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# New Directions in the Diagnostic Assessment of Swallowing Disorders in Children

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*To Tim  
& Amelie*



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## LIST OF ABBREVIATIONS

|                     |  |
|---------------------|--|
| ASCII               | The American Standard Code for Information Interchange |
| AP                  | Aspiration – Penetration Score                         |
| BR                  | Bolus Residue Score                                    |
| CLD                 | Chronic Lung Disease                                   |
| cm                  | centimetre   |
| CP                  | Cerebral Palsy   |
| DDS                 | Dysphagia Disorders Survey                             |
| DMSS                | Dysphagia Management Staging Scale                     |
| ENT                 | Ear, Nose and Throat                                   |
| FEES                | Fibreoptic Endoscopic Evaluation of Swallowing         |
| FTT                 | Failure To Thrive                                      |
| fMRI                | functional Magnetic Resonance Imaging                  |
| HRM                 | High Resolution Manometry                              |
| LOS                 | Lower Oesophageal Sphincter                            |
| LRTI                | Lower Respiratory Tract Infection                      |
| MATLAB <sup>®</sup> | Matrix Laboratory (Mathworks Inc.)                     |
| MII                 | Multi-channel Intraluminal Impedance                   |
| mm                  | millimetre   |
| mmHg                | millimetre mercury                                     |
| $\Omega$            | Ohms   |
| OSAS                | Obstructive Sleep Apnoea Syndrome                      |
| TOF                 | Tracheo-Oesophageal Fistula                            |
| VFSS                | Videofluoroscopic Swallowing Study                     |
| WCH                 | Women’s and Children’s Hospital                        |



## SUMMARY AND DECLARATION

Assessment and management of swallowing disorders is one of the key areas focused on by speech pathologists working with children in an acute setting. Swallowing is an extremely complex process of bolus passage from the oral cavity through to the oesophagus. Numerous muscles and nerves work together to produce contractions of the tongue and pharynx, initiate laryngeal elevation, and together with the passage of the bolus create pressure changes to move the food or liquid toward the oesophagus. Swallowing difficulties are disruptive to quality of life, impact nutrition and chest health, and at their worst can significantly reduce lung function and ultimately result in reduced life span and death. The age and range of children experiencing dysphagia varies widely, but the group experiencing most swallowing difficulties is that of children with neurological conditions. Feeding difficulties affect over half of children with neurological impairment (such as cerebral palsy), and swallowing disorders are present in up to 76% of children with severe brain injury (Morgan, Mageandran, & Mei, 2009; Morgan, Ward, Murdoch, Kennedy, & Murison, 2003; Sullivan et al., 2000). Pharyngeal stage swallowing difficulties are common within this group (Rogers, Arvedson, Buck, Smart, & Msall, 1994; Sullivan, et al., 2000) and the degree of disability correlates with the severity of dysphagia (Sullivan, et al., 2000).

The aim of this body of work was to contribute knowledge regarding the assessment of paediatric swallowing disorders, with the long-term goal of impacting therapy and management. Currently the most common assessment of

dysphagia in this group, the videofluoroscopic swallow study (VFSS), utilises radiology. For children in particular, the issue of radiation exposure must be considered, especially if the child is to have repeat studies throughout childhood (Weir et al., 2007). Alternative methods of determining pharyngeal dysphagia and risk of aspiration and, therefore, also its impact on health and wellbeing, would be extremely beneficial for this group.

This study proposes the use of impedance, or combined manometry and impedance to objectively assess swallowing disorders in children. While these methods were combined with radiology for validation purposes in this study, there is the potential for the technique to be developed to a level where information regarding the swallow can be derived without the need for radiology.

The *Flow Interval*, an objective method utilising impedance during assessment of bolus flow through the pharynx, was derived during the study. A longer Flow Interval was identified in those children who were at increased risk of aspiration. The further development of this technique will serve to enable more precise objective definition of the mechanisms of swallow dysfunction, and therefore, also the possibility of developing novel therapy options for these children with significant swallowing disorders.

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

.....  
*Larissa Kate Noll, 28<sup>th</sup> February 2011*

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## PUBLICATIONS

Noll, L., Rommel, N., Davidson, G. P. & Omari, T. I. (2011). Pharyngeal flow interval: a novel impedance-based parameter correlating with aspiration. *Neurogastroenterology and Motility*, 23(6), 551-e206.