Direct causality between aspiration during swallowing and chronic respiratory infections has long been assumed. However, emerging evidence suggests that aspiration in and of itself may not be an independent risk factor for the occurrence of lower respiratory tract infections (LRTI) in children. In fact, a variety of host and environmental factors determine whether or not aspiration during swallowing will be significant co-factor in the occurrence of LRTI. Factors which heighten the clinical significance of aspiration include respiratory illness especially early in life, feeding practises, smoke exposure and dental caries. These observations suggest that a change in thinking about the management of aspiration during swallowing in children is required. Management strategies must address both health and environmental factors that could negatively impact lung health. Enteral feeding is not a panacea in addressing the host of problems children with aspiration present. Using a case-based approach, this session will focus on the characteristics of children who aspirate and the development of feeding plans that address aspiration risk and lung health in comprehensive manner. Factors critical to the decision about the initiation of enteral feeding will be discussed.

At the conclusion of the presentation, the learner will be able to
1. List three of the most common causes of dysphagia in children
2. Communicate four important elements of a feeding plan for children who aspirate during feeding
3. Discuss the role of enteral feeding in a dysphagic management plan for a child

Questions:
1. Aspiration during swallowing always results in aspiration pneumonia? True or False
2. Careful handfeeding may be as safe as enteral feeding for some people? True or False
3. Enteral feeding decreases the risk of pneumonia in children who aspirate? True or False
(Answers: False, True, False)

References
Aspiration during swallowing was long thought to have a direct causal link with aspiration pneumonia and chronic lung disease. In fact, most teaching programs for a variety of disciplines teach this as a fact. Unfortunately, accepting the causal link between aspiration and lower respiratory tract infections, may lead to feeding treatment plans that are disproportionate to the problem and do not consider the holistic care of the affected child and family. Let us consider what is known about aspiration and its consequences in children.

Who aspirates? Children with neurodevelopmental problems, preterm infants, children with anatomic abnormalities of their aerodigestive tracts are all at increased risk of aspiration. The typical picture of a child who aspirates is one with a host of medical problems who has a neurodevelopmental problem like cerebral palsy who has difficulty both with food processing, as well as swallowing. Children with milder impairments, such as, Down Syndrome and Fetal Alcohol Syndrome also are more prone to aspiration. Aspiration during swallowing can be seen in children with typical development (Skeikh et al 2001). In addition, a clustering of cases in typical children with indigenous heritage has been described but is not yet fully understood (Rempel et al 2011)

What about the causal relationship of aspiration and pneumonia? Several authors have looked at children who aspirate and the relationship with pneumonia. Weir et al (2007) suggested in her review of children with aspiration during swallowing that a fluoroscopic swallowing study might over-estimate the impact of aspiration in relation to other known factors that are associated with pneumonia. In this group of children, aspiration and pneumonia were not related when they controlled for other factors that could contribute to pneumonia: the factors of importance for development of pneumonia were history of lower respiratory tract infection, cough, mechanical ventilation, oxygen requirement, asthma, Down Syndrome and gastroesophageal reflux. Similarly, Rempel et al 2011 demonstrated that children who demonstrated aspiration during swallowing more likely to have pneumonia only if they had other risk factors for pneumonia. Langmore et al (1998) had a similar finding in adult patients who developed aspiration pneumonia: independent factors correlated with aspiration pneumonia included dependent for feeding, dental caries, smoking and multiple medical diagnoses.

So what does this mean for treatment plans? Management decisions including restriction of oral feeding are often made following a finding of aspiration or perceived aspiration risk on a VFSS. These restrictions may significantly influence the childrens’ and parents’ lives and workload. The hypothesis that aspiration and pneumonia are directly correlated has not been supported by the literature in several studies making it important that we question traditional treatment plans. (Weir et al, 2005) A holistic view of the child and the intervention for the aspiration need to be taken into consideration.

Case discussions:

1. **Anatomic problems:** Natalie, a 4 year old with Down Syndrome had a colonic interposition for esophageal atresia shortly after birth presents with repeated life threatening pneumonias requiring respiratory support. Videofluoroscopic swallow study shows aspiration during swallowing of thin liquid and significant dysmotility in the neoesophagus such that even 20 minutes later the food retained in the pharynx. Natalie loves to eat, no oro-motor problems. Considerations for developing a feeding plan: anatomic abnormality, recurrent pneumonias, parental wishes and plans need to be balanced with love of eating. Mitigate risks, maximize the pleasurable aspects of eating

2. **Mechanical feeding and swallowing problems:** Drew is a 14 year old with cerebral palsy weighing 20 kg who is a wheelchair- user who loves to eat, despite his emaciated appearance. He has significant motor problems, is unable to feed himself but is able to express himself and communicate his needs. He has not gained weight for two years, but is reportedly eating >2000 calories per day. His school is calling us in Feeding Clinic because he is choking all the time when he is eating which is demonstrated on a swallowing study. His parents do not want to consider non-oral feeding. He has never had pneumonia. Considerations for developing a feeding plan: Drew’s wishes, family wishes and school planning need to be balanced with lack of weight gain, aspiration risk (without pneumonia). Is careful hand-feeding safe? (DiBartolo 2006)

3. **Lack of desire to eat:** Anna is a two year old with uncontrolled seizures and an undiagnosed neurodevelopmental problem who is bottle dependent, coughs regularly when drinking and has very immature oro-motor skills. She needs to be sucking to trigger a swallow. She was quite overweight when
first seen in Feeding Clinic, but progressively over the past 6 months she has had precipitous weight loss temporally associated with anticonvulsant management changes. While still at the 50% weight for height on the WHO growth charts for Canada, her mom is struggling to get in enough fluids to meet her needs. Anna herself is quite anorexic and no longer willingly takes her bottle, which in the past was never a concern. She has never had a lower respiratory tract infection despite the clinical signs of aspiration. Considerations for developing a feeding plan: Parental wishes, time to feed, fluid requirements of anticonvulsant regime, getting anticonvulsants into her to control the seizures, tenuous feeding skills and aspiration risk need to be balanced with parental sense of loss if non-oral feeding is considered

What are the essential elements of a treatment plan for a child with aspiration?

1. Listen to the child’s and parent’s goals
   Successful feeding can measured in terms of positive mealtime experiences (Arvedson, 2008) and not just in food consumed

2. Non-oral feeding: remember that non-oral feeding does not stop the aspiration. What do we do if parents are totally against non-oral feeding? Do we call their parental rights into question? Do we convince them to non-orally feed their child? Do we balance oral and non-oral intake?

3. If we look at risk factors for aspiration: dependent feeding, dental caries, smoking (? smoke exposure) and multiple medical problems with view to mitigating risks for aspiration, perhaps we can develop appropriate plans:
   a) Decreased risk of dependent feeding with appropriate pacing, no supine feeding, good positioning for
   b) Address mouth care – think of all the bacteria that are in the mouth of a child who aspirates
   c) Eliminate smoke exposure (tobacco and environmental). Perhaps we should add other airborne irritants
   d) Multiple illness: address other risks like gastroesophageal reflux, does posturing and pummeling help clear the airway and improve lung health, address nutrition concerns, maximize seizure control.

4. Non-oral feeding may be part of the treatment plan, but generally not if the parents or child are not in favour of it and if aspiration is the only risk factor for lower respiratory tract infections and poor nutrition. If eating is not fun anymore or takes all day and prevents participation in pleasurable activities, if nutrition is a problem and if there are chronic respiratory concerns, non-oral feeding for the bulk of the calories with small amounts for pleasure and skill maintenance may be the appropriate plan

Summary: Aspiration matters but is generally not sufficient to cause aspiration pneumonia unless there are other co-occurring factors. The presence of aspiration should not in and of itself be the only deciding factor in the decision to initiate non-oral feeding.

References:
DiBartolo MC. Careful Hand Feeding: a reasonable alternative to PEG tube placement in individuals with dementia. J Gerontological Nursing (2006); 32:25-33