Use of Spirometry to Measure Asthma Control in Patients with Sickle Cell Disease

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Background and Significance

- Sickle cell disease is a common genetic disorder and affects approximately 100,000 patients in the United States (Haskell, 2010).

- Asthma affects 23 million patients in the US alone (ALA Epidemiology and Statistics, 2009).

- African American children ages 0 to 17 years old are disproportionately affected having a 62% greater prevalence rate for asthma than Caucasians, in addition to a 250% higher rate of hospitalization, and 500% higher death rate (Akinbami, 2006).
• Acute Chest Syndrome (ACS) is the leading cause of premature death and the second most common reason for hospitalization in patients with SCD (Miller, 2011).
• The comorbidity of asthma in patients with SCD significantly increases the risk for developing ACS
• Sickle cell anemia patients with asthma have increased risks for morbidity and mortality
• To date, there are no published data from clinical trials prospectively investigating management of asthma in children with SCD.

• National Institutes of Health (NIH), National Heart, Lung, and Blood Institute guidelines for asthma management should be standard of care in children with SCD and asthma to minimize morbidity and mortality.

• Poor adherence to asthma treatment plans is very common in children in particular adolescents
• Patients with asthma and SCD should be followed by a pulmonologist to ensure proper management.
• Spirometry/ Pulmonary Function Test (PFT) are needed to evaluate effectiveness of treatment plan.
• Early detection of decrease in pulmonary function would lead to changes in management, possibly decreasing development of Acute Chest Syndrome (ACS).
Methods:

The Electronic Medical Record (EMR) using i2b2, (a de-identified data repository) for 4 Academic Medical Centers (AMC) was queried for the count of patients 5-34 years of age seen between 12/01/2010 and 12/01/2015 having co-morbid diagnoses of Asthma, Sickle Cell Disease and Acute Chest Syndrome. Queries to cross-reference those patients with the CPT code for spirometry was then performed.
The i2b2 query included; (1) Number of patients with SCD + ACS + Asthma + Spirometry, (2) Number of patients with SCD, (3) Number of patients with SCD + Asthma, (4) Number of patients with SCD + ACS, and (5) Number of patients with SCD + ACS + Asthma. The percentage of SCD + ACS + Asthma patients having spirometry testing was calculated by dividing SCD + ACS + Asthma + Spirometry by the number of patients with SCD + ACS + Asthma. The four AMC’s were labeled as A, B, C, D.
Results:
• The combined total number of patients for 4 AMC (A,B,C,D) for categories (1) SCD+ACS+Asthma+Spirometry,(2) SCD,(3) SCD+Asthma, (4) SCD+ACS, (5) SCD+ACS+Asthma are respectively; (1)77, (2)2749, (3) 577, (4) 409, and (5) 249. Number of patients for each AMC for these five categories; (1) Number of patients with SCD + ACS + Asthma + Spirometry, A =<10, B= 18, C= 52, D= <10.
(2) Number of patients with SCD, A=428, B=378, C=1202, D=741. (3) Number of patients with SCD+Asthma, A=79 (18.4%), B=57 (15.0%), C=377 (31.3%), D=64 (8.6%). (4) Number of patients with SCD+ACS, A=72 (16.8%), B=78 (20.6%), C=142 (11.8%), D=117 (15.7%). (5) SCD+ACS+Asthma, A=37 (8.6%), B=43 (11.4%), C=146 (12.1%), D=23 (3.1%).
The percent of patients with SCD+ACS+Asthma who also had spirometry performed for each AMC was calculated 
(SCD+ACS+Asthma+Spiro/SCD+ACS+Asthma = %); A=<10%, B=41.8%, C=35.6%, D=26%.
The total number of patients with SCD+ACS+Asthma for all 4 AMC= 249, those 
having spirometry = 77, thus (77/249) 30.9% of patients with SCD+ACS+Asthma 
had spirometry performed.
Conclusion:
Asthma is prevalent in children with SCD and may result in episodes of ACS. Across 4 AMC only 30.9% of patients with SCD, ACS, and asthma received spirometry testing. In addition there is considerable variation among the 4 AMC ranging from <10% to 41.8% receiving spirometry. Despite the NHLBI recommendations for children with asthma it appears that only a third of these patients with co-morbid SCD, ACS, and Asthma receive this procedure.
Very few are being routinely tested for changes in pulmonary function, or those tests are not being coded and documented appropriately. Better coding and documentation practices for spirometry testing in those with sickle cell disease and asthma will allow better access for providers to utilize those test results for asthma management. If the testing is not being done routinely, further research should be done to determine if there are barriers to obtaining appropriate pulmonology evaluation and management.
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