An effective connected care model should not only include Quality Improvement, but also an “initial model or phase” that will allow for a successful implementation. Our model includes an initial partnership with Lincoln Community Health Center and COACH. The extended use of COACH for all patients seen at Lincoln provides for a pilot phase of the model that can be demonstrated to effectively reach the Asthma and COPD patients in Durham County. COACH will be used to identify patients admitted to hospital or seen in ED for instance, or determine risk

In summary, the attributes of a highly successful connected care model are the specific attributes that we have incorporated into our proposed model.

- ✓ Short-term and long-term models (rapid success, followed by enhancements)
- ✓ Quality Improvement
- ✓ Community Health Care Navigators
- ✓ Oversight Committee of Duke and Community Leaders (continued)
- ✓ Third Party Facilitation of Technology Solutions
- ✓ Community Partnerships
- ✓ Existing community information network use (COACH)

Conclusions

Step 1 – Identify the high-risk patient

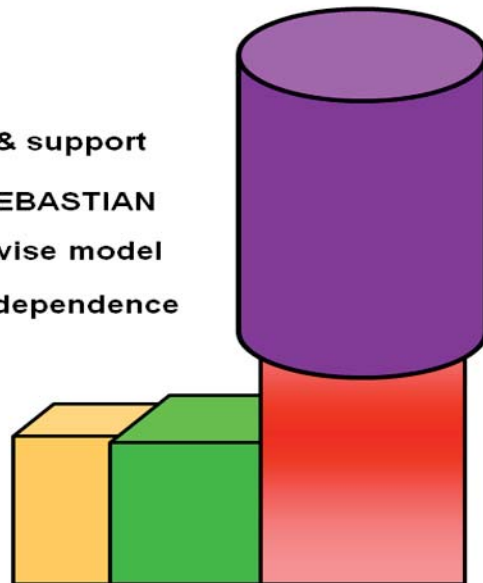
Step 2 – Enlist patients into our CCM

Step 3 – Engage Health navigator to educate & support

Step 4 – Monitor and track using COACH & SEBASTIAN

Step 5 – Employ QI measures to study and revise model

Step 6 – Improve outcomes & establish pt. independence



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