Consultant360 Multidisciplinary Medical Information Network

CASE IN POINT

Status Asthmaticus: Using a Digital Stethoscope

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A 5-year-old girl presented to a new primary care pediatrician the day after having been discharged from a hospital stay during which she had been treated for status asthmaticus with respiratory failure. The girl had a history of eczema, seasonal allergies, and the use of nebulized β-agonists with respiratory illnesses. She had never been on asthma controller medications.

Background. Prior to her hospitalization, she had been seen by an outside pediatrician, at which time she was noted to have cough, dyspnea, and intercostal retractions. Wheeze was noted upon examination, with decreased aeration noted diffusely. Her oxygen saturation was 92% on room air. She was given inhaled β-agonists and sent to the emergency department for evaluation and admission. Following admission to the pediatric floor, her status worsened, and she was transferred to the pediatric intensive care unit.

Her clinical status improved over the course of a 5-day hospital stay, during which she received heliox therapy, intravenous (IV) magnesium, IV methylprednisolone, and β-agonist treatments. Her complete blood cell count results were normal. Her C-reactive protein level was less than 0.5 mg/L. A blood culture test was negative for pathogens after 72 hours. She was found to be positive for rhinovirus/enterovirus via respiratory pathogen panel polymerase chain reaction testing.

She had been discharged home on hospital day 5 on fluticasone via hydrofluoroalkane inhaler, albuterol via metered-dose inhaler (MDI), and montelukast.

Her in-office evaluation the day after discharge revealed a well-appearing child in no acute distress. She had an intermittent cough during examination. Pulmonary examination revealed decreased aeration at the lung bases bilaterally. There was end-expiratory wheezing. There was no increased work of breathing and no intercostal retractions. Oxygen saturation was 96% on room air. Heart rate, respiratory rate, and blood pressure were within normal limits for her age. She also had noted enlarged, pink, boggy nasal turbinates. The remainder of the physical examination findings were normal.

She was given 2 puffs of albuterol via MDI with mask and spacer in the office, with improved aeration noted. Fluticasone nasal spray for her history of untreated seasonal allergic rhinitis also was prescribed. An asthma action plan, including proper use of the mask and spacer, was reviewed with and provided to the girl's parents.

Because of the family's distance from the pediatric office during the upcoming weekend, the parents were provided with a digital stethoscope and were given instructions and a presentation on its use, including correct placement of the digital stethoscope against the chest or back. The parents were reminded that they could refer to tutorial videos about placement with the stethoscope's accompanying smartphone-enabled CliniCloud app if they were unsure of the correct position. Pretreatment and post-treatment lung sounds were confirmed in the office with the digital stethoscope compared with a conventional acoustic stethoscope. The parents were instructed to send a follow-up recording of the patient's lung sounds in 48 hours after the office visit, or sooner if her cough worsened or if she had an increase in work of breathing. Symptoms necessitating a 911 emergency response were reviewed.

Discussion. Asthma is the most common chronic illness in children in the United States.[1] More than 24 million people in the United States representing an estimated 8.6% of children and 7.4% of adults, are living with asthma.[2] Additionally, with the increased number of health care visits for uncontrolled asthma, costs of hospitalization, and missed school/work days, asthma care was estimated to cost $56 billion per year in 2007.[3] With new technologies and the ability for improved follow-up and care within the medical home, peripheral devices, such as a digital stethoscope used through telemedicine consults, are an additional way to follow patients with chronic illnesses.

Telemedicine has been used effectively in cardiology, psychiatry, dermatology, and pathology and in intensive care units. Many studies in children have shown that telemedicine is effective in childcare settings and chronic disease care management.[4] Telemedicine technology has improved dramatically over the past few years and has allowed providers working as part of a medical home to care for their patients even during nontraditional office hours. Telemedicine has also been found to be a reliable tool in assessing the severity of respiratory distress in children.[5]

The quality of lung sounds heard with a digital stethoscope were found to be at least equivalent to those heard with a standard stethoscope. Additionally, the CliniCloud smartphone app accompanying the digital stethoscope provided sufficient guidance to the user on the placement and use of the stethoscope to produce clinically useful respiratory sounds.

Through virtual visits, following children or adults with asthma, whether after hospitalization or during periods of exacerbation, can enable children to miss fewer days of school and parents to miss fewer days of work. Additionally, nearly 30% of pediatric hospital readmissions may be preventable.[6] Virtual follow-up may allow plans of care to change sooner and potentially reduce asthma-related hospital readmission.

Wu and colleagues[7] found that a significant number of parents do not know what type of asthma medication their child was prescribed or how to properly use it. Telemedicine visits and the use of peripheral devices may improve medication adherence by allowing parents to communicate more with their primary care provider or physician extender staff, who can reiterate asthma action plans, redemonstrate proper use of spacers, and monitor medication usage before and after treatment.

Connecting patients and parents with their pediatrician or primary care provider via telemedicine with connected devices may be able to improve diagnoses and treatment plan adherence, reduce hospital readmission, and provide reassurance when indicated to patients.

Patient outcome. At a follow-up visit 2 days later, the parents reported that the patient was feeling well, active, and happy. Her cough had nearly resolved. The parents had recorded 4 areas of the lungs and had sent the recordings via secure messaging through the app to the pediatrician. Pulmonary examination revealed a normal respiratory rate, improved aeration especially at the lung bases, no wheezing, and no rhonchi. β-agonist therapy frequency was decreased as a result.

The patient was seen again in the pediatrician's office a few days after the digital stethoscope evaluation. Pulmonary examination revealed clear lung sounds, good aeration bilaterally, no increased work of breathing, and an oxygen saturation of 98% on room air. Blood pressure, heart rate, oral temperature, and respiratory rate were within normal limits. Pulmonary examination findings were again confirmed in the office with a conventional acoustic stethoscope and the digital stethoscope. The remainder of the physical examination findings were within normal limits except for enlarged, pink, boggy nasal turbinates consistent with her seasonal allergic rhinitis. The patient's parents reported that she was feeling great and had returned to baseline.

References:

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