

association of anxiety and gastrointestinal disorders in these children. Increased severity of anxiety symptoms is associated with the diagnosis of Asperger's and with higher IQ in children with ASD. Whether or not there is any relationship between anxiety and GI symptoms in children with ASD is not known **Objectives:** To characterize chronic GI symptoms in children with ASDs and their potential relationship with anxiety. **Methods:** The Autism Treatment Network Registry enrolled 3122 children ages 2 to 18 yr with an ASD diagnosis between September 2007 and July 2011 at 14 sites in the US and Canada. Autism Diagnostic Observation Schedules (ADOS) were administered to confirm an ASD diagnosis (Autism, PDD-NOS, or Asperger's). Among information collected upon entry, parents completed a GI symptom inventory, as well as Child Behavior Checklist (CBCL). GI symptom inventory identified type and prevalence of chronic GI symptoms. Anxiety Problems T-scores from the CBCLs were used to classify anxiety level as no anxiety (NA) (<65), borderline anxiety (BA) (65-70), or clinical anxiety (CA) (≥70). Scores from modules 1, 2, 3 and 4 of ADOS were used to place children in one of four verbal ability groups; non-verbal, some words, phrase speech, and verbal. The Stanford-Binet IQ test was used to characterize children with low IQ (<70) or high IQ (≥70). **Results:** One third (33%) of children were reported to have had at least one chronic GI symptom. Chronic GI complaints were greater in children with CA compared to those with NA (p<0.00005). Among ASD subtypes, chronic GI complaints were more likely in children with Asperger's than Autism (p=0.02) and in those with IQ ≥70 compared to IQ <70 (p=0.03.) Rates of GI complaints did not differ between the four verbal ability groups. **Conclusion:** Chronic GI symptoms occur in 1 out of 3 children with ASD. Further, Clinical Anxiety is associated with chronic GI symptoms in these children. As with rates of anxiety in previous studies of ASD study groups, increased rates of chronic GI symptoms were associated with diagnosis of Asperger's and higher IQ. Although verbal expression is known to be better in children with Asperger's than other ASD diagnoses as well as with higher compared to low IQs, the presence of chronic GI symptoms in our study group of children with Asperger's and high IQ is not due to increased verbal expression. Further studies are needed to investigate the relationship between anxiety and GI symptoms in children with ASD, and a potential causal relationship between anxiety and chronic GI symptoms in children with ASD.

343

**Obstructive Sleep Apnea and Hypoxia are Associated With More Advanced Fibrosis in Pediatric Non-Alcoholic Fatty Liver Disease**

Shikha S. Sundaram, Jillian S. Sullivan, Ronald J. Sokol, Kristen N. Robbins, Kelley Capocelli, Zhaoxing Pan, Ann Halbower

Non-Alcoholic Fatty Liver Disease (NAFLD) and obstructive sleep apnea (OSA) are common obesity related co-morbidities. An increased prevalence of OSA occurs in adults with NASH, and a relationship between elevated ALT and OSA has been described in children, suggesting that OSA may be a cause of oxidative stress in NAFLD. **Objective:** To evaluate the relationship of OSA and nocturnal hypoxia to severity of liver disease in pediatric NAFLD. **Methods:** Obese adolescents (ages 10-18 yrs, Tanner stage 2-4) with biopsy proven NAFLD participated in the study. Demographic and historical data were collected and clinical phenotype assessed, followed by standard polysomnography and fasting blood tests. Subjects were divided into those with and without OSA/hypoxia for analyses. **Results:** OSA/hypoxia was present in 12/19 (63%) subjects (mean age 13.2 yrs; mean BMI z score 2.23 ± 0.33). Subjects were 64% male, 86% Hispanic, and 14% had hypertension, 5% hyperlipidemia and 27% abdominal pain, with no differences between those with and without OSA/hypoxia. Mean ALT (99 ± 68 vs 108 ± 69 IU/L), AST (70 ± 53 vs 63 ± 28 IU/L), triglyceride (139 ± 79 vs 139 ± 62 mg/dl), cholesterol (150 ± 35 vs 117 ± 47 mg/dl), HOMA-IR (9.8 ± 7.3 vs 6.4 ± 3.5), CRP (3.9 ± 2.9 vs 1.7 ± 1.3 mg/dl), adiponectin (5.3 ± 2.1 vs 6.7 ± 3.0 µg/ml), leptin (30.4 ± 13.5 vs 34.2 ± 10.1 µg/ml), and uric acid (6.9 ± 1.8 vs 6.3 ± 1.2) were similar between those with (n=12) and without (n=7) OSA/hypoxia, respectively. There were no differences in reported fatigue, snoring, gasping for air, restorative sleep or daytime sleepiness between the two groups. On polysomnogram, total sleep time and % REM sleep were adequate and similar between groups. The Apnea Hypopnea Index (AHI) was significantly higher in subjects with OSA (8.6 ± 7.5) than without OSA (0.73 ± 0.6), p=0.004, indicating moderate severity of OSA. The oxygen nadir in patients with OSA was significantly lower (82.3 ± 5.5) than those without OSA (88.2 ± 3.4), p=0.01. There were no differences in % time saturations were < 90% or end tidal CO2 >50 mm Hg, arousal or oxygen desaturation index, or carbon dioxide retention between groups. NAFLD subjects with OSA/hypoxia had significantly worse (p=0.03) hepatic fibrosis on liver biopsy (Stage 0: 25%, Stage 1: 33%, Stage 3: 42%) compared to those without OSA/hypoxia (Stage 1: 86%, Stage 2: 14%). The mean NAFLD Activity Score (NAS) in those with OSA/hypoxia (4.7 ± 1.2) and without OSA/hypoxia (5.1 ± 1.2) and the presence of Type 2 histologic pattern of NAFLD (83% vs 71%) were similar. **Conclusions:** Moderately severe OSA and hypoxia are common in obese pediatric patients with biopsy proven NAFLD. NAFLD patients with OSA/hypoxia have more advanced hepatic fibrosis than those without OSA/hypoxia, suggesting a relationship between OSA/hypoxia and rate of disease progression in pediatric NAFLD.

344

**Factors Associated With Non-Adherence to Colonoscopy Interval Guidelines in an Integrated Managed Care System**

Deborah A. Fisher, Janet M. Grubber, Steven Grambow, Marcus R. Johnson, Matthew Maciejewski, Dawn Provenzale

**Objectives:** Physicians frequently recommend repeat colonoscopy sooner than guidelines advise. Overuse of colonoscopy is expensive, reduces capacity for appropriate use, and places patients at risk of complications. Physician non-adherence to colonoscopy guidelines has not been studied in the Veterans Affairs (VA) system, the largest integrated health system in the US. Our objective was to estimate non-adherence rates and identify factors associated with non-adherence to colonoscopy guidelines using patients selected from a representative sample of VA facilities. **Methods:** Data were abstracted from the VA electronic medical record for 2443 patients across 25 VA facilities, each performing ≥ 500 colonoscopies in 2008. Facilities were randomly selected among 80 qualifying facilities stratified by academic affiliation, geographic region, and resource level. Patients were randomly selected from those

aged 50-64 who underwent colonoscopy at each VA facility and had no colonoscopy in the prior 10 years. Patients with incomplete colonoscopies or inadequate bowel preparations were excluded from analyses. Non-adherence was defined as any recommendation that did not match the guideline follow-up interval. Physician recommendations were classified as non-adherent if they contained any value outside of guideline ranges. The proportion of non-adherent recommendations was calculated for four clinical groups defined by index colonoscopy result: normal (n=893), hyperplastic polyp only (n=203), low risk adenoma (1-2 adenomas < 1cm; n=231), and higher risk adenoma (3-10 adenomas or any adenoma ≥ 1 cm or high grade dysplasia; n=128). Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated using physician cluster-adjusted logistic regression modeling to measure the association between non-adherence, facility level characteristics and clinical group. **Results:** Characteristics of the 25 facilities and 1455 patients in the final analytic sample are in Table 1. Rates of non-adherence were 37% overall, 26% for normal colonoscopy, 61% for hyperplastic polyps, 46% for low risk adenomas, and for higher risk adenomas. The non-adherent follow-up interval was earlier than recommended by guidelines for 100% of the normal, hyperplastic, and low risk adenoma patients and for 71% of the higher risk adenoma patients. Adjusted modeling indicated clinical group and geographic region were associated with non-adherence (Table 2). **Conclusions:** Although adherence to the 10 year interval after normal colonoscopy was relatively high, the recommended intervals for hyperplastic and adenomatous polyp follow-up were frequently shorter than advised by guidelines. Facility level non-adherence varied strikingly by region. Colonoscopy capacity within the VA may be increased by interventions to reduce overuse for polyp surveillance. Patient (n=1455) and Facility (n=25) Characteristics

Characteristic	N (%)
Male	1170 (80%)
White non-Hispanic	1153 (79%)
Academically affiliated facility (21 facilities)	1242 (85%)
Geographic Region Midwest (7 facilities) Northeast (5 facilities) South (9 facilities) West (4 facilities)	384 (26%) 289 (20%) 520 (36%) 262 (18%)
Resources of facility (complexity score) High-level (13 facilities) Medium or low level (12 facilities)	757 (52%) 698 (48%)

Odds ratios (ORs) and 95% confidence intervals (CIs) from physician cluster-adjusted logistic regression modeling of factors associated with guideline non-adherence

Characteristic	Odds Ratio	95% CI	P value
Clinical Group Normal (n=893) Hyperplastic only (n=203) Low risk adenoma (n=231) High risk adenoma (n=128)	- reference 3.8 1.7 2.8	- - 2.3-6.1 0.9-3.0 1.4-5.4	<0.001 (Wald chi-square, df=3) - <0.001 0.089 0.002
Geographic region Midwest Northeast South West	- reference 6.2 1.6 1.0	- - 3.1-12.5 0.9-2.7 0.6-1.9	<0.0001 (Wald chi-square, df=3) - <0.001 0.10 0.93
Academic affiliation Yes No	- reference 0.8	- - 0.4-1.8	- - 0.62
Resources of facility High-level Medium or Low level	- reference 1.6	- - 1.0-2.6	- - 0.061

345

**Endoscopist Quality Can Be Determined by Automated Assessment of Quality Metrics**

Erin W. Thackeray, Jithinraj Edakkannambeth Varayil, Michael J. Szweczyński, Felicity Enders, Wallapak Tavanapong, JungHwan Oh, Johnny Wong, Piet C. de Groen

**Purpose:** Recent studies have shown that the risk of interval colorectal cancers is associated with the individual endoscopist's adenoma detection rate. As colonoscopy is an operator-dependent procedure, methods that can measure operator skill set and quality during colonoscopy will be important. **Aim:** To determine if video analysis software that provides an automated assessment of quality metrics of colonoscopy video files can differentiate between high and low quality endoscopists. **Methods:** All routine endoscopy rooms at our institution are capable of capture of de-identified procedural video files at 30 frames per second. Video files can be matched with de-identified endoscopist keys for endoscopists who have provided consent to participate in de-identified research per IRB guidelines. These files can then be assessed for quality metrics using manual and automated techniques. Eight anonymous staff endoscopists were chosen for study and separated into high (HG; n=4) and low (LG; n=4) groups based on a manual review of quality metrics by three independent and blinded reviewers. An average of 20 complete colonoscopy videos per endoscopist, either present in our video file archives or stored for this study, were evaluated by an automated system that extracted features assessing quality including withdrawal time, spiral score (the number of times all 4 quadrants of the colon were visualized upon withdrawal), cumulative amount of stool per frame upon withdrawal, and number of clear images that included views of the colon lumen or wall. At least 1 frame per second was analyzed; automated metrics were compared between the high and low groups. **Results:** A total of 159 video files performed by the 8 endoscopists, who were followed at least 1.5 years each, were analyzed by the automated system. The mean withdrawal time (16 minutes for HG vs 10 minutes for LG; p=0.001) and spiral score (19 for HG vs 12 for LG; p=0.005) were significantly different for the two groups. The HG had less cumulative stool per frame upon withdrawal (22% stool pixels for HG vs 29% stool pixels for LG; p=0.020). Clear images of the lumen (472 frames for HG vs 273 frames for LG; p=0.001 - 1 frame per second analyzed) and wall (337 frames for HG vs 211 frames for LG; p=0.007) were superior in the HG. **Conclusions:** (1) Endoscopist quality can be determined by an automated assessment of colonoscopy video files. (2) High quality endoscopists had longer withdrawal times, a higher spiral score during withdrawal, lower percentage of stool upon withdrawal, and