CELEBRATE PEDIATRIC RESEARCH DAY ABSTRACTS MARCH 6, 2015

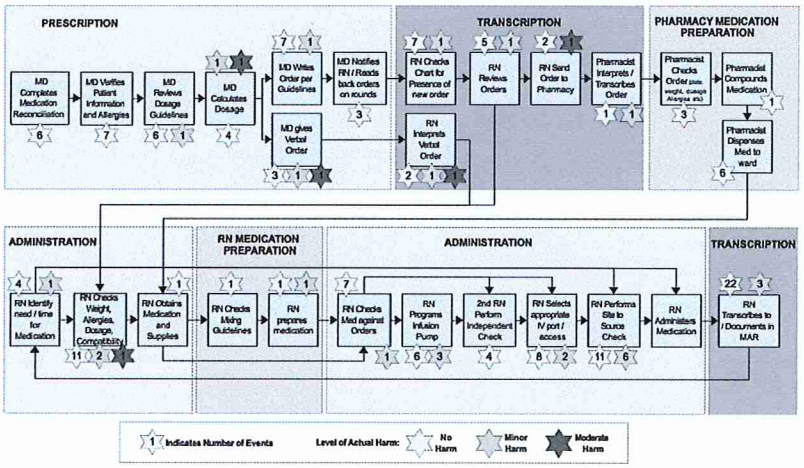
ABSTRACT #1 **SPEAKER: Dr. Brenda Law** **Resident Year 4** **Resident Competition Paper# 1**

Medication Errors in the Pediatric Intensive Care Unit: Characterizing Areas of Vulnerability by Mapping Safety Events to Medication Workflow

Brenda Law, D Wensley, R Carr, G Krahn, K Thibault, Division of Critical Care

Background: Medication errors affect patient safety, especially in Pediatric Intensive Care Units (PICU). At a tertiary PICU, medication-related patient safety events were analyzed to target quality improvement. **Methods:** The medication workflow was characterized through observations and interviews, then represented as a value stream map per Lean methodology. Medication-related patient safety events occurring between October 1, 2011 and September 30, 2012 were collected from an electronic voluntary reporting system. Each event was characterized; errors were identified and plotted on the value stream map. A risk estimation method was adapted to categorize the significance of each event. **Results:** Five-hundred events occurred, 90 (18%) related to medication errors and analyzed, resulting in 0.1 medication events per admission. More events occurred in infants compared to older children. Medications most involved were antibiotics (15.5%), morphine (10.0%), and total parenteral nutrition (7.8%). Most events involved more than 1 error (71.0%), with errors occurring in administration (48.9%), followed by prescription (38.9%) and transcription (38.9%). Most were initiated by errors in prescription (38.9%) or administration (32.2%). While most resulted in no harm (84.4%) or minor harm (13.3%), many had significant potential harm (44.7%). Many were high risk (34.4%). Error-prone steps were identified in prescription, manual transcription, and site-to-source checks; quality improvement initiatives were targeted towards these vulnerabilities. Results are detailed in Table 1 and Figure 1. **Conclusions:** We successfully applied Lean methodology to characterize medication errors and identify areas of vulnerability. Most reported events resulted in no or minor harm. However, using an adapted risk estimation method, we identified many events that posed significant risk to patients.

Number of Total PICU Events:	500	
Number of Events related to Medication Error:	90 (18.0%)	
By Age:	**Number of Events ***	**Patients Admitted**
Total	90	1247
0 – 28 days	30 (33.3%)	118 (9.5%)
> 28 days to < 1 year	19 (21.1%)	291 (23.3%)
1 to 6 years	15 (16.7%)	389 (31.2%)
7 to 12 years	13 (14.4%)	205 (16.4%)
13 – 19 years +	16 (17.8%)	244 (19.6%)
Events By Process:	**Contain Errors ***	**Initiated Errors**
Prescription	35 (38.9%)	35 (38.9%)
Transcription	35 (38.9%)	17 (18.9%)
Pharmacy Medication Preparation	10 (11.0%)	9 (10%)
Nursing Medication Preparation	3 (3.3%)	0 (0%)
Administration	44 (48.9%)	29 (32.2%)
Medication type:	**Number of Events ***	
Once only medication	9 (10%)	
Regularly Scheduled medication	39 (43.3%)	
PRN medication	7 (7.8%%)	
Continuous Infusion	31 (34.4%)	
Bolus through continuous infusion	1 (1.1%)	
Not specified / Not applicable	5 (5.6%)	
Number of separate errors per event:	**Number of health care workers involved**	
1 26 (28.9%)	1	44 (48.9%)
2 49 (54.4%)	2	36 (40.0%)
3 10 (11.1%)	3	8 (8.9%)
4 5 (5.5%)	4	2 (2.2%)
Events resulting in:	**Actual Harm**	**Potential Harm**
No Harm	76 (84.4%)	17 (18.9%)
Minor Harm	12 (13.3%)	30 (33.3%)
Moderate Harm	2 (2.2%)	22 (24.4%)
Severe Harm	0 (0.0%)	20 (22.2%)
Death	0 (0.0%)	1 (1.11%)
Near Misses:	29 (32.2%)	
Risk of Events:		
Very low	17 (18.9%)	
Low	35 (38.9%)	
Moderate	7 (7.8%)	
High	31 (34.4%)	



ABSTRACT #2 **SPEAKER: Dr. Amitava Sur** **Neonatology Division** **Fellow Competition Paper #1**

Assessment RSV-specific neutralizing Antibody Levels in Children Enrolled in a Modified RSV Immunoprophylaxis Program in British Columbia

Amitava Sur, AM Callejas, E Kwan, S Turvey, P Lavoie, A Solimano, N Marr, Division of Neonatology

Background: Human respiratory syncytial virus (RSV) is the most frequent cause of lower respiratory tract infection and hospitalization in early life. Monthly IM injections of PVZ, a humanized monoclonal RSV-neutralizing antibody (Ab), reduces the risk of severe RSV disease in high risk infants. The optimal dosing schedule remains controversial. We have previously shown that an abbreviated dosing regimen with a max of 3 or 4 doses of PVZ effectively prevents RSV hospitalizations in moderate and high risk infants in British Columbia (BC). **Objective:** To measure RSV-neutralizing serum Ab levels in infants in BC following a 3- or 4-dose PVZ regimen. **Design/Methods:** Infants eligible to receive 3 or 4 doses of PVZ during the 2013/14 RSV season in BC provided serum samples prior to, and within 1 week after the first PVZ dose, as well as 28 to 70 days after the final dose (end of RSV season). Serum samples were also obtained from 2 control groups of healthy adults and infants ≤12 months of age who did not receive PVZ. RSV-neutralizing serum Ab titers were measured using a RSV microneutralization assay. The endpoint of the assay was the neutralizing titer (NT95) corresponding to a 95% inhibition of RSV infection in cell culture. In our assay, 40 µg/ml PVZ yields a mean NT95 of 12, which was considered the minimum protective threshold. **Results:** Prior to having received PVZ, RSV-neutralizing serum Ab titers in high risk infants were below the minimum protective threshold (MED=4; IQR=4-6). Peak neutralizing serum Ab titers after the first dose of PVZ rose to levels expected from clinical trials (MED=48; IQR=40-80). All tested infants who completed PVZ prophylaxis in accordance with the BC guidelines had RSV-neutralizing serum Ab titers above the minimum protective threshold at the end of the RSV season (MED=48; IQR=28-56). We observed protective levels of natural RSV-neutralizing Ab titers among ~50% of the control infants (MED=12; IQR=4-32), and 100% of adult subjects (MED=96; IQR=40-192). **Conclusions:** 3 or 4 doses of PVZ in moderate and high risk infants results in protective RSV-neutralizing serum Ab levels until the end of the RSV season. Additional protection may be provided through natural RSV-neutralizing Abs, which should be considered for determining the most optimal dose regimen of PVZ in children at risk of severe RSV disease.

ABSTRACT #3 **SPEAKER: Dr. Alison Nutter** **Resident Year 3** **Resident Competition Paper # 2**

Constipation and Pediatric Emergency Department (PED) Utilization

Alison Nutter, Q Doan, G Meckler, M Truong, Division of Emergency Medicine

Background: Constipation is a common and often chronic condition in children causing a range of symptoms and leading to frequent healthcare visits. Little is known about the acute healthcare utilization of constipated children, including how many children present to the Pediatric Emergency Department (PED), the spectrum of presenting complaints, or the range of investigations and treatments used. **Methodology:** We conducted a cross-sectional chart review of all visits to BC Children's Hospital ED between August 31st, 2012 and September 1st, 2013. All visits during the study period were assessed for a potential diagnosis of constipation, regardless of chief complaint, and a total of 933 patients were included out of 42,875 ED visits. We recorded the chief complaints, tests performed, and therapies administered in the ED as well as measures of flow/efficiency including waiting time (WT), length of stay (LOS) and disposition of children diagnosed with constipation and compared outcomes between those with constipation and all other PED visits during the same period. **Results:** Constipation related visits comprised 2.2% of overall PED visits during the study period. The average age of children seeking care for constipation was 6.2 ± 0.3 years (*vs* 5.5 ± 4.9, P <0.001) and 53.9% were male. Abdominal pain was found to be the most common presenting complaint in 66.1% of patients as shown in in Figure 1; however, 11.9% of patients presented with complaints unrelated to the GI tract, including a range of symptoms such as back pain, refusal to walk, and vaginitis. The final discharge diagnoses are shown in Figure 2. Abdominal radiographs were obtained in nearly one third of patients in the evaluation of constipation and almost half of the patients received a fleet enema in the ED; only a quarter of patients were discharged home on longer-term management such as PEG 3350 and dietary counseling as shown in Figure 3. Measures of ED flow were similar between groups, with no meaningful difference in WT or LOS as shown in Table 1. The vast majority of children (99.6%) diagnosed with constipation were discharged home. **Conclusions:** Constipation can be treated as an out-patient, rather than burdening the PED unnecessarily. This study demonstrates over utilization of radiologic tests and invasive ED treatments and an under utilization of outpatient medication and dietary counseling that may contribute to unnecessary return ED visits.

Figure 1: Presenting complaints of constipation-related PED visits

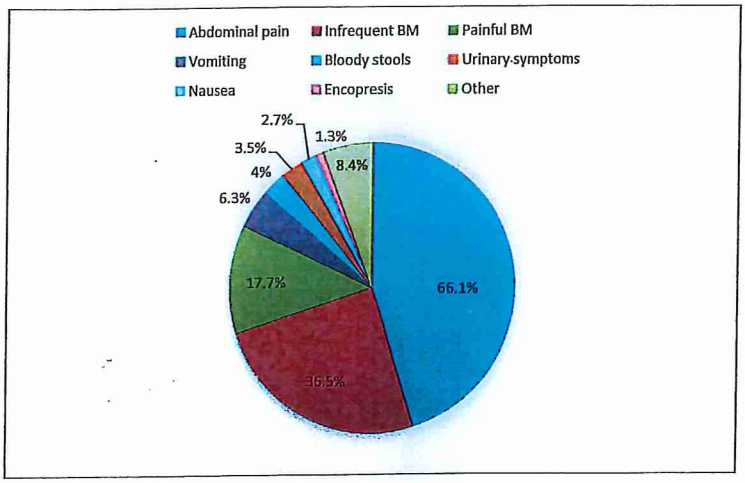


Figure 2: Discharge diagnoses of constipation-related PED visits

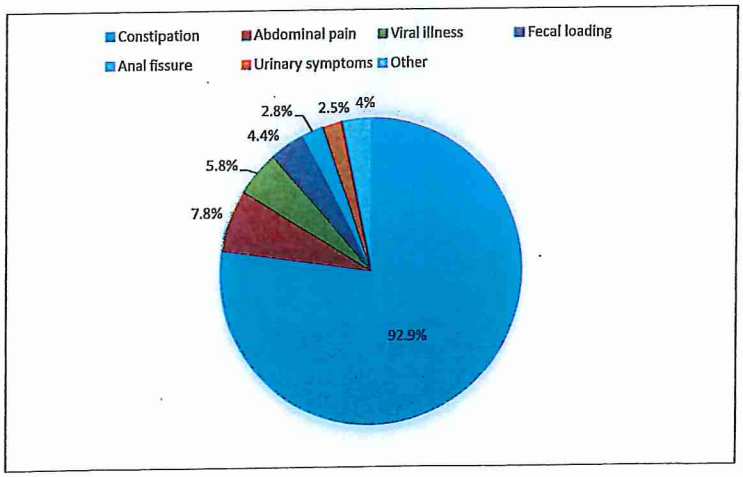


Figure 3: Treatment of children with constipation in the PED

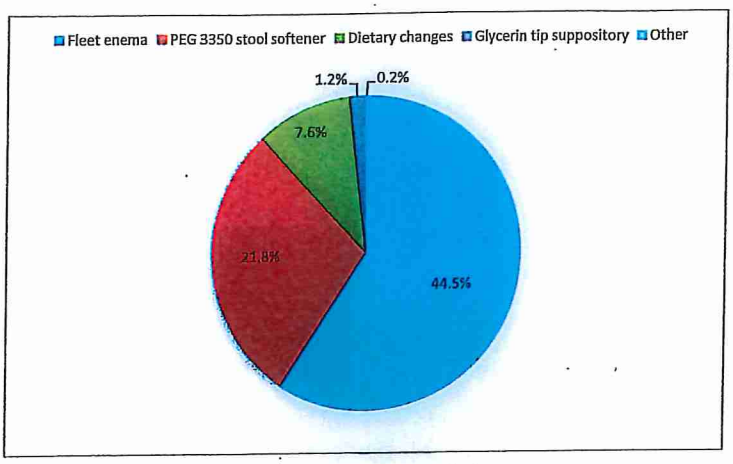


Table 1: ED wait times and length of stay for constipated and non-constipated children

	Waiting time in min (WTM)		Length of stay in min (LOSM)	
	Constipation (N = 933)	All PED visits (N = 42875)	Constipation (N = 933)	All PED visits (N = 42875)
1st quartile	50	50	129	117
Median	96	90	190	185
3rd quartile	157	149	277	283

ABSTRACT #4 **SPEAKER: Dr. Akshat Kapur** **Respirology Division** **Fellow Competition Paper # 2**

A Comparison of Three Methods for Improving Cough Flow and Lung Volume in Children with Neuromuscular Diseases

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Introduction: In Neuro-Muscular Diseases (NMD) patients, weak muscles and poor cough lead to atelectasis and retained pulmonary secretions. Chest physiotherapy devices aim to reduce these progressive changes but lack evidence about efficacy. **Aims and Objectives:** Prior to initiating a long term study, we conducted a pilot study to compare effects of 3 physiotherapy treatments on lung volume and cough flow in stable NMD patients: BiPAP assisted maximal inspiration (BAMI), mechanical insufflation-exsufflation (MI-E) and intrapulmonary percussive ventilation (IPV). **Methods:** We tested 40 subjects in 4, 3 day sessions. They underwent all 3 physiotherapy techniques, 1 a day. HR, SaO2, FVC, PEF, MIP and MEP were measured pre, immediately post treatment then 30 minutes later. All data was non-parametric so expressed as median (inter-quartile range (IQR)). **Results:** 38 patients; Duchenne muscular dystrophy largest group (n=17). M:F = 26:12. Age 15 years (11-21y); FVC 64% (46-82%). The effects of all 3 physiotherapy treatments on FVC and PEF are summarized in Graph 1. While the median changes were small (only IPV's effect on PEF was significant), the spread of results was unexpectedly wide. **Conclusions:** No physiotherapy modality showed consistent benefit but IPV may be worth studying long term in NMD children. Our study confirms the importance of gathering preliminary proof of concept data before conducting a long term study

ABSTRACT #5 **SPEAKER: Dr. Rebecca Ronsley** **Resident Year 1** **Resident Competition Paper # 3**

Increased Risk of Obesity and Metabolic Dysregulation Following 12 Months of Second-generation Antipsychotic Treatment in Children: A Prospective Cohort Study

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Objective: To determine the risk of developing obesity and related metabolic complications in children following long-term treatment with risperidone or quetiapine. **Methods:** This was a one-year naturalistic longitudinal study conducted between February 2009 and March 2012. A total of 115 children aged 2 to 18 years without prior exposure to second-generation antipsychotics (SGAs) were enrolled at initiation of treatment with either risperidone or quetiapine. Metabolic parameters were measured at baseline and months 6, and 12. Data of 37 participants (20 risperidone-treated and 17 quetiapine-treated) who completed 12 month monitoring were used in the analysis. **Results:** After one year of SGA treatment, mean weight increased significantly by 10.8 kg [95% confidence interval (95% CI) 6.6, 10.5 kg] for risperidone and 9.7 kg (95% CI 6.5, 12.8 kg) for quetiapine. BMI z-score also increased significantly in both groups ($p < 0.001$). There was a high incidence of children becoming overweight or obese [6/15 (40.0%) for risperidone-treated and 7/14 (50.0%) for quetiapine-treated]. The mean levels of fasting glucose (for risperidone-treated) and ratio of total cholesterol to HDL cholesterol (for quetiapine-treated) increased significantly by 0.23 mmol/L (95% CI 0.03, 0.42 mmol/L) and 0.48 mmol/L (95% CI 0.15, 0.80 mmol/L), respectively. **Conclusion:** Children treated with risperidone or quetiapine are at a significant risk for developing obesity, elevated waist circumference and dyslipidemia over 12 months of treatment. These data emphasize the importance of regular monitoring for early identification and treatment of metabolic side-effects

Table 1. Baseline characteristics

Variable	Total (N = 37)	Risperidone (n = 20)	Quetiapine (n = 17)	p*
Demographics, *n* (%)				
Age, years, mean (95% CI)	13.5 (12.4, 14.6)	13.5 (11.8, 15.2)	13.5 (12.1, 14.9)	0.692
Male sex	18 (48.7)	10 (50.0)	8 (47.1)	0.858
Ethnicity				0.431
Caucasian	17 (46.0)	8 (40.0)	9 (52.9)	
Other	20 (54.0)	12 (60.0)	8 (47.1)	
Family history, *n* (%)				
Diabetes	15 (40.5)	7 (35.0)	8 (47.1)	0.692
Hyperlipidemia	14 (38.9)	8 (42.1)	6 (35.3)	0.431
Cardiovascular diseases	12 (33.3)	6 (31.6)	6 (35.3)	0.397
DSM-IV-TR diagnosis, *n* (%)				
Psychotic disorders	9 (25.0)	5 (26.3)	4 (23.5)	0.847
Mood disorder	4 (11.1)	1 (5.3)	3 (17.7)	0.326
Depressive disorder	8 (22.2)	3 (15.8)	5 (29.4)	0.434
Bipolar disorder	6 (16.7)	3 (15.8)	3 (17.7)	1.000
Attention deficit hyperactivity disorder	8 (22.2)	4 (21.1)	4 (23.5)	1.000
Oppositional defiant disorder	4 (11.1)	4 (21.1)	0	0.106
Pervasive development disorder	1 (2.78)	0	1 (5.9)	0.472
Anxiety disorder	13 (36.1)	6 (31.6)	7 (41.2)	0.549
Adjustment disorder	1 (2.8)	1 (5.3)	0	1.000
Reactive attachment disorder	2 (5.6)	0	2 (11.8)	0.216
Mental retardation or personality disorder	7 (18.9)	2 (10.0)	5 (29.4)	0.212
GAF score, mean (95% CI)	51 (47, 56)	53 (48, 57)	50 (43, 58)	0.971
Anthropometric Measurements: mean (95% CI)				
BMI z-score	0.05 (-0.31, 0.41)	-0.06 (-0.58, 0.47)	0.18 (-0.36, 0.71)	0.542
BMI percentile	51.6 (41.3, 61.8)	49.0 (33.7, 64.3)	54.6 (39.5, 69.6)	0.542
Weight status, n (%)				0.130
Normal (<85th percentile)	29 (78.4)	15 (75.0)	14 (82.4)	
Overweight (≥85th – <95th percentile)	6 (16.2)	5 (25.0)	1 (5.9)	
Obese (≥95th percentile)	2 (5.4)	0	2 (11.7)	
WC, cm	71.6 (66.9, 76.3)	69.8 (63.9, 75.6)	73.6 (65.3, 81.9)	0.616
WC ≥90th percentile, *n* (%)	2 (6.9)	1 (6.7)	1 (7.1)	1.000
SBP z-score	0.24 (-0.10, 0.57)	0.14 (-0.35, 0.63)	0.35 (-0.16, 0.85)	0.679
DBP z-score	0.46 (0.24, 0.68)	0.40 (-0.09, 0.70)	0.52 (0.16, 0.88)	0.653

CI: confidence interval; GAF: global assessment of functioning; BMI: body max index; WC: waist circumference; SBP: systol blood pressure; DBP: diastolic blood pressure. *difference between groups (by chi-square and Fisher exact tests)

Table 2. Change to anthropometric parameters at 6 and 12 months

Variable	6 months		12 months	
	Mean (95% CI)	p	Mean (95% CI)	p
Weight, kg				
All	7.9 (6.5, 9.3)	<0.001	10.3 (8.1, 12.4)	<0.001
Risperidone	8.6 (6.6, 10.5)	<0.001	10.8 (6.6, 10.5)	<0.001
Quetiapine	7.2 (5.1, 9.2)	<0.001	9.7 (6.5, 12.8)	<0.001
BMI kg/m²				
All	2.81 (2.26, 3.37)	<0.001	3.34 (2.52, 4.16)	<0.001
Risperidone	2.90 (2.14, 3.67)	<0.001	3.61 (2.40, 4.62)	<0.001
Quetiapine	2.71 (1.90, 3.52)	<0.001	3.14 (1.94, 4.35)	<0.001
BMI z-score				
All	0.68 (0.51, 0.86)	<0.001	0.69 (0.45, 0.93)	<0.001
Risperidone	0.75 (0.51, 0.99)	<0.001	0.78 (0.45, 1.11)	<0.001
Quetiapine	0.60 (0.35, 0.85)	<0.001	0.59 (0.23, 0.95)	<0.001
BMI percentile				
All	19.82 (14.39, 25.26)	<0.001	19.70 (12.51, 26.88)	<0.001
Risperidone	21.73 (14.24, 29.22)	<0.001	22.85 (13.09, 32.62)	<0.001
Quetiapine	17.69 (9.79, 25.58)	<0.001	16.16 (5.55, 26.76)	<0.001
WC, cm				
All	8.6 (6.8, 10.9)	<0.001	10.3 (8.0, 12.7)	<0.001
Risperidone	10.8 (7.9, 13.6)	<0.001	11.5 (8.1, 14.8)	<0.001
Quetiapine	6.9 (4.0, 9.8)	<0.001	9.1 (5.9, 12.4)	<0.001
SBP z-score				
All	-0.40 (-0.87, 0.07)	0.097	-0.31 (0.77, 0.15)	0.189
Risperidone	-0.49 (-1.11, 0.12)	0.117	-0.32 (-0.96, 0.32)	0.329
Quetiapine	-0.30 (-1.02, 0.42)	0.379	-0.30 (-0.96, 0.36)	0.379
DBP z-score				
All	-0.25 (-0.58, 0.08)	0.221	-0.21 (-0.55, 0.13)	0.221
Risperidone	-0.35 (-0.77, 0.08)	0.114	-0.43 (-0.90, 0.04)	0.073
Quetiapine	-0.15 (-0.65, 0.35)	0.553	0.03 (-0.45, 0.51)	0.912

CI: confidence interval; BMI: body mass index; WC: waist circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure.

Table 3. Change to laboratory parameters at 6 and 12 months

Variable	6 months		12 months	
	Mean (95% CI)	p	Mean (95% CI)	p
Fasting glucose, mmol/L				
All	0.15 (0.03, 0.19)	0.016	0.20 (0.06, 0.35)	0.005
Risperidone	0.13 (-0.04, 0.29)	0.123	0.23 (0.03, 0.42)	0.025
Quetiapine	0.17 (-0.01, 0.34)	0.060	0.18 (-0.03, 0.39)	0.087
Fasting insulin, pmol/L				
All	12.19 (0.56, 23.83)	0.040	17.63 (1.14, 34.12)	0.036
Risperidone	21.19 (5.10, 37.28)	0.010	16.86 (-6.45, 40.17)	0.156
Quetiapine	2.23 (-14.62,19.08)	0.796	18.49 (-4.77, 41.74)	0.119
HOMA-IR*				
All	0.41 (0.03, 0.80)	0.037	0.64 (0.10, 1.19)	0.020
Risperidone	0.69 (0.16, 1.23)	0.011	0.66 (-0.12, 1.43)	0.095
Quetiapine	0.10 (-0.46, 0.66)	0.728	0.63 (-0.14, 1.40)	0.106
Triglycerides, mmol/L				
All	0.14 (-0.08, 0.36)	0.199	0.23 (0.10, 0.45)	0.040
Risperidone	0.35 (0.05, 0.64)	0.020	0.17 (-0.13, 0.47)	0.277
Quetiapine	-0.10 (-0.43, 0.22)	0.538	0.31 (-0.02, 0.64)	0.064
Total cholesterol, mmol/L				
All	0.26 (0.04, 0.49)	0.024	0.18 (-0.05, 0.41)	0.125
Risperidone	0.25 (-0.06, 0.55)	0.114	0.09 (-0.22, 0.39)	0.569
Quetiapine	0.28 (-0.06, 0.62)	0.105	0.29 (-0.06, 0.63)	0.100
LDL cholesterol, mmol/L				
All	0.26 (0.07, 0.44)	0.007	0.10 (-0.10, 0.29)	0.325
Risperidone	0.09 (-0.16, 0.34)	0.485	0.02 (-0.24, 0.27)	0.909
Quetiapine	0.46 (0.18, 0.74)	0.001	0.19 (-0.09, 0.48)	0.186
HDL cholesterol, mmol/L				
All	-0.11 (-0.20, -0.02)	0.023	-0.09 (-0.18, 0.01)	0.055
Risperidone	-0.09 (-0.21, 0.04)	0.169	-0.08 (-0.20, 0.05)	0.222
Quetiapine	-0.13 (-0.27, 0.01)	0.063	-0.11 (-0.25, 0.03)	0.133
Ratio of triglycerides to HDL cholesterol, mmol/L				
All	0.25 (0.01, 0.48)	0.042	0.26 (0.02, 0.50)	0.031
Risperidone	0.44 (0.12, 0.76)	0.007	0.22 (-0.10, 0.55)	0.174
Quetiapine	0.02 (-0.34, 0.37)	0.936	0.31 (-0.05, 0.67)	0.087
Ratio of total cholesterol to HDL cholesterol, mmol/L				
All	0.45 (0.24, 0.66)	<0.001	0.36 (0.14, 0.58)	0.001
Risperidone	0.38 (0.09, 0.67)	0.011	0.25 (-0.05, 0.55)	0.096
Quetiapine	0.54 (0.22, 0.85)	0.001	0.48 (0.15, 0.80)	0.004

CI: confidence interval; HOMA-IR: homeostasis model assessment of insulin resistance; LDL: low-density lipoprotein; HDL: high-density lipoprotein. *HOMA-IR= glucose [mmol/L]*insulin [mU/L] /22.5; to convert insulin from pmol/L to mU/L: divided values by 6.945.

Table 4. New-onset metabolic complications identified at 6 and 12 months

Variable	Incidence, n/N (%)	
	6 months	12 months
Overweight or obese		
All	10/29 (34.5)	13/29 (44.8)
Risperidone	5/15 (33.3)	6/15 (40.0)
Quetiapine	5/14 (35.7)	7/14 (50.0)
WC ≥ 90th percentile		
All	6/27 (22.2)	6/27 (22.2)
Risperidone	3/14 (21.4)	3/14 (21.4)
Quetiapine	3/13 (23.1)	3/13 (23.1)
Fasting glucose ≥5.6 mmol/L		
All	2/34 (5.9)	5/34 (14.7)
Risperidone	2/17 (11.8)	4/17 (23.5)
Quetiapine	0/17 (0.0)	1/17 (5.9)
Type 2 diabetes		
All	0/35 (0.0)	0/35 (0.0)
Risperidone	0/18 (0.0)	0/18 (0.0)
Quetiapine	0/17 (0.0)	0/17 (0.0)
Insulin resistance (HOMA-IR > 4.4)		
All	1/31 (3.2)	3/31 (9.7)
Risperidone	0/14 (0.0)	1/14 (7.1)
Quetiapine	1/17 (5.9)	2/17 (11.8)
Hypercholesterolemia (≥4.4 mmol/L)		
All	9/22 (40.9)	9/22 (40.9)
Risperidone	4/12 (33.3)	4/12 (33.3)
Quetiapine	5/10 (50.0)	5/10 (50.0)
High LDL cholesterol (≥2.85 mmol/L)		
All	7/24 (29.2)	9/24 (37.5)
Risperidone	2/12 (16.7)	3/12 (25.0)
Quetiapine	5/12 (41.7)	6/12 (50.0)
Low HDL cholesterol (≤1.03 mmol/L)		
All	6/26 (23.1)	7/26 (26.9)
Risperidone	3/14 (21.4)	3/14 (21.4)
Quetiapine	3/12 (25.0)	4/12 (33.3)
Hypertriglyceridemia (≥1.24 mmol/L)		
All	7/28 (25.0)	10/28 (35.7)
Risperidone	6/17 (35.3)	7/17 (41.2)
Quetiapine	1/11 (9.1)	3/11 (27.3)

Incidence was calculated based on the proportion of new-onset metabolic outcomes identified in at least one follow-up visit over number of patients having data available. WC: waist circumference; HOMA-IR: homeostasis model assessment of insulin resistance; LDL: low-density lipoprotein; HDL: high-density lipoprotein. HOMA-IR= glucose [mmol/L]*insulin [mU/L] /22.5; to convert insulin from pmol/L to mU/L: divided values by 6.945.
*n: number of patients with newly-identified outcome at one follow-up visit, N: total number of patients with data available.

ABSTRACT #6 **SPEAKER: Dr. Alexandra Faber Neurology Resident Year 5** **Resident Competition Paper # 4**

A Survey of Family Satisfaction of Pediatric Epilepsy Care via Telemedicine in British Columbia

Alexandra Faber, S Peinhof, LD Pan Y, S Richards, M Connolly, Division of Neurology

Rationale: Telemedicine was recently introduced to improve access for follow-up of children with epilepsy living in remote areas of BC. The objective of this study was to assess parent/caregiver satisfaction with consultation via Telemedicine and to assess social and economic factors. **Methods:** A questionnaire was designed following literature review and from telemedicine questions piloted in other specialty areas in our institution. The study was approved by the Ethics Committee. Parents/Caregivers of children scheduled for a telemedicine appointment were asked if they would agree to participate in a survey on satisfaction with telemedicine care. An email was sent with an online link to a secure, anonymous satisfaction survey. Analysis of the responses was undertaken with SPSS Version 22.0. **Results:** Of 116 children seen via telemedicine, all agreed to participate. There were 54 parents/caregivers who answered the survey on line, 2 mailed a copy of the questionnaire, and 4 were completed over the phone. Appointments involved 26 telemedicine sites with 50% at two larger sites. It was the first telemedicine appointment for 75% of patients. For the telemedicine appointment, 48% drove 10km or less, compared to 88% of patients needing to drive more than 200km to attend an in person appointment at BC Children's Hospital (BCCH). For the telemedicine appointment, 30% of patients spent 1 hour or less time to complete their travel and appointment times, compared to 90% requiring to take 2 or more days to attend an in person appointment at BCCH. In order to attend the telemedicine appointment, 73% spent $50 (Canadian) or less, compared to 68% who spent $500 (Canadian) or more (15% spending greater than $2000) to attend an in person appointment at BCCH. 92% of patients were satisfied that their questions were answered, and that they were able to communicate with the neurologist. With the Telemedicine equipment, 95% of patients were satisfied they could hear the health care provider and 93% satisfied they could see the health care provider clearly. Overall 95% were satisfied with the appointment via telemedicine and were willing to use it again. **Conclusions:** Satisfaction with epilepsy follow up via telemedicine was very high. The financial savings to families was significant. Telemedicine was associated with overall reduced burden of care to families. Telemedicine allows timely access for follow up of children with epilepsy, living in remote areas.

ABSTRACT #7 **SPEAKER: Dr. Benetta Chin Resident Year 4** **Resident Competition Paper # 5**

Complementary Food Introduction to Prevent Allergy?

Benetta Chin, *E Chan, Division of Allergy & Immunology*

Background: Previous food allergy prevention strategies proposed delaying introduction of highly allergenic foods. However, there is growing evidence that early introduction of allergenic foods may decrease the risk of allergic disease. In December 2013, the Canadian Paediatric Society (CPS) and the Canadian Society of Allergy and Clinical Immunology published a new joint position statement offering dietary recommendations for allergy prevention, which was followed by a Child Health Update for general practitioners in April 2014. **Objective:** Identify the recommendations that general practitioners (GPs) provide to parents and describe the beliefs of parents in regards to complementary feeding and the prevention of food allergy. **Methods:** A 12-item survey was distributed May 2014 to GPs in British Columbia by mail and an 8-item survey was distributed to parents online. Information on frequency of pediatric patient contact, length and type of practice, gender, and specific recommendations on food introduction was collected from general practitioners. Information on age, gender, information sources, and specific food introduction beliefs was collected from parents. **Results:** 119 surveys were returned with a 34% response rate from GPs. 108 surveys were completed online with a response rate of 27% from parents, although this is likely underestimated because the survey was posted in a public forum with limited response time. 70.3% of GP's delay commonly allergenic foods for any infant regardless of risk. 69.8% of GP's recommended delay of peanut containing foods for infants at high risk until 12 months, with 34.5% recommending delay until beyond 24 months. 55.3% of parents believed in delaying commonly allergenic foods for infants to prevent allergy. 51.5% of parents believed in delaying peanut containing foods until 12 months with 6.9% believing in delay until beyond 24 months. Male GPs (70.6%) were more likely to delay allergenic foods than female GPs (43.5%) ($p=0.018$). Parents who were younger than 40 years old were more likely to not delay the introduction of peanut containing foods ($p=0.049$). **Conclusions:** Both general practitioners and parents would delay introduction of allergenic foods and specifically peanut protein despite the current CPS position statement describing lack of benefit and possible increased risk of food allergy. Increasing awareness of current recommendations could result in less delay of allergenic food introduction and better prevention of food allergy.

ABSTRACT #8 **SPEAKER: Dr. Anamaria Richardson Resident Year 2** **Resident Competition Paper # 6**

Sustaining Life or Prolonging Dying: Moral Distress in Pediatric Nephrologists

Anamaria Richardson, *J Dionne, L d'Agincourt-Canning, A DeMello, Division of Nephrology*

Some of the most challenging situations in Pediatric Nephrology practice involve decisions about end of life care and withdrawal of withholding of dialysis. Moral distress occurs when a practitioner feels certain of an ethical course of action but cannot take that action due to intrinsic or extrinsic constraints. Although moral distress is linked to health care provider burn out, and the nursing literature has explored this concept in depth, there are very few publications that have surveyed physicians, even fewer involving pediatricians. Pediatric nephrologists from Canada and the Western United States were surveyed to assess causes of moral distress using the validated Moral Distress Scale (MDS-R). The MDS-R is a 21 question survey that uses a scale to rate both the frequency and the intensity of an ethical situation. The frequency and the intensity scores are multiplied to determine composite moral distress scores. Participants were then be provided with a framework to guide decision making around end of life decisions and will be re-surveyed in two years time to assess whether a framework can assist in reducing moral distress.

Responses from 32 Pediatric Nephrologists were analyzed, making this the second larges pediatric physician analysis to date. The composite moral distress score was 53.9 (sd 25.9). The frequency of a distressing situation had a greater impact on the experienced moral distress than intensity. We found that of the 5 most distressing situations, 3 related to end of life decision making where dying was being prolonged. Furthermore, poor team communication and lack of provider continuity were other sources of moral distress. Moral distress experienced by Pediatric Nephrologists is similar to that of ICU physicians despite that facet that end-of-life issues are less common in practice. The most common sources of moral distress are similar and involve prolonging death and poor team communication. While much research has been done on the impact of moral distress on nurses, further research is needed to determine what impact moral distress has on physicians as well as methods to reduce moral distress.

ABSTRACT #9 **SPEAKER: Dr. Mary Dunbar** **Neurology Resident Year 3** **Resident Competition Paper # 7**

Improving the Collection of Cerebrospinal Fluid Neurotransmitters: A Resident Initiative

Mary Dunbar, *G Horvath, Division of Biochemical Diseases*

Background: Cerebrospinal fluid (CSF) is collected from BC Children's Hospital for neurotransmitter quantification approximately 80 times per year. This is currently the only way to diagnose many rare disorders some of which are highly amenable to treatment. Collecting CSF for neurotransmitter analysis is challenging for a variety of reasons: It involves five extra tubes that are not sterile, an assistant is required to hold the tubes, the assistant must catch each drop of CSF without violating the sterile field. The collection of each drop is important because the normal values are based on a rostral to caudal gradient within the spinal column. This method of collection was extremely challenging to perform correctly and safely. The hypothesis was generated that a device to hold the five tubes would increase the validity and ease of the procedure. **Methods**: A cardboard prototype was used for 5 lumbar punctures. The ideal qualities of a holder were determined and a blueprint submitted to a plastics company. A neurotransmitter tube holder was manufactured for each senior pediatric neurology resident. An anonymous survey was performed at the time of holder dissemination in July 2014, followed by a follow up survey six months later. Qualitative data was also collected. **Results:** The seven senior pediatric residents and fellow were surveyed anonymously. Prior to implementation of the holder, the assistant was holding all five tubes only 13% of the time, the remainder used single or multiple tubes. No resident had a >90% success rate, defined as not missing any drops of CSF. The majority of residents had a success rate of <50%. The procedure was not standardized. After the device was used for six months, all but one resident had a >90% success rate and the majority of residents performed the procedure in a standardized fashion. **Conclusions:** The identification of a substandard procedure method inspired a simple device that has standardized this common procedure and improved the safety and quality of the data. This has been embraced by the neurology, pediatric and metabolic groups and adopted as the new standard of care.

ABSTRACT #10 **SPEAKER: Dr. Vinay Shivamurthy** **Rheumatology Division** **Fellow Competition Paper # 3**

Feasibility of Applying the Flare Definition Using the ACR Core Set Variables in Juvenile Idiopathic Arthritis in Routine Practice: Results from the ReACCh-Out Cohort

Vinay Shivamurthy, *J Guzman, A Huber, G Boire, K Oen, K Duffy, R Berard, N Shiff, E Stringer, K Morishita, L Tucker, R Yeung, D Levy, R Scuccimarri, C Duffy & ReACCh-Out investigators*

Objective: To determine the feasibility of using the American College of Rheumatology (ACR) core set variables for identification of flare in children with juvenile idiopathic arthritis (JIA) enrolled in a prospective cohort study. **Methods:** We studied children in the Research in Arthritis in Canadian Children emphasising outcomes (ReACCh-Out) prospective cohort. The study protocol design aimed to emulate routine clinical practice. Newly diagnosed patients in 16 pediatric rheumatology centres between 2005 and 2010 were recruited. All six ACR core set variables were required at full study visits (0, 6, 12, 18, 24, 36, 48 and 60 months) and active joint counts and physician's global assessment (PGA) at interim visits. Using the full study visits, flare was defined as worsening of at least 3/6 core set variables by at least 30% without concomitant improvement of more than one variable by ≥ 30% , after the patient had improved as per ACR Ped 30 criteria. The risk of flare was estimated with Kaplan-Meier survival analysis. **Results:** The primary difficulty in applying the ACR core set criteria for a flare was missing information which resulted in unexpected findings. To facilitate inclusion of patients, ESR was not required at each visit and it was missing in 42.4% of the 6177 full visits. Parent's global assessment was missing in 20% and the CHAQ score could not be calculated in 22.1%. Physician-reported variables were missing in a minority. Value thresholds were often needed to avoid division by zero in children who had markedly improved (e.g. no involved joints, normal CHAQ). Analysing the available data from all full visits we observed that, of the 1146 patients in the cohort, 830(72.4%) attained an ACR Ped30 improvement and 290 (25.3%) had one or more flares. The overall risk of flare was 21% at 12 months and 35% at 2 years. Children with psoriatic arthritis and ERA appeared to have a greater risk of flare (40% within 2 years) than children with RF positive polyarthritis (30%) On the contrary, flare defined as "recurrence of disease manifestations after attaining inactive disease" (using all available visits) reported 626(54.6%) patients with flare and higher risk of flare in those with RF-positive polyarthritis. **Conclusion:** A flare definition based on ACR core set variables has been used in JIA controlled clinical trials, but in an observational cohort comprising all JIA subtypes, this definition was difficult to apply and the resulting findings may be unreliable.

ABSTRACT #11 **SPEAKER: Dr. Stephany Quinn** **Resident Year 3** **Resident Research Paper #1**

Human Papillomavirus Vaccination for Boys

Stephany Quinn, *RD Goldman*

Question: In Canada, generally provincial human papillomavirus (HPV) vaccination programs exist for only the female population. What should I recommend when parents and teenage boys ask about male HPV vaccination? **Answer:** The quadrivalent HPV vaccine is effective and will reduce the incidence of disease in boys and girls. The quadrivalent HPV vaccination is approved and recommended for both boys and girls in Canada. Public funding for male vaccination is available in Prince Edward Island and Alberta. The remaining provinces and territories will need to consider cost-effectiveness analyses before expanding their female-only vaccination programs to include the male population.

ABSTRACT #12 **SPEAKER: Dr. Rachel Li** **Resident Year 2** **Resident Research Paper #2**

Characteristics of Enterovirus D-68 Presentation and Management at BC Children's Hospital- A Retrospective Case Series

Rachel Li[2] G Martin[1], M Carwana[2], V Cook[2] , A Kapur[2,3] , C Yang[2,3] [1]MD Undergraduate Program, UBC,[2] Department of Pediatrics, Division of Respiratory Medicine, UBC[3]

Background: Enterovirus D-68 is a non-polio human enterovirus that shares biologic resemblance with rhinovirus and is known to be almost exclusively associated with respiratory illness. Over the past decade, there have been several reports of Enterovirus D-68 associated with clusters of respiratory illnesses from the United States, Asia and Europe. Evidence from several of these reports suggests that Enterovirus D-68 may be associated with severe respiratory illness in the pediatric population. In the fall of 2014, an outbreak of Enterovirus D-68 occurred in North America resulting in a high number of pediatric hospital admissions for respiratory illness throughout Canada and the United States. During this time, physicians at BC Children's hospital observed that many patients with confirmed Enterovirus D-68 presented with unusually severe respiratory distress with wheeze and did not respond as expected to conventional therapy. **Methods:** We conducted a retrospective chart review on patients from 0-18 years admitted to BC Children's hospital with confirmed Enterovirus D-68 positive nasopharyngeal sputum samples from September 11, 2015 to December 1, 2015. Data was collected from patient's hospital charts. We received approval for this study by the Children & Women's Research Ethics Board on January 14th, 2014. **Results:** From September 15 – December 1 2014 a total of 47 pediatric patients were confirmed to have Enterovirus D-68. A total of 42 patients met the criteria for inclusion, while the remaining 5 patients were discharged from the ED. We will be summarizing detailed information about all cases including past medical history, presenting symptoms, objective findings on presentation to hospital and course in hospital with documented response to treatment. **Conclusions:** This case series will help characterize the clinical phenotype of Enterovirus D-68 respiratory infections including the spectrum and severity of illness, the children that are most predisposed to experiencing severe disease as well as the predicted course of disease and its usual response to treatment.

ABSTRACT #13 **SPEAKER: Dr. Jatinder Grewal** **Resident Year 4** **Resident Research Paper #3**

Review of Primary Long Term Enteral Tube Insertion Practice at BC Children's Hospital

Jatinder Grewal, L Casey, E Webber, A Robinson, J. Burrill, M Ansermino, Division of Gastroenterology

Background: We (interventional radiology, general surgery, gastrointestinal service, complex nutrition or anaesthesia) have not previously investigated our local and provincial clinical practise variation around enteral feeding tube insertion. **Methodology:** This is a single center minimal risk retrospective chart review for quality improvement involving sixty five patients. The study includes informal discussion with various stakeholders. The inclusion criteria is children aged 0-18 years who received primary enteral feeding tube at BCCH through interventional radiology and general surgery service. The exclusion criteria is age more than 18 years, procedures not done in the specified time period and repeat G, J or G-J tube insertion. **Results:** At BC Children's Hospital (BCCH) there is no single window referral system for primary long term enteral feeding tube insertion. General surgeons perform most of the gastrostomies through LG, PEG or GOL technique. Some surgeons favor one technique over the other depending on the patient needs and their personal choice. However, some children get this procedure through interventional radiologist via PRG technique to minimize anesthesia requirement or intubation considering complexity. But most of these children end up receiving general anesthesia and intubation. Moreover, these children require a second procedure and general anesthesia to convert to a permanent enteral feeding tube. IR team lacks dedicated nursing or dietician support to support these children and their families for teaching and troubleshooting. Note: More detailed results will be presented on the research day. **Conclusion:** There is practice variation in the childhood primary long term enteral tube insertion and lack of a standard pre and post procedure care protocol at BC Children's Hospital. The complex nutrition team will coordinate with all the stakeholders to standardize enteral feeding tube insertion and post care practise at BC Children's hospital and eventually across British Columbia.

ABSTRACT #14 **SPEAKER: Dr. Hallie Coltin** **Resident Year 4** **Resident Research Paper #4**

Propofol and Ketamine in Combination versus Ketamine or Propofol Alone for Procedural Sedation in Children Outside of the Operating Room

Hallie Coltin, JMS Bishop, J Ansermino, RA Milner, QDoan

Background: Procedural sedation is utilized outside of the operating room for a number of indications in children. The use of propofol and ketamine in combination (ketofol) is a novel strategy that has been described in a number of publications including both randomized controlled trials (RCT's) and non-randomized case series. **Objectives:** To identify and summarize the data from controlled trials of propofol and ketamine in combination versus ketamine or propofol alone for procedural sedation in children outside of the operating room in order to assess efficacy and safety. **Methodology:** We searched the Cochrane Central Register of Controlled Trials; (CENTRAL) (The Cochrane Library, current issue); MEDLINE through OVID SP (1950 onwards); EMBASE through OVID SP (1988 onwards); CINAHL (1982 onwards); In-Process & Other Non-Indexed Citations; BIOSIS Previews (1969 onwards); Papers First through OVID SP; Proceedings First through OVID SP. No language restrictions were applied. **Selection Criteria:** Randomized controlled trials and crossover trials of ketamine and propofol in combination versus ketamine alone or propofol alone used in children outside of the operating room were compared. As propofol provides minimal analgesia, studies that also utilized other analgesic agents were included so long as they were given to both study groups or only to the group receiving propofol. Studies examining ketofol versus ketamine plus another agent were not included.
Data Collection and Analysis: Three reviewers independently extracted the data. The data were pooled using the Cochrane Collaborations' methodology and statistical software RevMan 5.2. **Results:** Fourteen trials examining propofol and ketamine in combination versus ketamine alone or propofol alone for paediatric procedural sedation outside of the operating room met with inclusion criteria. Of these, one trial looked at ketofol versus ketamine, four examined ketofol versus propofol for non-painful procedures and nine involved ketofol versus propofol for painful procedures.
No significant differences were identified for ketofol versus propofol alone for the outcomes of ability to complete the procedure, recovery time from painful procedures, total adverse events or serious adverse events and total amount propofol used for non-painful procedures. In studies examining non-painful procedures, propofol alone yielded slightly faster recovery times than ketofol. Less propofol was required when combined with ketamine for painful procedures than when ketamine was not used. While a trend was seen towards fewer serious adverse events for painful procedures done utilizing ketofol, this did not meet statistical significance. The overall adverse event rate for non-painful procedures was 13.6% for sedations done with either ketofol or propofol. For painful procedures, 27.4% of participants experienced an adverse event meeting the Quebec Criteria with propofol and 17.6% with ketofol. This difference was again, not statistically significant. Total adverse event rates during painful procedures were seen to be significantly lower in the ketofol

group when sensitivity analysis was applied but only when results from two studies were excluded.In regards to ketamine alone versus ketofol, limited comment can be made as only one study met with inclusion criteria for this review. That study did show an advantage for ketofol in recovery time, practitioner satisfaction and total amount of ketamine used. No difference was seen in ability to complete the procedure or rate of adverse events.
Conclusions: At this time, the combination of ketamine and propofol provides a viable alternative to the use of propofol alone or ketamine alone for paediatric procedural sedation done outside of the operating room. The one high quality study of ketamine alone versus ketofol demonstrated faster recovery and higher practitioner satisfaction for the combination option. The pooled data for the 13 trials examining ketofol versus propofol demonstrated a faster recovery time for non-painful procedures when propofol was used alone but no difference in the other prespecified outcome measures. While a trend towards lower adverse events and serious adverse events was shown for the procedures done with ketofol, the data was affected by significant heterogeneity. Further investigation in studies with larger samples sizes would be helpful in determining if there truly is a difference in these important outcomes. Additional information concerning optimal dosing of these medications in combination would also be helpful to clinicians.

ABSTRACT #15	SPEAKERS: Dr. Jovan Vuksic Dr. Jessica Breton	Resident Year 4 Resident Year 3	Resident Research Paper #5 Research in Progress

Measurement of Gastro-esophageal Reflux in Patients with Cystic Fibrosis: Comparison of a New Oropharyngeal Probe and with Esophageal Multichannel Intraluminal Impedance-pH monitoring.
Jovan Vuksic, Jessica Breton, M Chilvers, A Vishal, Division of Respiratory Medicine

Introduction: Children with cystic fibrosis have a high incidence of pathological gastro-esophageal reflux (GER). Although previous studies have suggested that patients with CF and increased GER may have a poorer lung function compared with patients having CF without GER. Oropharyngeal (OP) pH monitoring has been developed as a new way to diagnose extra-esophageal gastric reflux, which appears to be more important to risk stratify those patients at risk of microaspiration. However this new diagnostic tool has not been well validated in the pediatric population. The aim of this pilot study is to compare the diagnostic accuracy of the new oropharyngeal Restech Dx-H probe against combined multichannel intraluminal impedance-pH (MII-pH) monitoring in order to improve the ease of GER diagnosis and monitoring in pediatric cystic fibrosis patients.
Method: Twenty patients (aged between 2-18 years old) attending the Cystic Fibrosis Clinic at BCCH and including 10 patients with clinically suspected GER and 10 patients already on anti-reflux medication will be prospectively recruited in this pilot study. The twenty patients will undergo 24-hour oropharyngeal pH monitoring simultaneously with esophageal MII-pH monitoring, which is considered the gold standard as per the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHN) for diagnosis of GER. The 2-minute window preceding each OP event will be analyzed for correlation with an episode of GER detected by the MII-pH probe. Correlation between symptoms and reflux events will also be analyzed by having patients recording symptoms (dysphagia, odynophagia, vomiting, regurgitation, heartburn or an acid taste in the back of the throat) and pressing the appropriate button on the receiver when they occur.

ABSTRACT #16	SPEAKERS: Dr. Dr. Aaron St. Laurent Dr. Tatiana Sotindjo	Resident Year 4 Resident Year 4	Resident Research Paper #6

Empyema Study: A Retrospective Study to Investigate the Incidence, Complication and Management of Complicated Pediatric Pneumonia in the Era of Pneumococcal Vaccination at a Tertiary Care Pediatric Centre
Aaron St-Laurent, Tatiana Sotindjo, A Roberts[1], M Chilvers[2] Division of Infectious Diseases[1], Division of Respiratory Medicine[2]

Background: Pneumonia and Invasive pneumococcal disease (IPD) are both major causes of pediatric morbidity and mortality worldwide. Recent data has established an overall decrease in Pneumonia. However, recent evidence suggests that the incidence of S. pneumoniae associated complicated pneumonia appears to be increasing. The aim of this study is to objectify if this is truly the case, compare British-Columbia data with temporal trends elsewhere, trend incidence in the era of standard pneumococcal immunization and observe variations in management of the pathology. **Methods:** At a Tertiary care Pediatric academic centre medical. A convenience sample starting in 2005 to the Fall of 2012 was obtained. Records were abstracted using ICD codes consistent with parapneumonic effusion, bronchopulmonary fistula and pneumonia. Of an original sample of over 250 cases, 192 met criteria. Data regarding demographics, time to presentation clinical therapy, course in hospital and causal microorganism were retained and compiled into a comprehensive database. **Results:** Preliminary reports suggest the following; Microbiological : Microorganisms associated with complicated pneumonia vary greatly. Some microorganisms not originally felt to be associated with significant burden of disease were associated with complicated pneumonia.
Pulmonary: Air leaks continue to be a morbidity associated with parapneumonic effusion in the era of pneumococcal vaccination. Management: Even within an institution with established management protocol ongoing variations in practices in the management of complicated pneumonia persist.
Conclusions: Complicated pneumonia continues to be a significant cause of morbidity within the Pediatric population. Further research in needed in order to clearly elucidate the nature of the microorganisms associated with complicated pneumonia and possible emerging serotypes in response to vaccines. Internal clinical management protocols for Pneumonia and its complications have varied widely over time. The data set compiled affords a rich opportunity to engage in prospective evaluation of more standardized protocols.