2. Norman M, Piedvache A, Borch K, Huusom LD, Bonamy AE, Howell EA, et al. Effective Perinatal Intensive Care in Europe Research G. Association of short antenatal corticosteroid administration-to-birth intervals with survival and morbidity among very preterm infants: results from the EPICE cohort. JAMA Pediatr 2017;171:678-86.
3. Jobe AH, Goldenberg RL. Antenatal corticosteroids: an assessment of anticipated benefits and potential risks. Am J Obstet Gynecol 2018;219:62-74.
4. Roberts D, Dalziel S. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. Cochrane Database Syst Rev 2006:CD004454.
5. World Health Organization. WHO Recommendations on Interventions to Improve Preterm Birth Outcomes. Geneva, Switzerland: World Health Organization; 2015.
6. World Health Organization ACTION Trial Collaborators. Antenatal dexamethasone for early preterm birth in low-resource countries. N Engl J Med 2020;383:2514-25.
7. Griffin JB, McClure EM, Kamath-Rayne BD, Hepler BM, Rouse DJ, Jobe AH, et al. Interventions to reduce neonatal mortality: a mathematical model to evaluate impact of interventions in sub-Saharan Africa. Acta Paediatr 2017;106:1286-95.
8. Jobe AH, Kemp M, Schmidt A, Takahashi T, Newnham J, Milad M. Antenatal corticosteroids: a reappraisal of the drug formulation and dose. Pediatr Res 2020. http://dx.doi.org/10.1038/s41390-020-01249-w.
9. Raikkonen K, Gissler M, Kajantie E. Associations between maternal antenatal corticosteroid treatment and mental and behavioral disorders in children. JAMA 2020;323:1924-33.

Trends in Pediatric Endoscopic Retrograde Cholangiopancreatography and Interventional Endoscopy

The application of endoscopic retrograde cholangiopancreatography (ERCP) for the pediatric population is expanding, drawing upon the experience of adult ERCP applications during the last 50 years.[1-4] In the past, indications for and perceived utility of ERCP in pediatric patients were restrictive. The historical performance of pediatric ERCP procedures had been consigned to adult gastroenterology practitioners because of the paucity of pediatric gastroenterologists with interventional endoscopy training. This practice pattern has changed within the last 10-15 years corresponding to a growing number of pediatric-trained interventional endoscopists who can perform ERCP safely and effectively.[4,5] Yet despite this greater availability of the interventional pediatric gastroenterologist, there are regions within the US with limited or no availability of a pediatric-trained interventional endoscopist, resulting in a lack of exposure to these advanced techniques in general pediatric gastroenterology training and practice.

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Due to the expanding interest of pediatric gastroenterology providers in interventional endoscopy, specifically ERCP, new training opportunities have arisen within the last few years. This includes the establishment of dedicated pediatric gastroenterology interventional endoscopy advanced fellowships with combined adult and pediatric training, and in 2020 the availability of an annual training grant award offered by the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition for fellows pursuing advanced fellowship in pediatric endoscopy.[6] With the advent of these training opportunities, combined with other nontraditional or formal adult advanced fellowship training programs pursued by some pediatric gastroenterologists, the field will continue to further evolve.

Interventional endoscopic procedures and therapies in pediatric cohorts have generally been published as case series and single institution, retrospective reviews.[4,7,8] In 2014, Troendle et al initiated the pediatric ERCP database initiative, a multicenter prospective database to evaluate indications, safety, and outcomes of ERCP in pediatric patients.[3,9] The pediatric ERCP database initiative has served as the basis for investigations into pediatric ERCP safety and efficacy, however, this database captures data from a limited number of large, tertiary care institutions and, thus, may not be completely representative of universal practice patterns and procedure-related outcomes. A more comprehensive assessment of the utilization of pediatric ERCP at a national level occurred in 2014, with trends from 2000 to 2009 showing increased utilization of therapeutic interventions.[2] This is re-visited in the present volume of *The Journal*, in which Barakat et al analyze US population level outcomes and utilization trends in pediatric ERCP.[10]

This study was a retrospective analysis of hospitalized patients ≤20 years old undergoing ERCP; the authors utilized the National Inpatient Sample (NIS) and the National Readmission Database from 2005 to 2014 and from 2010 to 2014, respectively. Within the study period from the NIS database query, over 11 000 hospitalized pediatric patients underwent ERCP with a predominance of procedures performed in adolescents (84% of patients were 14-20 years old) and in female patients (81%). A biliary indication accounted for nearly one-half of all procedures (48%), followed by the indication of acute/chronic pancreatitis (29%), with endoscopic therapy being performed in 85% of the cases. From the National Readmission Database, the rate of readmission within 30 days following a hospitalization where an ERCP was

ERCP Endoscopic retrograde cholangiopancreatography
NIS National Inpatient Sample

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performed was 13%. Based on the readmission diagnosis, the authors identified that a substantial proportion appeared to be related to an ERCP-related adverse event. Younger patients (≤4 years of age), those post liver transplant, patients of male sex, and obese patients were more likely to be readmitted.

The authors should be commended for their efforts in evaluating this population level data to provide an overview of pediatric ERCP practices. The mitigation of bias to tertiary care centers, regions, or specific endoscopists enables a more inclusive view of inpatient pediatric ERCP in the early part of this decade. Based on adult ERCP indications and practice patterns, it would be expected that most procedures would be therapeutic and performed for a biliary indication, and indeed, from the data analysis, this is what the authors identified. Data not reported by the authors, but perhaps a limitation in the queried databases themselves, is whether there are regional differences in primary procedure indications and if such differences do exist, whether this is based on ethnic patient population differences or other factors. From our own institution located within the Midwest (Cincinnati, Ohio), where there is a relatively lower Hispanic representation[11] but close proximity to a geographic region with a higher population density with pancreatitis genetic risk factors,[12] we encounter a higher proportion of patients needing an ERCP for acute recurrent/chronic pancreatitis (unpublished data). However, this may be more reflective of the high-volume referrals to our pediatric pancreas center rather than other factors/characteristics.

Of importance with the ongoing attention toward the rising costs of healthcare, the study by Barakat et al reported hospitalization cost data, including analysis of patient-related factors that might correlate with increased costs. They found that the median total charge of hospitalization for ERCP-associated hospitalizations was higher than that reported for adult patients, with higher costs in older children (≥14 years of age) and of female sex, with both correlating to longer duration of hospitalization. The basis for these findings are unclear, but the data does provide a framework to which greater scrutiny can be placed toward the exploration into cost expenditures as healthcare trends toward a value-based reimbursement model.

There are inherent limitations to the study, including the use of large national databases, which lack access to important details of the hospitalizations. As the authors address, the inability to further evaluate admission diagnosis in 30-day readmissions limits the ability to fully elucidate whether these admissions were primarily related to post-ERCP adverse events. Additional data granularity, including timing of readmission relative to when the ERCP was performed could help establish a more direct cause and effect relationship. Nonetheless, the data the authors provide is valuable in risk stratifying patients.

Barakat et al do suggest that most pediatric ERCPs are performed on inpatients, and if so, the NIS database would be an appropriate representation of all pediatric ERCPs. However, the utilized NIS database does not account for outpatient procedures or hospital stays designated as observation.[13] From our own large tertiary care children's hospital, of 863 pediatric ERCPs performed since January 2012, only 321 (37.2%) were performed for inpatients. As such, the percentage of total pediatric ERCP volume the inpatient NIS database captures is unclear. Even if observation and outpatient ERCPs comprise only a minority of the total annual procedures, they likely constitute a lower procedure complexity and are less likely to develop procedure related adverse events leading to readmission. Barakat et al also observed a downward trend in volume of inpatient ERCPs from 2010 to 2014. This could reflect a growing number of ERCPs being performed on an outpatient or observation basis. A reassessment from these same databases in the coming years would reveal new utilization and performance trends.

There are opportunities for future study of pediatric ERCP and advanced endoscopy. Given the relatively lower volume of pediatric interventional endoscopic procedures in comparison with adults, multicenter collaborative studies are necessary. Newer endoscopic technologies, such as endoscopic ultrasound are recently blossoming in their application to pediatric medicine and will complement the utilization of ERCP. Prospective evaluations of specific patient populations or ERCP interventions should also be pursued. Support from the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition for an ERCP significant interest group has provided an imperative forum for collaboration amongst multiple centers and will continue to be important moving forward.

With new and increasing interest in pediatric ERCP and interventional gastroenterology, questions continue to arise. What is the optimal training pathway for the pediatric advanced interventional endoscopist? With limited case volume in pediatrics, is there a limit to the number of interventional endoscopists that should be trained? Should training include adult interventional endoscopy experience to maximize volume? How can we adequately measure competence of pediatric trainees and/or trained endoscopists? What volume is required to maintain competence? Many of these questions remain unanswered even in the adult interventional endoscopy field.

In conclusion, Barakat et al present a population level national database study evaluating inpatient ERCPs and subsequent readmission rates, showing predominantly pancreaticobiliary indications.[10] The study provides a critical overview of pediatric ERCP in the US. The interest in pediatric ERCP and interventional endoscopy is increasing. More interventional endoscopy training opportunities are becoming available, and there remain numerous important questions to address in further studies. ■

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References

1. Moffatt DC, Yu BN, Yie W, Bernstein CN. Trends in utilization of diagnostic and therapeutic ERCP and cholecystectomy over the past 25 years: a population-based study. Gastrointest Endosc 2014;79:615-22.
2. Pant C, Sferra TJ, Barth BA, Deshpande A, Minocha A, Qureshi WA, et al. Trends in endoscopic retrograde cholangiopancreatography in children within the United States, 2000-2009. J Pediatr Gastroenterol Nutr 2014;59:57-60.
3. Troendle DM, Abraham O, Huang R, Barth BA. Factors associated with post-ERCP pancreatitis and the effect of pancreatic duct stenting in a pediatric population. Gastrointest Endosc 2015;81:1408-16.
4. Troendle DM, Barth BA. Pediatric considerations in endoscopic retrograde cholangiopancreatography. Gastrointest Endosc Clin N Am 2016;26:119-36.
5. Troendle DM, Barth BA. ERCP can be safely and effectively performed by a pediatric gastroenterologist for choledocholithiasis in a pediatric facility. J Pediatr Gastroenterol Nutr 2013;57:655-8.
6. Foundation N. NASPGHAN Foundation Advanced Fellowship In Pediatric Endoscopy. 2020., https://naspghan.org/wp-content/uploads/2020/02/AdvancedEndoscopy2020_2720.pdf. Accessed December 5, 2020.
7. Giefer MJ, Kozarek RA. Technical outcomes and complications of pediatric ERCP. Surg Endosc 2015;29:3543-50.
8. Troendle DM, Fishman DS, Barth BA, Giefer MJ, Lin TK, Liu QY, et al. Therapeutic endoscopic retrograde cholangiopancreatography in pediatric patients with acute recurrent and chronic pancreatitis: data from the INSPPIRE (INternational Study group of Pediatric Pancreatitis: In search for a cuRE) Study. Pancreas 2017;46:764-9.
9. Fishman DS, Barth B, Mazziotti MV, Lazar DA, Brandt ML, Fallon SC, et al. Same anesthesia ERCP and laparoscopic cholecystectomy in the Pediatric ERCP Database Initiative (PEDI) Experience. J Pediatr Gastroenterol Nutr 2020;71:203-7.
10. Barakat MT, Cholankeril G, Gugig R, Berquist WE. Nationwide evolution of pediatric endoscopic retrograde cholangiopancreatography indications, utilization, and readmissions over time. J Pediatr 2021;232:159-65.e1.
11. Krogstad JM. Hispanics have accounted for more than half of total US population growth since 2010. Fact Tank, News in the Numbers; July 10, 2020.
12. Applebaum-Shapiro SE, Finch R, Pfützer RH, Hepp LA, Gates L, Amann S, et al. Hereditary pancreatitis in North America: the Pittsburgh-Midwest Multi-Center Pancreatic Study Group Study. Pancreatology 2001;1:439-43.
13. Khera R, Krumholz HM. With great power comes great responsibility: big data research from the national inpatient sample. Circ Cardiovasc Qual Outcomes 2017;10:e003846.

Treating Cyclic Vomiting Syndrome in the Emergency Department: Sooner Appears Better

Cyclic vomiting syndrome (CVS) is a complex disorder of gut-brain interaction characterized by repeated cyclic or sporadic episodes of extreme nausea, severe vomiting, and retching occurring as often as every 5 minutes. The formation of the Cyclic Vomiting Syndrome Association in 1993 spurred current progress in characterizing the phenotype, uncovering potential mechanistic pathways, and improving acute and preventative management. The North American Society of Pediatric Gastroenterology, Hepatology and Nutrition Consensus Statement in 2008 and the American Neurogastroenterology and Motility Adult Guidelines in 2019 have helped guide diagnostic and treatment approaches.[1,2] From the vantage point of 2020, CVS is recognized as a disorder that affects adults as well as children, one with multiple comorbidities, and one composed of distinct endophenotypes. Despite this progress, the widest remaining knowledge gap is how to best treat acute episodes.

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In this volume of *The Journal,* Abdulkader et al report a retrospective, single-center analysis of 209 children with CVS seen over a 3-year period and address the disposition—whether to send home or be admitted to the hospital—of pediatric patients with CVS who received acute treatment in the emergency department (ED).[3] Underscoring the high medical morbidity, nearly one-quarter (23%) used the ED: 14% used it 1-2 times, 3% between 3 and 5 times, and 7% more than 5 times! Remarkably, nearly two-thirds (62%) of those seen during 152 ED visits required admission to the hospital for continued therapy. Using univariable and multivariate analyses, factors predictive of subsequent hospitalization included male sex, younger age, a more than 24-hour delay from the onset of symptoms to ED presentation, and longer wait times from ED presentation to antiemetic administration. The prehospital use of rescue medications, time delay in administration of intravenous saline boluses, and numbers of antiemetics administered were not predictive of hospitalization. It is noteworthy that the difference in delayed dispensing of antiemetics between the hospitalized and discharged groups was approximately one hour, suggesting that even a brief delay could have a significant impact! Prior

CHS	Cannabinoid-hyperemesis syndrome
CVS	Cyclic vomiting syndrome
ED	Emergency department

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