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# Chronic Pulmonary Aspiration in Children: Diagnosis and Management

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Chronic pulmonary aspiration (CPA) is a common cause of morbidity in children with complex aerodigestive disorders. CPA can be caused by swallowing dysfunction, anatomic, or dynamic abnormalities of the airways, and/or other circumstances that overcome the child's natural capacity to protect the airway. Diagnostic evaluation for suspected aspiration aims to characterize the swallowing function, identify the etiology of aspiration, including anatomic and/or dynamic abnormalities causing aspiration, and evaluate for the development of aspiration sequelae (e.g., bronchiectasis).

CPA management approach should be guided by the recognized risk factors and co-morbidities, and directed to decrease the events of aspiration, improve clearance of aspirated material, and limit the development of aspiration sequelae (e.g., chronic inflammation and recurrent infections). This article presents a practical approach for the diagnosis and management of chronic pulmonary aspiration (CPA) in children.

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## Introduction

**C**hronic pulmonary aspiration (CPA) refers to recurrent entry of material (such as upper airway secretions, feeds, or esophago gastric refluxate) into the lower airways. Aspiration can be caused by swallowing dysfunction, anatomic, or dynamic abnormalities of the airways, and/or circumstances that overcome the child's capacity to protect the airway.<sup>1,2</sup>

Chronic aspiration is a common cause of morbidity in children with complex multi-systemic medical problems as aerodigestive disorders. Aspiration pneumonia is one of the primary causes of hospitalization in children with aerodigestive disorders. In contrast to children admitted with a diagnosis of community-acquired pneumonia, children admitted with a diagnosis of aspiration pneumonia tend to have more severe clinical presentation and more

complications, are 3 times more likely to require ICU level of care, have longer lengths of stay, more costly hospitalizations and more frequent 30-day readmission rates.<sup>3</sup>

The effect of aspiration in the development of chronic symptoms and long-term sequelae is dependent on multiple factors including the quality, volume and bacterial load of the aspirated material, the frequency of aspiration events, and the child's capacity to clear aspirated material. In addition, sequelae of aspiration events will depend on the immunologic status of the host, as it will determine the capacity to fight infection and the severity of the inflammatory response resulting from aspiration.

This article presents a practical approach for the diagnosis and management of chronic pulmonary aspiration (CPA) in children.

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***CPA Sequelae is dependent on the quality, volume and frequency of aspiration events, as well as the child's capacity to clear aspirated material and infections.***

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## Clinical History

The medical history for a child in whom CPA is suspected should focus on identifying and characterizing the clinical symptoms, risk factors, co-morbidities, and sequelae of aspiration.

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## Clinical Symptoms

Chronic respiratory symptoms that should raise concerns about CPA include: chronic cough, noisy breathing, wheezing, tachypnea, and dysphonia. Important aspects of the clinical history are age of onset, frequency, chronicity, severity and triggers of the symptoms, and response to treatment. Cough in children with CPA is typically described as wet in quality, constant though increased during sleep and upon awakening, and triggered by oral intake, gastrostomy tube feedings, physical activity and/or with increased upper airway secretions (e.g., URIs) or with emesis. Noisy breathing is frequently described as chest ronchi or wheezing. Frequent wheezing may result from exacerbation of reactive airway disease (RAD) triggered by aspiration events, but most commonly results from airway obstruction by excessive mucous and inflammation. Wheezing caused by mucous plugging tends to be central, monophonic, biphasic, focal and migratory on auscultation, and responds to airway clearance therapy. In contrast, wheezing due to bronchospasm, tends to be peripheral, polyphonic, expiratory, and multifocal on auscultation, and responds to bronchodilators. Persistent tachypnea is a compensatory mechanism to maintain minute ventilation and gas exchange when mucus plugging and inflammation caused by CPA results in airway obstruction. Intermittent tachypnea may result from sporadic events of aspiration resulting in transient non-infectious pneumonitis.

Information about the age at onset and timing of symptoms helps identify the etiology of aspiration by narrowing the differential diagnosis. Onset of symptoms early in life suggests a congenital abnormality as the etiology of aspiration (e.g., laryngoesophageal cleft and Chiari malformation). Late onset of symptoms suggests an acquired pathology such as vocal cord paralysis resulting from trauma to the recurrent laryngeal nerve or due to acquired scarring of glottis

structures. Predominance of symptoms during sleep suggests a swallowing dysfunction resulting in aspiration of upper airway secretions or refluxed material as the cause of aspiration. Aspiration of upper airway secretions during sleep can be caused by obstructive sleep apnea (OSA) that results in defective coordination of breathing and swallow.<sup>4</sup>

Intermittent symptoms consistent with aspiration may develop when a child is challenged by circumstances that overcome their natural capacity to protect their airway from aspiration, as may occur at times of seizure activity or due to sedation even in children with normal or minimally abnormal swallowing function.

Sequelae of chronic aspiration include development of chronic respiratory symptoms, recurrent lower respiratory tract infections (LRTIs), lung injury, decreased

pulmonary function and failure to thrive. Recurrent pneumonia or LRTIs are one of the most common reasons for referrals to pediatric aerodigestive centers. Children with asthma and/or bronchomalacia having a viral respiratory illness may present with persistent cough and chest congestion, and may have chest radiographic findings demonstrating focal areas of opacities. Consequently they are commonly diagnosed as having bacterial LRTIs without meeting clinical criteria to support it. A diagnosis of bacterial LRTI should not be made lightly in the absence of symptoms such as fever, changes in breathing pattern (e.g., tachypnea and increased work of breathing), persistent focal auscultatory findings, hypoxemia and/or ill-appearing presentation. It is important to make an independent

assessment of the clinical history and available imaging studies in order to validate the 'established diagnosis' of recurrent LRTIs.<sup>5,6</sup>

### Risk Factors

Risk factors for aspiration include having a congenital or acquired disorder that affects the anatomy and/or function of the upper airway and the gastrointestinal

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***History of chronic cough, chest congestion, failure to thrive, and prolonged, frequent or complicated respiratory infections should raise concerns for CPA.***

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***Some children with only mildly abnormal swallowing function may aspirate only when challenged by circumstances that overcome their natural capacity to protect their airway (e.g., emesis or increased upper airway secretions).***

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