

11-27-2023

## Conference Proceedings: Select Abstracts Presented at 2023 Advocate Aurora Scientific Day

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### Recommended Citation

Conference proceedings: Select abstracts presented at 2023 Advocate Aurora Scientific Day. J Patient Cent Res Rev. 2023;10:255-77. doi: [10.17294/2330-0698.2070](https://doi.org/10.17294/2330-0698.2070)

Published quarterly by Midwest-based health system Advocate Aurora Health and indexed in PubMed Central, the Journal of Patient-Centered Research and Reviews (JPCRR) is an open access, peer-reviewed medical journal focused on disseminating scholarly works devoted to improving patient-centered care practices, health outcomes, and the patient experience.

# Conference Proceedings: Select Abstracts Presented at 2023 Advocate Aurora Scientific Day

This abstract supplement includes findings presented at the 49th annual Advocate Aurora Scientific Day on May 24, 2023. The Scientific Day symposium provides a virtual forum for the sharing of preliminary results from research and case studies conducted by faculty, fellows, residents, and other health professionals associated with Illinois-based Advocate Health Care and Wisconsin-based Aurora Health Care. (*J Patient Cent Res Rev.* 2023;10:255-277.)

## **RIESELBACH DISTINGUISHED PRESENTATIONS**

### **Psychological Impact of Type II Violence Against Nurses**

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**Background:** Violence against nurses in health care settings is not a new phenomenon. The University of Iowa Injury Prevention Research Center classified violence perpetrated by a customer/client/inmate as Type II violence, which ranges from verbal abuse to assault with a weapon. Type II violence toward nurses increased globally during the COVID-19 pandemic. Increasing violence has escalated the known psychological impact of caring for patients during a pandemic. Increasing reports of Type II violence throughout Advocate Aurora Health led to this multisite study.

**Purpose:** To provide in-depth information about the psychological impact brought about by violent and aggressive acts toward nurses during the COVID-19 pandemic. New insights into the Type II violence phenomenon were gained and will drive interventions mitigating the adverse effects on nurses.

**Methods:** A mixed-methods convergent design answered research questions measuring distress, impact of Type II violence, and the verbatim descriptions of violent experiences related by nurse victims of Type II violence. The study took place at 7 sites (n=351). Data were collected using the Impact of Patient Aggression on Carers Scale (IMPACS) and the Impact of Events Scale-Revised (IES-R). Semi-structured interviews with a purposive sample of 12 nurse victims were transcribed and underwent thematic analysis.

**Results:** Subjects (n=351) reported verbal abuse/intimidation (n=322), physical harassment (n=148), physical assault (n=148), and assault with a weapon (n=16). Medians, interquartile ranges (IQR), and minimum/maximum scores (M/M) of instruments were calculated due

to a non-normal distribution. The highest IES-R scores were in the Avoidance subscale, 1.19 (IQR: 0.38, 1.99) (M/M: 0.00, 3.75), and the Impaired Relationship subscale scored highest on the IMPACS tool, 12.0 (IQR: 9.0, 14.0) (M/M: 4.0, 20.0). When the IES-R was used clinically, cutoffs indicating posttraumatic stress disorder (PTSD) behaviors occurred at scores of 24, 33, and 37. Scores of  $\geq 24$  indicate that symptoms of PTSD are present; scores of  $\geq 33$  represent the cutoff for a probable diagnosis of PTSD; scores of  $\geq 37$  are high enough to suppress the immune system's functioning. Findings showed 28.9% (n=119) scored at least 24, with 13.7% (n=47) scoring 24–32, 4.3% (n=15) scoring 33–36, and 14.9 (n=57) scoring 37–79. Thematic analysis generated 4 themes: Nurse as Victim, Nurse as Advocate, Nurse as Enforcer, Nurse as Professional.

**Conclusion:** Impaired relationships with patients and symptoms of PTSD in nurses demonstrate the lingering impact of Type II violence.

### **Predicting Pulmonary Embolism Using Wells Score in COVID-19-Infected Patients**

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**Background:** COVID-19 was a global pandemic. Clinical presentations and laboratory findings show a strong association between COVID-19 infection and a proinflammatory and hypercoagulable state, which increases patient risk of developing pulmonary embolism (PE). Prevalence of PE and deep vein thrombosis (DVT) in COVID-19 patients may be as high as 54% in the ICU and 11.9% in non-ICU patients. Diagnosis and treatment

of DVT and PE is crucial for reducing mortality in patients with COVID-19. In our system, we have seen an increase in computed tomographic pulmonary angiography (CTPA) orders for patients infected with COVID-19. Performing CTPA for all patients with COVID-19 based on clinical suspicion of PE or DVT alone is not cost-effective or helpful. There are many well-studied probability scores for patients with suspected DVT/PE. The Wells score is a validated scoring system to determine probability of PE.

**Purpose:** To review COVID-19-infected patients with CTPA imaging to determine prevalence of DVT or PE and explore utility of Wells score in patients with COVID-19 infection.

**Methods:** This retrospective chart review study used data from patients treated at Advocate Aurora Health facilities with COVID-19-positive PCR test and CTPA order between March 1, 2020, and December 31, 2020. IRB approval was obtained. Medical records, radiologic findings, and laboratory results of eligible patients were reviewed and analyzed. CTPA results were reviewed by an expert radiologist. Descriptive statistics were performed to describe demographics and DVT/PE prevalence. Wilcoxon 2-sample test was performed to determine whether Wells score was significantly associated with DVT/PE diagnosis. Chi-squared test was used to compare categorical variables.

**Results:** A total of 1245 patients met eligibility criteria. Median patient age was 53 years (range: 15–102). Most patients (n=1078, 86%) were diagnosed with COVID-19 in the emergency department; 102 patients (8%) had onset of DVT or PE after COVID-19 diagnosis. Median Wells score for patients diagnosed with DVT or PE was 3.0 (interquartile range [IQR]: 1.5–4.5). This was significantly higher than median Wells score for patients who were not diagnosed with DVT or PE (1.5, IQR: 0–4.0;  $P<0.001$ ). We noted patients with moderate or high-risk Wells scores were disproportionately diagnosed with higher rates of DVT/PE ( $P<0.001$ ).

**Conclusion:** Wells score can be used as a probability scoring system for patients who have COVID-19 infection and clinical suspicion of PE. This might help to reduce number of CTPA tests ordered for patients with COVID-19 infection.

## ORAL PRESENTATIONS

### Adherence to an At-Home Blood Pressure Monitoring Program Among an African American Population With Uncontrolled Hypertension

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**Background:** Hypertension is the most prevalent modifiable risk factor for cardiovascular disease. Mortality due to hypertension is 4–5 times more likely in African Americans than Caucasians. In Wisconsin, minority populations suffer higher rates of hypertension. Recent guidelines support implementing at-home blood pressure (BP) monitoring programs to improve BP control.

**Purpose:** To describe adherence to an at-home BP monitoring program within one internal medicine residency clinic in Milwaukee, Wisconsin.

**Methods:** Our BP monitoring program targeted adult African American patients with a previous diagnosis of hypertension and uncontrolled BP ( $>140/90$ ) despite adequate goal-directed treatment who were on at least 2 BP medications (diuretics optional). Patients were asked to voluntarily participate and were provided an automated BP monitor and cuff. They were instructed to complete the initial intake survey, check BP twice daily, provide readings every 2 weeks either by phone or at a clinic visit for 6 months and complete a 6-month survey. Medications were discussed and potentially changed at each 2-week follow-up if BPs were reported. Descriptive statistics were used to summarize program adherence and outcomes.

**Results:** A total of 30 patients received BP monitors. Overall, 24 completed the initial intake survey: 11 (45.8%) were not sure if they were observing a low salt diet, 14 (58.3%) had missed medications occasionally, and 7 (29.2%) had no confidence in managing their BP. At the initial 2-week follow-up, only 19 (63.3%) patients reported BPs. At the last 2-week follow-up (6 months from initial visit), only 2 (6.7%) patients reported BPs. Both patients saw an improvement in their BPs, from averages of 156.7 and 145 (systolic) and 103.3 and 100 (diastolic) at intake to 121 and 117.8 (systolic) and 99.7 and 87.3 (diastolic), respectively. Overall, 7 (23.3%) completed the 6-month follow-up survey: 3 were not sure if they were observing a low salt diet, 4 had missed medications occasionally, and 1 had no confidence in managing their BP. However, all 7 felt a BP monitor helped to better control their BP and that they would continue to use it in the future.

**Conclusion:** Patient adherence to a voluntary home BP monitoring program is challenging. Many patients were inconsistent in their reporting of BPs at 2-week follow-up intervals and reported their readings sporadically. Patients should be given multiple tools to help them monitor and improve their BP.

### Aggressive Resectional Arthroplasty vs Implant Arthroplasty vs Arthrodesis for Hallux Limitus/Rigidus: A Systematic Review With Meta-Analysis

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**Background:** Hallux limitus/hallux rigidus (HL/HR) is the most prevalent pedal osteoarthritis, causing first metatarsophalangeal joint (MPJ) pain, restricted motion, and difficulty with the propulsive phase of gait. A wide variety of procedures are utilized to treat HL/HR; however, no consensus exists regarding optimal surgical treatment protocol.

**Purpose:** To determine the relative clinical efficacy of first MPJ aggressive resectional arthroplasty (ARA) vs total implant arthroplasty (TIA) vs arthrodesis in treating symptomatic HL/HR.

**Methods:** Three PubMed searches were conducted. Inclusion criteria were single-arm studies evaluating first MPJ surgical outcomes in adults with HL/HR. A total of 120 records were assessed for eligibility, and 33 studies were included in synthesis: 10 ARA (n=549 feet), 9 TIA (n=327 feet), and 14 arthrodesis (n=760 feet). Primary outcomes are outlined below.

**Results:** Mean TIA survival (n=7 studies) was  $92.3\% \pm 10.2$  at a mean follow-up of 3.99 years. Mean arthrodesis non-union rate (n=13 studies) was  $4.1\% \pm 4.6$  at a mean follow-up of 13.6 months. Mean American Orthopaedic Foot and Ankle Society (AOFAS) score at final follow-up for ARA (n=3 studies), TIA (n=6), and arthrodesis (n=5) was  $83.0 \pm 1.7$ ,  $85.6 \pm 5.4$ , and  $81.0 \pm 4.0$ , respectively. No statistically significant difference was found for AOFAS score in TIA vs arthrodesis ( $F=1.75$ ;  $P=0.22$ ). Mean increase in AOFAS score from preoperative to final follow-up for ARA (n=2), TIA (n=5), and arthrodesis (n=5) was  $42.06 \pm 10.25$ ,  $38.83 \pm 10.02$ , and  $41.03 \pm 12.33$ , respectively. No statistically significant difference was found for mean increase in AOFAS score for TIA vs arthrodesis ( $F=0.02$ ;  $P=0.89$ ). Mean VAS at final follow-up for ARA (n=3 studies), TIA (n=3), and arthrodesis (n=1) was  $1.3 \pm 0.3$ ,  $1.9 \pm 0.2$ , and  $0.6$ , respectively. The decrease in mean visual analogue scale score for ARA (n=2), TIA (n=2), and arthrodesis (n=2) was  $9.8 \pm 0.8$ ,  $5.9 \pm 0.8$ , and  $6.0$ , respectively. The percentage of subjects with no pain for ARA (n=4), TIA (n=2), and arthrodesis (n=2) was  $54.44 \pm 24.66$ ,  $52.86 \pm 2.83$ , and  $65.16 \pm 14.57$ , respectively. Reoperation rate for ARA (n=5 studies), TIA (n=8), and arthrodesis (n=7) was  $3.95\% \pm 3.19$ ,  $6.73\% \pm 10.07$ , and  $8.73\% \pm 23.37$  at a mean follow-up of 4.97, 4.31, and 0.79 years, respectively. ANOVA demonstrated no significant difference between groups ( $F=1.04$ ;  $P=0.37$ ).

**Conclusion:** Although all differences were statistically nonsignificant, ARA resulted in a greater improvement in AOFAS score, greater improvement in visual analogue scale score, and lower reoperation rate as compared to TIA or arthrodesis. Preliminary evidence suggests possible advantages of ARA.

## Survival of Women Diagnosed With Stage IV Breast Cancer and Brain Metastases by Molecular Subtype

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**Background:** Women with stage IV breast cancer and brain metastasis typically have a poor prognosis.

**Purpose:** To further define prognosis based on molecular subtype (luminal A, luminal B, HER2-enriched, and triple-negative) and to identify other predictors of mortality.

**Methods:** The National Cancer Database (NCDB) is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study were derived from de-identified NCDB files. Patients without recorded survival status were excluded from the statistical analysis. All statistical analyses were done without imputing missing values for all the variables. Kaplan-Meier survival function was used to compare survival probability for 4 molecular types (luminal A, luminal B, HER2-enriched, and triple-negative). Multivariable Cox proportional hazards models explored factors for mortality.

**Results:** We identified a total of 3517 patients from the NCDB diagnosed from January 1, 2010, to December 31, 2015. Median age for these patients was 60 years, with range of 24–90 years. All patients were diagnosed with invasive breast cancer with brain metastases. These patients were pathologically identified with luminal A (47.3%), triple-negative (22.8%), luminal B (16.4%), and HER2-enriched (13.5%) molecular subtypes. One-year and 5-year overall survival probability were highest for luminal B type (0.58, 0.23), followed by luminal A (0.56, 0.15), HER2-enriched (0.53, 0.17), and triple-negative (0.24, 0.03). Similarly, median survival time in months was higher for luminal B (19.6), followed by luminal A (15.5), HER2-enriched (12.9), and triple-negative (5.3). Significant predictors of mortality other than molecular type were age (hazard ratio [HR]: 1.02, 1.016–1.024;  $P<0.001$ ), Black vs White race (HR: 1.18, 1.06–1.31;  $P=0.003$ ), Other race category vs White (HR: 0.83, 0.73–0.94;  $P=0.003$ ), academic research facility vs community cancer program (HR: 0.80, 0.68–0.94;  $P=0.006$ ), and highest income group vs lowest income group (HR: 0.80, 0.71–0.90;  $P=0.001$ ).

**Conclusion:** Women with triple-negative stage IV breast cancer and brain metastasis had the worst prognosis. Other significant predictors of poor outcome include low socioeconomic status and being Black. In addition to novel treatments, targeted therapy and interventions to address racial and economic disparity are urgently needed.



## **An Interactive Multisource Diversity, Equity, and Inclusion Snapshot for Graduate Medical Education and Sponsoring Institution for Quality Improvement**

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**Background:** Successful diversity, equity, and inclusion (DE&I) efforts are data-driven and transparent over time. Our graduate medical education (GME) programs and sponsoring institution use multiple DE&I data points to monitor progress. The need to utilize DE&I data is emphasized in Accreditation Council for Graduate Medical Education (ACGME) program requirements. However, capturing a longitudinal view of our efforts has been complicated, as data come in variable formats from multiple sources.

**Purpose:** To create a longitudinal DE&I data snapshot for GME using established and newly developed datasets at the program and sponsoring institution levels.

**Methods:** To develop the snapshot, available data points were identified. These included: ACGME annual faculty and resident surveys, recruitment progression data, DE&I items that were added to all GME required evaluations by all programs, and a DE&I structural fluency milestone. The data from these various sources were then compiled into a Microsoft Excel spreadsheet, resulting in a longitudinal snapshot by program and sponsoring institution with national comparison scores where available. The snapshot was reviewed and approved by the GME council for immediate implementation.

**Results:** The snapshot currently includes 9 DE&I elements abstracted annually: 4 internal evaluations, 1 milestone rating, 1 ACGME faculty and 1 resident survey, 1 annual program evaluation, and recruitment progression from application to match. Users can drill up (sponsoring institution) or down to program level data by data element. It illuminates trends across separate data sources over time, informing program/designated institutional official actions. Responses from stakeholders have been very positive, noting the value of aggregating DE&I longitudinally in a single location to inform program decision regarding recruitment, curriculum, and assessment. For example, some programs noted dramatic improvements across all resident evaluations of instruction, while others decreased over time prompting discussion regarding what did/didn't work between programs. Milestone data scores declined

over time across 95% of our programs (18 of 19).

**Conclusion:** Creating a longitudinal DE&I snapshot from multiple, varied sources allows for easy data review and results in evidence-based analysis of DE&I efforts for rapid cycle improvements. Its transparency and accessibility enable stakeholders to identify strengths and flag areas for further investigation/action known to improve engagement, leading to an increase in response rate and utilization to inform changes.

## **Decreasing Abdominal Hysterectomies: Results of a Standardized Decision Tree**

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**Background:** Minimally invasive hysterectomies reduce length of stay and postoperative recovery time when compared to abdominal hysterectomies. In 2017, our Wisconsin-based health system evaluated its abdominal hysterectomy rates, finding them to be higher than other hospitals in Wisconsin. Therefore, a decision tree for route of hysterectomy was created and disseminated among all gynecologic surgeons in our system to decrease abdominal hysterectomies.

**Purpose:** This quality improvement study aimed to determine the appropriateness of abdominal hysterectomies, stratified by year, based on the decision tree.

**Methods:** Abdominal hysterectomies performed within our system between January 2015 and December 2019 were randomly reviewed to assess the appropriateness of route using the decision tree algorithm. Abdominal hysterectomies were categorized as expected, unexpected, or conversions from a minimally invasive approach. Descriptive and frequency statistics were used to summarize findings. The percentage of appropriateness (unexpected, expected, or conversion) of the abdominal hysterectomy route was stratified by year, and rates were compared before and after introduction of the decision tree. Chi-squared and Kruskal-Wallis H tests were used to determine group differences.

**Results:** A total of 1777 abdominal hysterectomies were completed in the study timeframe, of which 794 were randomly reviewed: 79 (9.9%) were unexpected, 655 (82.5%) were expected, and 60 (7.6%) were a conversion from a minimally invasive approach. The random sample was similarly distributed based on all abdominal hysterectomies by year. Rates before and after the introduction of the decision tree were found to be significantly different, with unexpected abdominal hysterectomies decreasing from 74.7% to 25.3% ( $P < 0.001$ ). Unexpected abdominal hysterectomy rates decreased from 2015 to 2019 (15.2%

to 2.5%;  $P<0.001$ ), expected abdominal hysterectomy rates rose (77.5% to 90.9%;  $P=0.002$ ), and conversion rates remained similar (7.4% to 6.6%;  $P=0.801$ ). Most unexpected abdominal hysterectomies should have been performed laparoscopically (97.5%) based on the decision tree.

**Conclusion:** While unexpected abdominal hysterectomy rates significantly decreased following implementation of the decision tree, other factors (eg, nationally changing guidelines, physician practices, and increased access to and training in minimally invasive gynecology) also influenced this change.

## **BRIEF ORAL/POSTER HYBRID PRESENTATIONS**

### **Interim Analysis of a Pilot Randomized Controlled Trial of Hospital Waterbirth**

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**Background:** Waterbirth, a low-intervention method used for pain control during labor, has been associated with reduced need for pharmacological analgesia and anesthesia. However, obstetric, midwifery, and pediatric organizations differ in their recommendations for offering waterbirth, with some recommending additional studies including randomized trials. Given the variable nature of labor and birth, randomized studies can be challenging in such a vulnerable patient population. While a handful of randomized trials for waterbirth have been conducted, none have been conducted in the United States, which limits their generalizability. In 2021, we launched a randomized controlled trial of hospital waterbirth to address this gap in the literature.

**Purpose:** To present a preliminary analysis of enrollment and our primary outcomes of analgesia and anesthesia use between groups.

**Methods:** In an unblinded fashion, healthy low-risk pregnant adults who met initial inclusion criteria for waterbirth and who voluntarily agreed to participate were enrolled between 25–34 weeks gestation using a computer-generated 2:1 (waterbirth:land birth) randomization allocation ratio. An interim analysis based on intention to treat was completed 1 year after the start of the trial to summarize study progress to date. Descriptive and inferential statistics were computed.

**Results:** A total of 115 participants have been approached, consented, and randomized ( $n=77$  waterbirth,  $n=38$  land birth). In the waterbirth group, 20 became ineligible for

waterbirth due to the development of intrapartum risk factors including hypertension, preterm labor, and breech presentation. Overall, 57 remained eligible for waterbirth. Of the 43 who have given birth in the water arm to date, 22 did so in water. The rates of intravenous narcotic use (waterbirth 14.3% vs land 41.2%;  $P=0.713$ ) and epidural use (waterbirth 23.8% vs land 76.5%;  $P=0.326$ ), were not statistically significantly between groups. When analgesia and anesthesia were combined, significantly fewer waterbirth participants used analgesia/anesthesia compared to those who gave birth on land (35.7% vs 88.2%;  $P<0.001$ ).

**Conclusion:** During the first 12 months of the study, participants were willing to enroll in the study. Interim analysis demonstrated an overall reduction in pharmacological analgesia/anesthesia.

### **Reducing Variability in the Infant Sepsis Evaluation at Advocate Children's Hospitals: Assessing Appropriateness of Workup and Disposition of Well-Appearing Febrile Infants**

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**Background:** In recent years, there has been a push to standardize care for well-appearing febrile infants. In August 2021, the American Academy of Pediatrics published and updated “Clinical Practice Guideline: Evaluation and Management of Well-Appearing Febrile Infants 8 to 60 Days Old.” The Value in Pediatrics-Launched Reducing Variability in the Infant Sepsis Evaluation II (REVISE II) study was conducted in order to evaluate appropriate workup and disposition in accordance with these guidelines.

**Purpose:** As part of Value in Pediatrics-Launched REVISE II, this study aimed to assess the frequency of appropriate workup and disposition of febrile infants at Advocate Children's Hospital.

**Methods:** Chart review was conducted for patients between 8 and 60 days old who presented to Advocate Children's Hospitals for evaluation of fever per REVISE II protocols. Patients under 2 weeks old who had complicated perinatal courses, patients born pre- or post-term, ill-appearing infants, infants recently treated with antibiotics, those with suspected herpes, and those with clinical diagnosis of bronchiolitis were excluded. Cases were reviewed for age-appropriate workup including presence or absence of complete blood count, blood cultures, inflammatory markers, urinalysis, urine cultures, and cerebral spinal fluid studies based on febrile neonate guidelines. Appropriate emergency department disposition was determined based on admission vs discharge home as well as length of stay.

**Results:** Over 24 cycles, 69% of patients received appropriate disposition from the emergency department. There was an

overall rise in the percentage of infants with appropriate disposition over progressive cycles, though this change was not significant. Of infants between 8 and 21 days, 87% had an appropriate workup. There was no significant change in the proportion of these patients who received appropriate workup in progressive cycles. Of infants between 22 and 60 days, 96% had an appropriate workup. There was no significant change in the proportion of patients receiving appropriate workup over progressive cycles.

**Conclusion:** Over 24 cycles, there were slight increases but no significant change in the percentage of infants presenting with fever who had appropriate disposition from the emergency department. While the vast majority of febrile infants had appropriate workups, there was no significant change in the percentage of patients who received appropriate workup over progressive cycles.

### **Feasibility and Accuracy of Contrast-Enhanced Echocardiographic Assessment of Left Ventricular Global Longitudinal Strain**

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**Background:** Left ventricular (LV) global longitudinal strain (GLS) derived from speckle-tracking echocardiography is used in various cardiac pathologies as an assessment of subclinical LV systolic function. Its main limitation is the inability to assess GLS in patients with poor image quality — using ultrasound-enhancing agents (UEA) was an exclusion in use of GLS.

**Purpose:** As part of a quality study, we evaluated the feasibility of assessing GLS in patients with UEA images compared to non-UEA images.

**Methods:** Echoes were included if they met the following criteria: transthoracic echocardiography images of adequate quality for GLS to be acquired, and UEA used per clinical indication to better visualize endocardial definition. GLS was performed post-echo acquisition on both non-UEA and UEA images.

**Results:** There were 50 echoes in this study: mean age was  $64.18 \pm 17.74$  years, and mean body mass index was  $32.68 \pm 9.63$  kg/m<sup>2</sup>. Most echoes had good (62%, n=31) or fair (34%, n=17) image quality. The GLS measured on regular non-UEA-enhanced images had a mean of  $14.25\% \pm 4.26\%$ . GLS with UEA-enhanced imaging had a mean of  $15.07\% \pm 4.36\%$  and a difference of  $0.81\% \pm 1.57\%$  between the two sets of data. UEA GLS was higher in 74% (n=37), the same in 6% (n=3), and lower in 20% (n=10) of patients. Bland-Altman plot showed agreement between UEA and non-UEA GLS measurements ( $P < 0.0001$ ).

**Conclusion:** The difference between the datasets for non-UEA GLS and the UEA-enhanced GLS was within a singular percentage point. Improved diagnostic accuracy can be obtained with the ability to complete speckle-tracking echocardiography on patients using UEA imaging. The results of this study suggest that GLS can be accurately measured from UEA imaging.

### **Trends in Hysterectomy Route Within a Large Health System in Wisconsin**

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**Background:** Hysterectomy is the second most common surgery women undergo, with at least 430,000 procedures performed annually in the United States. Both the American Association of Gynecologic Laparoscopists (AAGL) and the American College of Obstetricians and Gynecologists (ACOG) recommend that hysterectomies for benign disease should be performed through minimally invasive routes (eg, vaginal or laparoscopic) given shorter hospitalization and postoperative recovery times. Despite these recommendations, the number of vaginal hysterectomies has decreased from 25% in 1998 to 17% in 2010, and more than 50% of all hysterectomies are performed abdominally.

**Purpose:** Our quality improvement study aimed to determine the annual trends in route of hysterectomy within our health system from 2012 to 2019.

**Methods:** We retrospectively identified all patients who underwent a hysterectomy between January 1, 2012, and December 31, 2019, within a large health system located predominantly in southeastern Wisconsin. Descriptive and frequency statistics were used to summarize the characteristics of the study population. The percentage of each hysterectomy route was stratified by year.

**Results:** In total, 17,216 hysterectomies were identified in the time period. Abdominal hysterectomies represented 16.3% of all hysterectomies in this time period; minimally invasive hysterectomies represented the remaining 83.7%. In reviewing trends over time, abdominal hysterectomies decreased from 2012 to 2019 (27.4% to 11.6%;  $P < 0.001$ ). When comparing minimally invasive routes of hysterectomy, vaginal hysterectomy rates rose during the time period (6.3% to 12.5%;  $P < 0.001$ ), as did laparoscopic-only approaches (60.2% to 66.1%;  $P = 0.001$ ). Laparoscopic-assisted vaginal hysterectomy rates rose (6.1% to 9.8%;  $P < 0.001$ ) as well. The single biggest annual change in rate for hysterectomy route was in 2013, at which time abdominal rates decreased 9.3 percentage points from 2012 (27.4% to 18.1%).



**Conclusion:** In our health system, the route of hysterectomy has significantly trended toward minimally invasive routes over time, which is in line with current AAGL and ACOG recommendations.

### Is There a Dose-Dependent Benefit of Aspirin Use in the Prevention of Preeclampsia During Pregnancy?

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**Background:** Hypertensive disorders, including preeclampsia, impact approximately 10.8% of all pregnancies in the United States. Use of low-dose aspirin (ASA) has been shown to reduce the likelihood of developing preeclampsia.

**Purpose:** To confirm that use of ASA reduces the likelihood of developing preeclampsia within our patient population and to determine whether there is a dose-dependent effect.

**Methods:** We retrospectively reviewed all pregnant patients and pregnancy episodes at one urban teaching hospital serving primarily state-insured patients. Those with a diagnosis of chronic hypertension or history of pregnancy-induced hypertension (PIH) during January 2016–December 2020 were included. Pregnancy episodes were excluded if patients received prenatal care or delivered at a different hospital site. ASA use and dose during pregnancy were recorded. Pregnancy episodes were grouped as no ASA use vs any ASA use. Pregnancy episodes also were grouped by dose as: no-ASA use, ASA 81 mg, and ASA 162 mg. Descriptive statistics were computed. Chi-squared tests were used to assess differences among ASA groups. Additional subanalyses were performed.

**Results:** Overall, 955 pregnant patients with 1101 pregnancy episodes were included. Patients predominantly identified as Black, non-Hispanic (68.4%). ASA use was documented in 607 (55.1%) episodes, with ASA 81 mg prescribed in 533 (87.8%) and ASA 162 mg in 74 (12.2%). There were no significant differences in antepartum PIH episodes (162 [32.8%] no ASA use vs 206 [33.9%] any ASA use;  $P=0.69$ ) or postpartum PIH episodes (82 [16.6%] no ASA vs 87 [14.3%] any ASA;  $P=0.34$ ). There were also no significant differences in antepartum PIH episodes (162 [32.8%] no ASA vs 185 [34.7%] ASA 81 mg vs 21 [28.4%] ASA 162 mg;  $P=0.51$ ) or postpartum PIH episodes (82 [16.6%] no ASA vs 76 [14.3%] ASA 81 mg vs 11 [14.9%] ASA 162 mg;  $P=0.62$ ) when comparing dose. Subanalyses looking at no ASA use vs any ASA use found no significant difference in the development of PIH in patients with a history of hypertension, chronic

hypertension, or pregestational diabetes.

**Conclusion:** Our study found no significant difference in the development of PIH among pregnant patients regardless of ASA use. Further prospective studies may be needed to ensure medication adherence when evaluating dose-dependent response to ensure patient medication compliance.

### Effect of a Clinical Pathway Project on Buprenorphine Prescription Practices in the Emergency Department

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**Background:** Opioid overdose death rates in Illinois and across the nation have continued to rise. Buprenorphine has emerged as an effective treatment in curbing illicit opioid use and mitigating opioid overdose deaths in individuals suffering from opioid use disorder. Not only does buprenorphine initiation in the emergency department (ED) reduce the risk of opioid overdose death, but the therapy also reduces future ED/hospital utilization for opioid overdose. To this end, we sought to develop a quality improvement (QI) project utilizing a clinical pathway with Epic-embedded order set and provider education program toward increasing buprenorphine prescriptions in the ED.

**Purpose:** To analyze the effectiveness of a QI project that utilized a clinical pathway and provider education program toward increasing rates of buprenorphine prescriptions in the ED.

**Methods:** A retrospective query was performed using Epic to determine the number of buprenorphine prescriptions written in the ED 6 months before and after the implementation of the QI project.

**Results:** There was a nearly 300% increase in buprenorphine prescriptions in the ED during the 6 months after the implementation of the QI project compared to the preceding 6 months.

**Conclusion:** QI projects utilizing clinical pathways with Epic order sets and provider education programs appear to be an effective means of encouraging buprenorphine prescription in the ED.

### Comparison of Diltiazem Immediate vs Extended Release in Sustaining Acute Rapid Ventricular Response Rate Control in Atrial Fibrillation

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**Background:** Diltiazem, a non-dihydropyridine calcium channel blocker, is a guideline-recommended rate-control agent for atrial fibrillation/flutter with rapid ventricular response (AF with RVR). Following an intravenous (IV) bolus dose, a maintenance regimen is typically initiated with oral or continuous IV infusion to maintain rate control. Among the oral options, data are lacking comparing immediate-release (IR) and extended-release (ER) formulations at maintaining rate control in the acute setting.

**Purpose:** To compare sustained rate control between oral IR and ER diltiazem in patients with acute AF with RVR after diltiazem IV bolus.

**Methods:** This retrospective cohort study included patients in the emergency department who received diltiazem IR or ER formulation following successful rate control (heart rate of <110 bpm) of RVR with IV diltiazem bolus dose(s). A list of patients who received diltiazem IV bolus dose(s) in the emergency department was generated using Epic Slicer Dicer. The study excluded patients most commonly due to inability to obtain rate control following the IV bolus or incomplete documentation of study endpoints. The primary outcome evaluated was sustained rate control defined as no more than 1 documented heart rate of  $\geq 110$  bpm within 6 hours of oral diltiazem administration. Secondary endpoints included number of doses administered, need for repeat dosing or electric cardioversion, and need for inpatient admission.

**Results:** Among the 65 patients included, median age was 69 years and 61.5% were male. Most patients (78.4%) required 1 IV bolus dose of diltiazem to obtain rate control. Regarding the primary outcome, proportionally more patients in the IR group observed successful rate control (80.4% vs 50.0%;  $P=0.04$ ). Proportionally fewer patients in the IR group required additional rate control measures (11.8% vs 28.6%;  $P=0.20$ ). Adverse events were minimal in both groups, with bradycardia being the most common (7.8% vs 7.1%;  $P=1.00$ ).

**Conclusion:** In emergency department patients who have AF with RVR, oral administration of immediate-release diltiazem following an IV bolus dose may provide higher rates of sustained initial rate control compared to extended-release diltiazem.

### **Inequitable Impacts of Climate Change on Our Patients: Getting Climate Smart**

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**Background:** Climate change is impacting our patients' health through increased heatwaves, wildfires, vector-borne illnesses and worsening air quality. Known as a threat multiplier, climate change's impacts amplify existing health disparities in vulnerable communities. According to a perspective published in 2022 in the *New England Journal of Medicine*, "Clinicians have a powerful megaphone — and a profound responsibility — to effectively communicate" the relationship between climate change and health to their patients. While most clinicians are "concerned" about climate change, a literature and Google search revealed numerous curricula on climate advocacy but limited continuing education with a clinical lens on managing climate impacts on patient health.

**Purpose:** To design an interprofessional continuing education series on climate change and its impacts on patient health.

**Methods:** A climate change education group was assembled with knowledgeable individuals from medicine, nursing, pharmacy, behavioral science, and sustainability to design/deliver 5 1-hour, continuing education-accredited, clinically actionable sessions. Framed by the American Public Health Association's model on health impacts of climate change, session format included an overview of specific climate change impacts (eg, air quality, rising temperatures), 3–4 clinically relevant vignettes from varied professions, and Q&A. A "lib guide" of resources for each session was accessible through the system's library. Session attendees were asked to voluntarily complete an anonymous 4-item survey to help improve future series.

**Results:** Across the 5 sessions, 66% of registrants (608 of 923) attended. Session attendance ranged from 146 (overview) to 109 (severe weather). Multiple professions attended, including nursing (29%), physicians (11%), pharmacists (11%), and medical students/residents/fellows (5%), with the remainder in other categories. Overall, 185 attendees completed the survey with 100% recommending the session to their colleagues (82% "yes definitely"; 18% "yes"). As a result of attending this session, 64% reported that their ability to discuss the effects of climate change on their patients' health had "significantly increased" while 35% selected "moderately increased." Typical comments included "Fantastic" and "Cases and multiple presenters from various health care backgrounds were excellent..." To date, lib guides have been accessed >500 times.

**Conclusion:** Clinically focused education on climate change and health for interprofessional clinicians with easy access to resources was highly rated and enhanced their ability to engage patients on the effects of climate on their health.

### **Reducing Discharge Opioid Prescription After Breast Conservation Surgery: A Systemwide Multihospital Quality Improvement Initiative**

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**Background:** Most patients with breast cancer undergoing breast conservation surgery (BCS) are routinely discharged with a significant number of opioids despite no clear evidence that a large quantity of opioids is necessary for adequate pain control after surgery. We performed a systemwide quality improvement initiative across multiple hospitals to help decrease opioid use in the postoperative setting for BCS for breast cancer.

**Purpose:** To analyze systemwide postoperative opioid prescribing for patients undergoing BCS and, by utilizing a multisite quality improvement initiative, to achieve a significant reduction in postoperative opioid use.

**Methods:** Postoperative opioid prescriptions were examined for women with a new breast cancer diagnosis during the measurement period. Patients who had BCS (lumpectomy/excisional biopsy with or without sentinel lymph node biopsy) were included (CPT codes 19120, 19125, 19160, 19162, 19301, and 19302). Re-excision surgical procedures were included in the study group. Patients who had mastectomy or oncoplastic reconstruction at the time of surgery were excluded. Discharge prescriptions containing >25 morphine milligram equivalents (MME) were examined. During the measurement period, providers were educated on postoperative prescribing practices, nonopioid alternatives, local/regional analgesia, and techniques for setting patient expectations preoperatively. Confidential reports containing surgeon and system rates were provided to all providers. Our goal was to limit the number of patients discharged with opiates totaling >25 MME to  $\leq 25\%$  of all BCS procedures.

**Results:** From July 2020 to June 2022, 1447 patients underwent BCS and met study requirements. In these patients, we identified those with discharge prescriptions containing >25 MME. Quarterly postoperative opioid prescriptions were tabulated for all Wisconsin hospitals in our system. A total of 14 hospitals were included in our study, with a mean of 202 patients included in each quarter. Over

the measurement period, the number of patients discharged with prescriptions of >25 MME was reduced from 63% (108 of 171) in 2020 Q3 to 20% (49 of 246) in 2022 Q2 for all hospitals ( $P < 0.005$ ).

**Conclusion:** Quality improvement with performance reports and provider education can provide a significant reduction in postoperative opioid prescribing for patients undergoing BCS. Based on these data, most patients can be discharged with <25 MME of postoperative opioids following BCS.

## **POSTER PRESENTATIONS**

### **Implementation of an Emergency Department-Set Palliative Care Curriculum for Emergency Medicine Residents**

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**Background:** Half of Americans visit the emergency department (ED) in their last month of life, and 75% in the last 6 months. Because many patients present to the ED while critically ill, it is imperative that emergency medicine (EM) physicians be able to quickly align with patients and families to determine patients' values and offer recommendations. EM physicians have reported that palliative care is an important competence in their practice, yet they feel they are not adequately educated in providing palliative care. Previously reported EM residency palliative curricula were effective methods to increase knowledge and confidence in palliative care skills.

**Purpose:** To develop a palliative care curriculum for EM residents and evaluate if this curriculum improves residents' knowledge, level of comfort, and perceived application of skills in caring for patients with chronic and/or terminal illness in the ED. Secondly, we aimed to determine if EM residents find palliative care education important and determine which modalities are most effective.

**Methods:** A curriculum was developed that consisted of didactic sessions, a communication skills lab, and a small group simulation case. The study population was EM residents at Advocate Christ Medical Center in all levels of training. Data were collected via pre- and postintervention surveys using Likert scale questions.

**Results:** The number of subjects was 41. All variables were found to be non-normally distributed, leading to the use of the Wilcoxon signed-rank test. Survey items 3–12 were found to have statistically significant differences in preintervention vs postintervention responses. These items evaluated determination of decision-making capacity, goals-of-care discussions, interpretation of advanced directive forms, delivering bad news, treatment of acute pain, refractory

symptoms, symptoms at end of life, and understanding the difference between hospice and palliative care. Survey results evaluating learning modalities showed residents felt lecture, small group discussion, and simulation are all effective education tools, with the strongest preference for simulation and small group discussion.

**Conclusion:** This palliative care curriculum did improve residents' knowledge, level of comfort, and perceived application of skills in caring for patients with chronic or terminal illness in the ED. EM residents did find palliative care education important. Small group discussion and simulation were found to be the most effective modalities to learn palliative care skills.

### Improving Rates of Pediatric Developmental Screening at Two Family Medicine Residency Practice Sites

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**Background:** Approximately 12%–16% of children have disabilities, and only 30% are diagnosed before entering school. The American Academy of Pediatrics currently recommends routine pediatric developmental screening during 9-, 18-, and 30-month office visits and autism spectrum disorder (ASD) screening at 18- and 24-month visits, using standardized instruments (eg, ASQ, MCHAT-R). Developmental screening rates at Aurora St. Luke's Family Practice Center (FPC) and Aurora Sinai Family Care Center (FCC) residency sites are low, with only 3% and 4% of eligible children screened, respectively.

**Purpose:** To improve clinician awareness and increase rates of pediatric developmental and autism screening at FPC and FCC sites.

**Methods:** Interventions to educate and train residents, faculty, and support staff on pediatric developmental screening started on January 4, 2023. A handout detailing screening intervals, scoring, documentation, and billing was distributed to residents and faculty. Children eligible for screening included patients turning 1–3 years old (for ASQ) or 30 months old (for MCHAT-R) by end of the measurement year, with at least 2 office visits at FCC or FPC in the last 24 months and at least 1 visit in the last 12 months. Screening rates of eligible children were calculated for the 365 days preceding educational intervention ("preintervention") and for the 43 days following intervention ("postintervention"). Screening rates were obtained through Epic reports. Postintervention rates presented herein include interim data only. Final postintervention data will be collected on April 14, 2023, and

final outcomes will be analyzed by chi-squared test.

**Results:** ASQ screening rate at FCC was 3.2% preintervention and 9.4% postintervention. MCHAT-R screening rate at FCC was 13% preintervention and 12.9% postintervention. At FPC, ASQ screening rate was 3.4% preintervention and 5.0% postintervention. MCHAT-R screening rate at FPC was 15.8% preintervention and 24.1% postintervention.

**Conclusion:** Preintervention ASQ and MCHAT-R screening rates were low at both sites. Interim postintervention analysis shows ASQ screening rates are improving at both clinics, and MCHAT-R screening rates are improving at FPC. Screening rates may be underestimated in this study due to clinician error in documentation. Additionally, screenings are not counted as "met" outcomes in Epic until a patient turns 1, 2, or 3 years old if seen and screened after 9, 18, and 30 months of age.

### MedStopper: An Online Tool to Assist With Deprescribing Medications in Patients Enrolled in Home Hospice

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**Background:** Polypharmacy is defined as the prescription of 5 or more medications to a single patient. It also refers to the use of medications that do not have a specific indication or are ineffective for the condition being treated. Polypharmacy may lead to adverse drug events, falls, increased mortality, and functional impairment. Deprescribing is the deliberate process of discontinuing medications that are potentially harmful or no longer align with the patient's goals. Barriers to deprescribing in hospice are lack of time and lack of well-defined guidance. Numerous deprescribing tools have emerged to provide time-efficient guidance; one such example is MedStopper, a free online tool that helps clinicians and patients make decisions about stopping certain medications.

**Purpose:** The primary objective of this study was to identify patients enrolled in Aurora Home Hospice who were eligible for deprescribing of nonhospice medications using the MedStopper tool. The secondary objective of this study was using MedStopper to provide targeted educational information for home hospice nurses to facilitate deprescribing conversations.

**Methods:** From November 2022 to February 2023, 3 hospice RN case managers voluntarily agreed to participate in this quality improvement project. They were given an overview of the MedStopper tool and educated on providing recommendations about deprescribing. Their censuses

were reviewed to identify patients  $\geq 65$  years of age taking 3 or more nonhospice medications. The list of nonhospice medications was compiled using MedStopper and reviewed with the patient at routine home hospice visits. Chart review was performed 1 month later to determine if deprescribing recommendations were followed.

**Results:** From a census of 24 patients, 17 patients had 3 or more non-hospice medications and were included in this study. Hospice RN case managers felt MedStopper provided visually helpful guidance. Patients and their families were open to having deprescribing conversations and found MedStopper helpful. Deprescribing conversations were conducted with 8 patients and their caregivers. One month later, 5 of 8 had followed the recommendations.

**Conclusion:** MedStopper appears to be helpful in guiding conversations about deprescribing nonhospice medications for patients enrolled in home hospice, albeit in a small sample size and short timeframe. Continuing conversations with more patients over longer timeframes will be prudent in demonstrating the long-term utility of MedStopper in deprescribing.

### Addressing the Gap in Parenting Education for Pediatric Residents: An Interdisciplinary Interactive Curriculum Focused on Parenting Toddlers

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**Background:** Pediatric residents are viewed by parents as authorities in parenting and raising children. Therefore, pediatric residency education should include curricula that address this important role. However, this type of education is lacking in current pediatric residencies. According to an online survey distributed to members of the Association of Pediatric Program Directors, respondents noted it was “‘very important’ to educate residents about parenting skills,” but “only 11% rated their program as doing so ‘very well.’”

**Purpose:** This workshop aimed to present an avenue to address this gap and give a framework for a formal curriculum addressing parenting.

**Methods:** Our team created a 2-hour interactive and interdisciplinary toddler-parenting workshop for pediatric residents, delivered during academic hours. The workshop included the following 4 stations: Car Seat Safety (led by car seat safety technicians); Poison Prevention and Childproofing (led by injury prevention specialists); Picky Eating (led by registered dietitians); and Toilet Training and Tantrums (led by resident and attending parents). Residents were given pre- and postworkshop surveys to assess baseline and postworkshop self-reflective competencies.

**Results:** 30 pediatric residents participated in the

preworkshop survey, and 22 participated in the postworkshop survey. Using Wilcoxon signed-rank test, all competencies saw a significant increase in self-reported confidence. A significant increase in confidence was reported across all competencies within the PGY-1 class. In comparison, the differences noted in the senior classes were not statistically significant, which could suggest this workshop’s utility as being most effective for interns.

**Conclusion:** This toddler-parenting curriculum offers an interactive multidisciplinary approach to bridging the gap pediatric residents have between anticipatory guidance and realistic, applicable parenting advice. Within a single workshop, there was a significant increase in self-reported competencies in topics of picky eating, car seat safety, childproofing, and toilet training. Similar results were found in the previously piloted infant-parenting curriculum. Next steps include formal integration of the infant- and toddler-parenting workshops in our program’s 18-month curricula and an assessment of the workshop’s long-term effect on clinical practice change, specifically in resident clinics.

### Review of Octreotide Use for End-of-Life Symptom Management by Indication in an Inpatient Hospice Setting

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**Background:** Octreotide, a somatostatin analogue, has been shown in the literature to be useful in the treatment of numerous conditions, including adjuvant pain control, bronchorrhea and lymphorrhea, noninfectious diarrhea, nausea and vomiting, liver disease with cirrhosis, and management of malignant bowel obstruction (MBO). Hospice care focuses on management of end-of-life (EOL) symptoms with a fairly limited formulary of medications for management of pain, dyspnea, and agitation. There is often repurposing of medications to manage symptoms, which are beyond the scope of the medications on formulary. As octreotide can be used for multiple indications, we wanted to review other ways this medication is being used to manage EOL symptoms at Aurora Zilber Family Hospice.

**Purpose:** To evaluate current practices of octreotide use and assess whether there is evidence to supporting its use for lesser-known indications.

**Methods:** Patients receiving octreotide at the inpatient Zilber hospice unit from January 2019 to December 2022 were identified by pharmacy. Patient charts were manually reviewed to collect data on indication for octreotide, admission diagnosis, patient demographics, and details of patient hospice stay. Data were stored in a Microsoft Excel



file, and descriptive statistics were calculated to summarize collected data.

**Results:** A total of 90 patients received octreotide at Zilber over the study period. There were 7 unique indications for octreotide use. Malignant bowel obstruction was the most common indication and was documented for 42 patients (47%), followed by gastrointestinal bleed, which was documented for 13 patients (14%). The efficacy of octreotide for pain management at the EOL was difficult to assess. For patients included in this study, pain was assessed as the absence or presence of pain behaviors. Given the propensity for terminal restlessness and inability to communicate at EOL, it is challenging to collect data for the purposes of assessing octreotide efficacy for EOL pain management.

**Conclusion:** The majority of octreotide use was for treatment of malignant bowel obstruction. This is not surprising, as this is the condition with most literature supporting its use. There were several other indications for its use in the inpatient hospital setting, and this could provide an educational opportunity.

### **Prospective Observational Analysis of the Use of Resuscitative Transesophageal Echocardiography in the Emergency Department and Intensive Care Unit**

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**Background:** Transesophageal echocardiography (TEE) is an emerging modality used in resuscitation of cardiac arrest, respiratory failure, and shock. TEE can evaluate the various pathologies leading to these presentations and may guide management decisions, with the potential to improve patient outcomes.

**Purpose:** Primary objective was to evaluate the usage pattern of resuscitative TEE across a health system following initiation of a prospective, observational registry. Secondary objectives included exam findings, patient safety, management changes, and patient outcomes.

**Methods:** Data were collected from a prospective, observational, multicenter registry enrolling patients from 3 hospitals within the same health system who had TEE performed as part of resuscitation efforts for cardiac arrest, respiratory failure, or shock. Data from March 2022 through October 2022 included: location (emergency department [ED] vs intensive care unit [ICU]), patient presentation, indication for the exam, TEE views obtained, exam findings,

changes in clinical management, adverse events related to TEE, and patient outcomes. Statistics are descriptive.

**Results:** A total of 27 patients were included in the analysis; 10 (37%) exams were performed in the ED, 2 (7%) on the hospital floors, and 15 (56%) in the ICU. Presentations for these 27 patients included shock (n=6, 22%), respiratory failure (n=6, 22%), and cardiac arrest (n=15, 56%), including both out-of-hospital (n=8, 53%) and in-hospital arrests (n=7, 47%). Indications for the exam included intra-arrest evaluations (n=10, 37%), postarrest evaluations (n=5, 19%), initial evaluation of undifferentiated shock or acute hypotension (n=6, 22%), hemodynamic monitoring in a critically ill patient (n=5, 19%), and procedural guidance (n=1, 3%). A change in medical management due to TEE findings occurred in 14 (52%) of the exams. Out of 27 patients, 5 (19%) expired in the ED, with 3 (11%) surviving to ICU admission from the ED; 9 (33%) patients ultimately expired in the ICU and hospital ward, and 4 (15%) survived discharge from the ICU. As of the writing of this abstract, final outcomes were not available or still uncertain for 6 (22%) patients. There were no adverse events related to TEE.

**Conclusion:** Resuscitative TEE can provide diagnostic information for critically ill patients in both ED and ICU settings. In this study, the most common indication was cardiac arrest. Further research is needed to evaluate how often these findings may lead to changes in clinical management.

### **Implementing Point-of-Care Ultrasound Training into a Family Medicine Residency Curriculum**

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**Background:** The use of point-of-care ultrasound (POCUS) is becoming a valuable tool in primary care. POCUS has been shown to decrease emergency visits and specialist referrals and increase patient satisfaction. Family medicine residency programs are increasing their efforts to provide POCUS training, but a lack of skilled faculty to support this often limits POCUS incorporation into residency curricula.

**Purpose:** To assess the effectiveness of one approach to implementing POCUS training into a family medicine residency curriculum.

**Methods:** A series of three 2-hour POCUS workshops open to all residents and faculty and led by a PGY3 family medicine resident with formal training in sonography were held during resident didactic time November-December 2022. Five handheld ultrasound devices were available for

training purposes. Session topics included: introduction to ultrasound, evaluation for deep vein thrombosis, and outpatient procedural techniques. All attendees received voluntary electronic pre- and posttraining surveys. Survey responses were linked with a nonidentifiable code and compared using paired *t*-testing. Pooled survey data were analyzed using descriptive statistics.

**Results:** 27 residents and 8 faculty participated in at least one POCUS training session and completed a pretraining survey; 14 posttraining surveys were completed. Prior to the sessions, 100% of respondents expressed interest in POCUS education, 63% of residents and 75% of faculty reported no prior POCUS experience, 37% of respondents reported being “Somewhat” or “Very” familiar with primary care POCUS applications, and 14% of respondents reported being “Somewhat” or “Very” confident performing POCUS. After attending at least one training session, 86% of respondents reported being “Somewhat” or “Very” familiar with POCUS primary care applications, and 36% reported being “Somewhat” or “Very” confident in performing POCUS. Only 11 of 14 posttraining surveys were able to be linked to a pretraining survey; of these, increases in familiarity with primary care POCUS applications ( $P=0.027$ ) and confidence in performing POCUS ( $P=0.006$ ) were observed.

**Conclusion:** Family medicine residency program POCUS training sessions with a content expert led to improvement in resident and faculty familiarity with POCUS primary care applications and confidence in performing POCUS. Project limitations included varying ability to participate in all three sessions and low posttraining survey response rates, with limited ability to link pre- and posttraining survey results. Results support continuing to develop a broad, longitudinal POCUS education plan for incorporation into program curriculum.

### Assessing Cardiac Troponin Levels in Pregnancy Complicated by Hypertension

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**Background:** Studies have shown that women with a history of preeclampsia during pregnancy have a higher lifetime risk of developing cardiovascular disease. However, finding a marker that identifies the cardiovascular impact of preeclampsia during pregnancy remains a challenge. Cardiac troponin testing has been used to assess various disease processes for myocardial injury. Limited evidence supports cardiac troponin testing during pregnancy for the

diagnosis of hypertensive conditions and predicting long-term cardiovascular sequelae.

**Purpose:** Primary aim was to determine if patients with an elevated cardiac troponin level had a hypertensive condition present. Secondarily, we aimed to determine if cardiac troponin elevation correlated with disease severity.

**Methods:** We conducted a retrospective observational study that reviewed all pregnant patients  $\geq 18$  years of age who delivered between January 1, 2019, and October 1, 2021, and who had an ultra-sensitive troponin I test in the peripartum state (within 180 days prior to or 60 days after delivery). Patients were categorized into normotensive and hypertensive categories on a spectrum as defined by the American College of Obstetricians and Gynecologists at the time of their first troponin I test. Descriptive statistics were used to describe patient characteristics; chi-squared test was used to test associations.

**Results:** Overall, 597 patients had a troponin I test in the peripartum period. At the time of their first troponin I test, 385 (64.5%) were normotensive, 34 (5.7%) had gestational hypertension, 32 (5.4%) had preeclampsia without severe features, 126 (21.1%) had preeclampsia with severe features, and 4 (0.7%) had eclampsia. Additionally, 66 (11.1%) patients (irrespective of other hypertension status) had chronic/preexisting hypertension. Overall, 212 (35.5%) had some form of hypertensive condition present. A total of 18 patients (3.0%) had an elevated first troponin I level. Of the patients who had elevated troponin I levels, 6 were normotensive, 2 had preeclampsia without severe features, and 10 had preeclampsia with severe features. Furthermore, results show that those who had some form of hypertension in pregnancy had significantly higher elevated troponin (5.7% vs 1.6%;  $P=0.005$ ).

**Conclusion:** While our results show a statistically significant elevation in troponin levels in pregnancies complicated by hypertension, further prospective studies should explore the use of troponin labs as a screening tool or predictive measure for this disease spectrum.

### Use of Topically Applied Sweet Marjoram Essential Oil for Pain Reduction Following Intrauterine Device Placement

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**Background:** More women may seek out the intrauterine device (IUD) if pain during insertion is adequately addressed. Pain with IUD insertion is related to two mechanisms: the mechanical action of cervical manipulation with insertion and the uterine muscle pain with placement of the IUD. Local anesthetic tends to help with cervical mechanical pain in the short term but is minimally effective for decreasing

uterine pain. Clinical trials have looked at ibuprofen at doses of 400–600 mg or misoprostol (a drug to soften the cervix), neither of which helped to reduce pain associated with IUD insertion. Currently, there are no studies in the literature addressing direct application of an essential oil mixture for IUD insertion pain management. Sweet marjoram essential oil used topically may help reduce pain and relieve spasms. Essential oils may be a safe, cost-effective, non-habit-forming pain relief option to offer patients.

**Purpose:** To evaluate the use of topically applied sweet marjoram essential oil for pain reduction following IUD insertion.

**Methods:** A randomized, single-blinded, prospective pilot study of 59 women undergoing IUD insertion was conducted between June 4, 2021, and May 26, 2022. Participants were randomly assigned to 1 of 3 methods (Method 1: sweet marjoram essential oil diluted in grapeseed oil with abdominal massage; Method 2: grapeseed oil with massage; Method 3: control group with no oil or massage). Pain was measured at 4 time points using a scale of 0–10, with 10 being worst pain imaginable.

**Results:** No significant differences between groups were found among demographics, obstetric history, premedication, and baseline pain scores. Pain scores 3 minutes after IUD insertion ( $P=0.061$ ) and 5 minutes postintervention ( $P=0.051$ ) were similar between the 3 methods. There was a significant difference in pain 15 minutes postintervention ( $P=0.041$ ; effect size: 0.08), with a median pain score of 1.0 (interquartile range [IQR]: 3.0) for Method 1, 0.0 (IQR: 1.0) for Method 2, and 2.0 (IQR: 4.0) for Method 3. Pairwise comparisons found a significant difference between Method 2 and Method 3 ( $P=0.037$ ), with Method 2 patients reporting less pain 15 minutes postintervention. No significant difference was found between Method 1 and Method 2 ( $P=0.359$ ) or between Method 1 and Method 3 ( $P=1.000$ ).

**Conclusion:** Abdominal massage may be a safe, cost-effective, non-habit-forming pain relief option to offer patients undergoing IUD insertion. Larger, more robust studies are needed to confirm these findings.

### **Knowledge Assessment of Palliative and Hospice Care Basics by Resident Physicians: A Quality Improvement Project**

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**Background:** Review of the literature strongly suggests that resident physicians lack adequate knowledge and confidence regarding hospice and palliative care (HPC). Milestones and basic knowledge requirements remain vaguely defined or undefined, leading to an overall lack of a standardized training curriculum. Many trainees avoid engaging in palliative and hospice medicine, but these services are often needed outside the consultation service in a variety of settings. Trainees have expressed a need to recognize when to initiate palliative care and how to seek additional resources. We propose that resident physicians across Aurora Health Care will demonstrate a similar need for HPC education as those demonstrated by literature.

**Purpose:** This quality improvement project aimed to assess resident physicians' knowledge of hospice and palliative care topics and determine needs for further education. We also anticipated gaining insight into which domains require refinement to improve the curriculum and optimize education provided to resident physicians at Aurora.

**Methods:** We used the Palliative Care Knowledge Test (PCKT) to assess the knowledge base of internal and family medicine resident physicians at Aurora. We additionally piloted a survey to assess resident exposure to and confidence in HPC. Residents were invited to anonymously complete the knowledge test and survey through a secure web application twice — once prior to and once following 4 HPC didactic sessions hosted throughout the 2022–2023 academic year.

**Results:** A total of 37 unique responses were collected prior to didactic sessions, and 34 completed the PCKT portion. Analysis of PCKT data revealed overall scores ranging from 27.8% to 88.9% correct, with a mean score of 56.5% (standard deviation [SD]: 16) for all respondents. Despite high rates of reported prior formal education, survey respondents rated their knowledge of HPC patients' concerns as an average 4.4 (SD: 1.9) out of 10. Questions about knowledge of HPC medication management and comfort caring for a patient in HPC had mean scores of 3.9 (SD: 1.8) and 4.2 (SD: 2.4) out of 10, respectively. At the conclusion of the study window, only 4 responses were submitted as posteducation data, thereby greatly limiting the ability to determine the impact of the education series piloted in this study. Further data collection is needed.

**Conclusion:** We demonstrated a need for further education in hospice and palliative medicine for resident physicians training at Aurora Health Care. Additional data are needed to guide curriculum adjustment, as our study was limited to a small cohort over a limited period of time.

### **Optimization of Interdisciplinary Communication**

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**Background:** Epic's Secure Chat (SC) is used as an alternative to paging between nurses, physicians, and other health care professionals. However, implementation of SC without a standardized training approach can lead to its inappropriate use. The use of the SC system in the Internal Medicine Teaching Service (IMTS) at Aurora St. Luke's Medical Center has also led to confusion about who nursing professionals should first contact for nonurgent communications.

**Purpose:** To assess the knowledge of nursing staff regarding paging vs SC before and after implementation of an educational intervention and, secondarily, to assess nursing staff's knowledge of communication with IMTS.

**Methods:** The study included nurses in all med/surg units and the medical respiratory intensive care unit at Aurora St. Luke's. We assessed participant knowledge using anonymous pre- and postintervention surveys. Flyers with QR codes to the surveys were placed in nursing units. Both the pre- and postintervention survey consisted of clinical scenarios where survey respondents determined if Epic SC or paging was most appropriate, as well as items relating to communication between nursing and IMTS. The preintervention survey was active for 2 weeks, followed by the posting of educational flyers in nursing units for 4 weeks that outlined when to page vs SC in various scenarios. Postsurvey data collection occurred over 2 weeks following educational intervention. A 2-sample *t*-test was used to determine if mean scores were different between pre- and postintervention surveys.

**Results:** There were 28 pre- and 12 postintervention survey respondents (only the 6 who reported seeing the intervention were included in data analysis). The percentage of correctly answered survey items in the preintervention survey and postintervention survey group were 84.5% and 85.6%, respectively, which did not reach statistical significance ( $P=0.38$ ). Items regarding leaving against medical advice and intravenous access scored poorly. Also, 17.6% of respondents incorrectly indicated SC was the best channel to communicate a critical lab value. Participants scored well on items related to communication with IMTS.

**Conclusion:** Our intervention did not appear to be effective at increasing nursing knowledge of when SC vs paging is most appropriate. Future quality improvement in this area is needed and should focus on reaching more nurses, for example by emailing the intervention, requiring a training module, or holding an in-person training session.

## **CASE REPORT/SERIES POSTERS**

### **A Rare Case of Spontaneous Pneumomediastinum in Sports and High Altitude in a Pediatric Patient**

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**Introduction:** Spontaneous pneumomediastinum is air within the mediastinum due to increased alveolar pressure. It can present with chest pain and dyspnea. It is considered a rare presentation in the pediatric population but can be seen in those with a pulmonary history or after playing sports. It is typically a self-limiting condition but can have serious complications.

**Description:** This case details a pediatric patient who was found to have spontaneous pneumomediastinum after traveling from a high-altitude area while playing soccer. His imaging was notable for dissection of air into the spinal canal, a phenomenon known as pneumorrhachis.

**Discussion:** In an otherwise healthy patient, etiology was multifactorial, including high-altitude environment, exertional activity with sports, and changes in barometric pressure. Treatment included symptomatic control and rest prior to return to activity.

### **A Case of Tuberous Sclerosis and Rhabdomyoma in a Neonate**

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**Introduction:** Tuberous sclerosis complex (TSC) describes a neurocutaneous disorder causing pleomorphic features tending to affect multiple organ systems often in the form of benign hamartomas. The disease is somewhat rare, occurring between 1 in 5000 and 1 in 10,000 live births. It is inherited in an autosomal dominant manner, with pathologic genotypes involving mutations in the *TSC1* or *TSC2* genes. De novo mutations, however, occur in up to 80% of cases. Regardless of cause, the expression of the disease is variable. The rarity of this disease paired with the potential severity of its expression makes understanding its presentation important to recognizing the disease and providing appropriate treatment.

**Description:** A seronegative, group B *Streptococcus*-negative mother (gravida 2, para 1) initially presented with concern for an abnormal fetal ultrasound suspicious for rhabdomyoma, possible sandal gap, and pyelectasis.



Follow-up fetal echocardiogram demonstrated two intracardiac masses (right ventricular apex, left ventricular outflow tract). Fetal magnetic resonance imaging (MRI) was suspicious for subependymal nodules. This clinical picture in context of a consanguineous pregnancy raised suspicion for TSC prenatally. NICU team was made aware of the case prior to presentation. At delivery the patient was initially brought to the warmer, dried, and stimulated. APGARs were 9 of 9. The patient was initially made “nothing by mouth” while pending initial cardiac clearance. Prenatal diagnosis of cardiac rhabdomyoma was confirmed with postnatal echocardiogram. An MRI of the brain revealed numerous cerebral tubers and subependymal nodules consistent with TSC. Routine electroencephalogram (EEG) on day of life 1 was normal. Prolonged EEG also was without abnormal findings. Genetic testing was obtained to confirm the strong clinical suspicion of TSC. Testing confirmed the diagnosis of TSC, with a positive *TSC2* mutation noted. Patient was started on prostaglandin initially, which was subsequently discontinued. Sirolimus 0.1 mg was started while the patient was admitted. Patient’s diet was advanced with cardiology clearance and was on oral ad libitum feeds by the time of discharge. At time of writing, the patient was set to follow up with the Lurie Children’s Hospital TSC interdisciplinary clinic, urology, and cardiology.

**Discussion:** This case demonstrates a fairly routine presentation and initial workup of a patient in whom tuberous sclerosis was suspected. Of note, the presence of rhabdomyoma is very common in the condition, present in up to 61% of cases in the patient’s demographic. These tumors are typically benign, asymptomatic, and spontaneously regress, though require close monitoring.

### A Case of *Mycobacterium fortuitum* on Standard Blood Culture

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**Introduction:** Peripherally inserted central catheter (PICC) lines are necessary in the majority of our pediatric hematology/oncology patients. A well-known adverse effect of central lines is a central line-associated bloodstream infection (CLABSI). Common etiologies of CLABSIs are gram-positive organisms, including coagulase-negative *Staphylococcus*, *Enterococcus*, and *Staphylococcus aureus*. Some common causes specific to our hematology/oncology patient population are *Pseudomonas* and *Candida*. Mycobacteria are not a common cause of CLABSIs/bacteremia.

**Description:** A 5-year-old girl with a history of neuroblastoma stage IV, now status post chemotherapy,

radiation, and stem cell transplant twice, had her PICC line placed 3 years ago, and it remained intact. She spiked a fever of >101°F during her stay, and blood cultures were drawn. Less than 48 hours later, *Mycobacterium fortuitum* was seen on standard blood culture. A pathologist confirmed the presence of this organism. Repeat PICC culture was drawn, which resulted positive for this organism. Acid-fast culture was sent and confirmed this organism. The PICC line had to be removed. She was started on triple therapy, initially with amikacin, imipenem, and TMP/SMX. She was transitioned to amikacin, ciprofloxacin, and TMP/SMX when sensitivities came back. She completed a 2-month course of triple therapy and is now on oral therapy with ciprofloxacin and TMP/SMX for another 4–10 months.

**Discussion:** Standard blood culture should not grow *Mycobacterium*. Mycobacteria species typically grow on an acid-fast culture. Some similar case reports have shown these bacteria to be associated with infections in this specific type of malignancy. It is unknown how non-acid-fast culture could have shown mycobacteria, and this was a good catch by the pathologist. Further research is warranted to determine how this growth was possible.

### An Unusual Cause of Bacteremia in an Immunocompetent Child

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**Introduction:** In children hospitalized with community-acquired pneumonia (CAP), positive blood cultures are reported in 2%–7% of cases. The most frequently isolated pathogens are *Streptococcus pneumoniae*, *S. aureus* and *S. pyogenes*; gram-negative organisms are significantly less common.

**Description:** A previously healthy 8-year-old male presented to the emergency department (ED) with 6 days of worsening left rib pain and 1 day of fevers and decreased energy/appetite. Review of systems results were otherwise negative. The patient denied any recent travel, sick contacts, or animal exposures. He is fully vaccinated, with no significant past medical history. In the ED he was febrile, tachycardic, and breathing comfortably on respiratory assistance. Exam was notable for decreased breath sounds on the left and left rib tenderness. Labs showed white blood cell (WBC) count of 28.3, 81% neutrophils, and C-reactive protein (CRP) of 17.7. Blood cultures were drawn twice. A chest X-ray demonstrated a persistent large nonspecific consolidation in the left lower lobe. He was started on ampicillin for CAP and admitted to the pediatric hospital medicine service. The following morning, he was afebrile, symptoms resolved, and WBC/CRP improved. Both blood cultures gram stains

returned positive, one at 22 hours and the other at 28 hours, for gram-negative bacilli. Rapid-detection polymerase chain reaction (PCR) test was negative. Antibiotics were broadened to ceftriaxone. Two days later, blood cultures speciated out to *Psychrobacter phenylpyruvicus*. He was discharged home on amoxicillin-clavulanic acid. Susceptibility testing returned after discharge; *P. phenylpyruvicus* was pansusceptible.

**Discussion:** *Psychrobacter* genus is part of the family Moraxellaceae. Although widely found in the environment, reports of *Psychrobacter* species causing disease in humans are rare and are mainly opportunistic infections. To our knowledge this is the first reported case of *P. phenylpyruvicus* causing bacteremia and likely pneumonia in an otherwise healthy pediatric patient. Most *Moraxella* species are extremely susceptible organisms, including to penicillin. However, B-lactamase-producing strains have been identified. This wide-ranging susceptibility likely accounted for the patient's rapid clinical improvement with the initial dose of ampicillin. Although the patient recovered quickly, the presence of *P. phenylpyruvicus* bacteremia contributed to the patient being exposed to broader spectrum antibiotics and having a longer length of stay. This case reinforces the need to consider rare causes of bacteremia in the setting of CAP when the gram stain is positive for gram-negative organisms but nothing is detected on rapid-detection PCR panel.

### Influenza A Infection as the Catalyst for Appendicitis and Rhabdomyolysis in a Pediatric Patient

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**Introduction:** Respiratory viruses such as influenza A and B have the ability to affect not only the respiratory system but can consequently affect other systems of the body as well. Although knowing the true viral source of infection will not generally change management other than supportive care, there are cases in which knowing the source can help in dictating whether further investigation of symptoms is warranted or if symptoms can be attributed to the virus alone. This is the case of a patient whose illness initially started with upper respiratory infection (URI) symptoms and was followed by right lower quadrant pain, which was suspicious for appendicitis. He concurrently reported myalgias and dark-red urine for which lab work confirmed as rhabdomyolysis. The diagnosis of rhabdomyolysis was especially important as it dictated his course of treatment for appendicitis.

**Description:** A previously healthy 12-year-old male presented from an outside hospital with persistent right lower quadrant pain, nausea, vomiting, dysuria, and decreased urinary output for 4 days prior to admission. His urine was dark red-colored, concerning for rhabdomyolysis,

and he also had cough and congestion preceding his other symptoms. Both computed tomography and ultrasound of the abdomen showed findings significant for a perforated appendix. Viral quad screen was positive for influenza A. Urinalysis was notable for blood, 3 to 5 erythrocytes, and trace leukocyte esterase. Creatine phosphokinase (CPK) was elevated to 25,409 U/L. CPK continued to fluctuate during the 10-day hospital stay. Liver enzymes were initially elevated with aspartate aminotransferase (AST) of 110 U/L and alanine transaminase (ALT) of 39 U/L. They remained elevated until down-trending after day 6 of admission. Given the perforated appendix, this patient required surgical management, yet due to the rhabdomyolysis, the recommendation was to be medically managed with antibiotics until 8–10 weeks after resolution to have surgical intervention.

**Discussion:** The mechanism for viral infections preceding appendicitis is their ability to cause mucosal ulcerations, potentially resulting in a bacterial infection of the appendix. Appendicitis occurring in the setting of influenza A infection was determined as the most likely source of initial infection in this case. A handful of cases have reported an increased incidence of acute appendicitis during influenza infection, but the magnitude of true incidence is still unknown. This was a rare case of influenza A concurrently causing appendicitis and rhabdomyolysis. There have been no documented case reports of influenza infection causing appendicitis and rhabdomyolysis simultaneously.

### Tattoo Pigment Accumulation in Axillary Lymph Nodes

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**Introduction:** New small calcifications or hyperdense foci in axillary lymph nodes are an important finding on screening mammography that would raise suspicion of metastatic calcifications, potentially related to breast, thyroid, and ovarian carcinomas. However, there are a number of potential nonmalignant sources that also need to be evaluated.

**Description:** A 44-year-old female presented for routine screening mammogram after a negative (BIRADS-1) screening mammogram 1 year prior. Screening and subsequent diagnostic workup with mammography and ultrasound revealed new suspicious hyperdensity in the cortex of multiple right axillary lymph nodes for which a core needle biopsy was performed. The biopsy revealed fragments of lymphoid tissue without identifiable malignancy. Physical examination at the time of biopsy also revealed a new tattoo over the patient's right upper arm and back, which she had had done since her previous mammograms the year prior. Patient was subsequently followed for 5 years without

mammographic change or evidence of other malignancy.

**Discussion:** A number of other causes for high-density foci in axillary lymph nodes include sequelae of granulomatous disease such as tuberculosis, silicone deposition from leakage of silicone from prior breast implants, deposition of gold salts used in the treatment of rheumatoid arthritis (chrysotherapy), malignant calcifications related to various breast, thyroid, and ovarian primaries, and even the accumulation of high-density tattoo ink when new tattoos are placed on the thorax or upper extremity. Patients presenting after nodal uptake of metallic tattoo pigments are asymptomatic with findings made incidentally on routine imaging or imaging ordered for other symptoms. Cosmetic tattoo ink composition is highly variable, composed of a solvent and mix of metallic pigments which can be phagocytosed by dermal macrophages that migrate to and accumulate in lymph nodes. The vast majority (>90%) of lymph node drainage from the trunk above the waist occurs to the ipsilateral axillary lymph nodes. The prevalence of tattoos is increasing in younger individuals, especially in women, who in recent decades have surpassed men in the United States as being more likely to have a tattoo. Therefore, the incidence of intranodal pigment deposition is likely to become a more frequently seen phenomenon.

### Acute Deep Vein Thrombosis Secondary to May-Thurner Syndrome: A Case Report

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**Introduction:** May-Thurner syndrome (MTS) describes compression of the left common iliac vein by the right common iliac artery. It may cause deep vein thrombosis (DVT) and leg swelling. Computed tomography (CT) has a high sensitivity for detecting MTS.

**Description:** A 46-year-old female presented with left leg swelling and pain for 1 week. Her past medical history was noncontributory. Vital signs were within normal limits. Physical exam demonstrated a warm and red left leg that was tender to palpation, with pitting edema that extended to the hip; pulses were intact. The right leg was normal. Complete blood count, comprehensive metabolic panel, and coagulation studies were within normal limits; D-dimer was elevated. A venous duplex ultrasound of the left lower extremity was ordered, which demonstrated an extensive, acute DVT in the left lower extremity. Given the magnitude of the clot, a CT scan of the abdomen and pelvis was performed. It demonstrated that the left common iliac vein was compressed by the right common iliac artery, suggesting a diagnosis of MTS. She was started on a heparin infusion. Interventional radiology was consulted and performed a venogram with mechanical thrombectomy and initiation

of catheter-directed thrombolysis. A follow-up venogram the next day demonstrated incomplete thrombolysis, so a repeat mechanical thrombectomy with stent placement was performed, this time with clot resolution. The patient was bridged to warfarin and discharged on this medication.

**Discussion:** MTS is compression of the left common iliac vein by an overlying right common iliac artery. It can be complicated by the development of DVT. Typically, MTS anatomy must be combined with other risk factors (like recent surgery) to cause symptomatic DVT. DVT in patients with MTS classically occurs in females in their 20s or 30s. Ultrasound is generally the initial imaging modality for patients with a suspected DVT. CT of the abdomen/pelvis in the venographic phase can demonstrate compression of the iliac vein. The gold standard for MTS diagnosis is venography. In patients with MTS and DVT, catheter-directed thrombolysis and/or mechanical thrombectomy can be performed to resolve the clot. Subsequently, angioplasty and endovascular stenting of the iliac vein at the point of compression can be performed. Postoperatively, anticoagulation is generally continued. In conclusion, MTS should be considered if there is persistent edema or chronic DVT of the left leg, especially in young women with no other DVT risk factors.

### Case of Takotsubo Cardiomyopathy Following Spinal Decompression Surgery

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**Introduction:** Takotsubo cardiomyopathy (TCM) is a stress-induced syndrome of transient systolic dysfunction of the apical or mid-left ventricle, often precipitated by a period of severe stress. Clinically it may resemble acute coronary syndrome (ACS), however, without evidence of coronary artery disease on angiography. We describe a patient who developed TCM in the postoperative period.

**Description:** A 65-year-old woman with hypertension, depression, and progressive back pain presented for elective spinal decompression surgery. Imaging visualized a spondylolisthesis at L5-S1 and multilevel lumbar spinal stenosis. She underwent posterior spinal decompression and fusion of L2-S1 complicated by hypovolemic shock due to intraoperative blood loss requiring a short course of vasopressor. The patient was discharged home in stable condition but readmitted 2 days later for palpitations. Troponin was elevated to 4100 ng/L. Electrocardiogram (ECG) showed nonspecific ST-T-wave changes. Transthoracic echocardiogram (TTE) showed akinesis of the apical and anterolateral left ventricle wall with an ejection fraction (EF) of 38%. Coronary angiogram showed no coronary artery disease, confirming TCM. She was started on metoprolol succinate and lisinopril and discharged

home with a LifeVest. One month later, she was readmitted following a suicide attempt. A repeat TTE showed improved EF to 63%. She was transferred to inpatient psychiatry in stable condition.

**Discussion:** Despite postoperative TCM incidence remaining low, it must be considered in patients presenting with symptoms of ACS in the postoperative period. Surgical procedures predispose to physical and emotional stress, which can cause one of the most likely explanations of pathogenesis — catecholamine-induced microvascular dysfunction and myocardial stunning or toxicity. This case presents a complicated picture of predisposing factors for TCM. The patient suffered a postoperative complication of hypovolemic shock, received a catecholamine agent for acute supportive care, and had a history of anxiety and depression, all of which can contribute to different stress mechanisms resulting in TCM. She met diagnostic criteria of transient left ventricular systolic dysfunction, typical absence of coronary artery disease, new ECG abnormalities, and a modest troponin elevation. Management is supportive and similar to that of heart failure with reduced EF. Although risk of severe in-hospital complications is similar to ACS, there is lower mortality with TCM and prognosis is favorable, with return of normal left ventricular function within approximately 4 weeks.

### Life-Threatening Anemia in Patients for Whom Blood Transfusion Is Not an Option

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**Introduction:** Refusal of human blood and blood products makes treatment for severe anemias challenging. Anemia is considered life-threatening when hemoglobin levels are below 5. Jehovah's Witnesses (JW) believe that it is against the will of God to receive blood transfusions, even if it is their own blood. Therefore, for JW patients requiring blood transfusions, alternative treatments should be utilized. Erythropoietin and iron infusions can restore endogenous hemoglobin. Although obvious, another strategy is to reduce phlebotomy frequency and utilization of pediatric-sized phlebotomy tubes.

**Description:** A 39-year-old female JW presented to the hospital referred by her father due to confusion and menorrhagia. On admission, the patient had a syncopal episode and was intubated for airway protection and transferred to intensive care unit (ICU). She was found to have clinical signs consistent with high-output cardiac heart failure. Initial laboratory evaluation was remarkable for a hemoglobin of 1.7, hematocrit of 7, white blood cell

count of 36.1, platelet count of 701, reticulocyte count of 10.8, aspartate aminotransferase (AST) of 1649, alanine transaminase (ALT) of 758, alkaline phosphatase (ALP) of 433, lactic acid of 19, pH of 7.08, PCO<sub>2</sub> of 20, HCO<sub>3</sub> of 6, and troponin of 91. Electrocardiogram was remarkable for sinus tachycardia, chest X-ray for cardiomegaly and left perihilar opacities, and vaginal ultrasound remarkable for a uterine mass of 6 cm. Gynecology exam revealed a punctuate lesion, and it was cauterized with silver nitrate. She was diagnosed with severe microcytic anemia secondary to profound iron deficiency due to neglected chronic blood loss anemia in regard to menometrorrhagia. This was complicated by hypovolemic shock with secondary organ injury. This anemia was compensated as the patient was clinically much more stable than one would expect with this degree of anemia. Patient received erythropoietin, vitamin K, tranexamic acid, and iron infusion. The patient was admitted to the ICU. The patient was placed on folate and iron; phlebotomies were deferred.

**Discussion:** Treatment for severe life-threatening anemia could be challenging in JW patients and other patients refusing blood and human products. However, there are alternative options besides human blood products, including iron infusions, folate, and decreasing phlebotomy frequency even if they are in the ICU.

### Bilateral Adrenal Hemorrhage With Subsequent Resolution of Adrenal Insufficiency

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**Introduction:** Bilateral adrenal hemorrhage (BAH) is a rare cause of adrenal crisis with an incidence of 0.1% to 1%. It is a life-threatening emergency with a 10%–20% mortality rate due to the challenge of correctly diagnosing and promptly treating it. Clinical manifestations vary based on the size of the bleed and can mimic severe illness and sepsis. This case describes a rare case of BAH secondary to anticoagulant usage, which precipitated adrenal crisis with resolution of adrenal insufficiency.

**Description:** A 71-year-old male with history of hypertension, hyperlipidemia, type 2 diabetes mellitus, and atrial fibrillation on rivaroxaban presented with generalized weakness, chest pain, and malaise. A week prior, he was evaluated for cholecystitis and a cholecystostomy tube was placed. Upon arrival, he was bradycardic and hypotensive. Labs were significant for hyperkalemia (6.0 mmol/L), hyponatremia (130 mmol/L), and a troponin elevation (12.2 ng/ml). He was started on heparin drip for NSTEMI and broad-spectrum antibiotics for presumed sepsis originating from previously known cholecystitis. Computed tomographic



(CT) scan (without contrast due to chronic kidney disease) showed bilat adrenal masses. The patient was transferred to intensive care unit for both cardiac and sepsis monitoring. Stress-dose hydrocortisone (50 mg every 6 hours) was started for presumed adrenal insufficiency given the patient's vital sign abnormalities and electrolyte derangements. CT scan images were reevaluated and were consistent with BAH, with greatest area of hemorrhage measuring 4 cm on right. The patient was taken off of anticoagulation and started on a fludrocortisone 0.05 mg daily. He had symptomatic improvement with both hydrocortisone and fludrocortisone treatment and was transitioned to a combined oral regimen prior to discharge. On outpatient follow-up he was weaned completely from steroids over 1 year, with follow-up 8 a.m. cortisol 11 mcg/dL.

**Discussion:** This case illustrates the importance of suspecting and treating adrenal crisis secondary to BAH due to high mortality risk. The patient did not have recurrent adrenal insufficiency at subsequent hospitalizations. Recognition based on electrolyte abnormalities and presenting symptoms can be central to diagnosing adrenal crisis. In addition to the rare presentation of adrenal hemorrhage, this patient also demonstrated resolution of intrinsic adrenal function. There are a few case reports in the literature about partial recovery following hemorrhage; however, complete recovery is very rare.

### **Fever Unmasking Brugada Type I Pattern in a Patient With Acute Pyelonephritis**

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**Introduction:** Brugada syndrome is an autosomal dominant disorder associated with an increased risk of ventricular tachyarrhythmias and sudden cardiac death. The prevalence of Brugada pattern is less than 1% and is more predominant in men. Fever is a well-known provoking factor for induction of Brugada and cardiac arrest. We present a case of Brugada pattern diagnosed during a febrile episode in a previously healthy woman.

**Description:** A 44-year-old female with diabetes mellitus and hypothyroidism presented to the hospital with 4 days of high fever, left flank pain, dysuria, and hematuria. On arrival she was tachycardic, normotensive, and febrile to 103°F. Electrocardiogram (ECG) performed prior to admission was remarkable for sinus tachycardia. Initial laboratory evaluation was notable for white blood cell count of 15.9, lactic acid of 2.6, magnesium of 1.5, and troponin of <0.02. Urinalysis and clinic exam were consistent with pyelonephritis, and she was subsequently admitted to the hospital for intravenous antibiotics. On day 1 of admission, the patient developed

pressure-like, mid-sternal chest pain and a fever of 102.7°F. New ECG during febrile episode showed the presence of ST-elevation in V1 and V2 leads without reciprocal changes was consistent with type I Brugada pattern. During her hospital course, telemetry demonstrated no arrhythmias, a transthoracic echocardiogram remarkable for an ejection fraction of 68%, and computed tomography (CT) negative for coronary calcifications. Electrophysiology study revealed no drug-inducible arrhythmias. Treatment was tailored toward aggressive antipyretic therapy, and the consideration of an implantable cardioverter defibrillator (ICD).

**Discussion:** Most cases of Brugada are diagnosed in adulthood. If not promptly identified, there is an increased risk of sudden cardiac death. Our patient demonstrated the classic type I pattern but without inducible tachyarrhythmias. Common triggers include fever and medications. Clinical assessment and electrophysiology studies play an essential role in diagnosis and further medical decision-making, but treatment should always be directed to precipitating factors as well as the evaluation for an ICD. Overall mortality for cardiac events in asymptomatic patients with Brugada pattern is less than 0.5%; however, screening of first-degree family members is imperative.

### **Puff of Smoke: A Case of Moyamoya-Associated Stroke in Down Syndrome**

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**Introduction:** Down syndrome (DS) is a highly prevalent chromosomal disorder caused by trisomy of chromosome 21. The condition is highly variable in severity of illness and impairment of development and function. A small subset of patients with DS are affected by Moyamoya syndrome (MMS), which is a rare cerebrovascular disease defined by progressive bilateral stenosis of the distal internal carotid arteries (ICAs) with subsequent development of prominent small collateral vessels described as a “puff of smoke.” The cerebrovascular consequences of MMS can be devastating if it is not promptly recognized.

**Description:** A 37-year-old Hispanic man with DS, hyperthyroidism, and a surgically corrected congenital cardiac defect presented with sudden-onset left facial droop, dysarthria, and left extremity weakness. Computed tomography (CT) of the head revealed chronic centrum semiovale infarcts. CT angiography of the head/neck showed tapered bilateral ICA occlusions and small collateral vessels at the basal ganglia. Brain magnetic resonance imaging showed right frontal white matter and caudate head acute infarcts, old right frontal lobe microhemorrhage, and poorly visualized proximal bilateral M1 middle cerebral artery (MCA) segment flow voids. Angiogram revealed MMS-compatible findings of bilateral steno-occlusive disease of

the supraclinoid ICA with formation of a basal collateral network of small vessels. The patient was discharged in stable condition on a 3-month course of aspirin and clopidogrel with outpatient evaluation for flow-augmentation bypass.

**Discussion:** MMS is a distinct progressive cerebrovascular condition, with diagnostic criteria on cerebral angiography of bilateral stenosis/occlusion of the terminal portion of the ICA and the proximal anterior cerebral artery (ACA)/MCA with a conglomerate of fragile, small blood vessels near the stenotic areas. There is an increased incidence of MMS among patients with DS compared to the general population. The pathophysiology is hypothesized to be due to a derangement in type IV collagen expression on chromosome 21. Ischemic injury in MMS is caused by hypoperfusion from inadequate collateral circulation following stenosis of larger arteries. Patients with DS and MMS tend to present with cerebrovascular events at a younger age. Surgical revascularization with flow-augmenting bypass remains the primary treatment. Given the difference in treatment and potential outcomes for MMS-associated ischemic cerebrovascular accident, it is important to consider the possibility of MMS in patients with DS who present with clinical symptoms of stroke.

### **Intracranial Hemorrhage in a Child With New-Onset Acute Myeloid Leukemia**

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**Introduction:** Hematologic malignancies have the highest rate of intracranial hemorrhage (ICH) among all cancers; however, there are limited data on the incidence of ICH in childhood acute myeloid leukemia (AML).

**Description:** A previously healthy 7-year-old female presented to the emergency department for evaluation of 3 days of fevers, 2 days of fatigue, and 1 day of headache, abdominal pain, and 3 episodes of nonbloody, nonbilious emesis. On arrival, the patient was noted to be sleepy but arousable. Initial lab work was notable for significant leukocytosis, anemia, and thrombocytopenia. While in the emergency department, patient clinically decompensated with bradycardia, widened pulse pressure, and worsening mental status with pupillary changes. Due to concern for increased intracranial pressure (ICP), pediatric intensive care unit (PICU) and neurosurgery were urgently consulted, and hypertonic saline, intubation, computed tomography (CT), and further management in the PICU was recommended. Head CT showed extensive ICHs in the bilateral frontal lobes, with extensive local mass effect requiring emergent neurosurgical intervention. Patient remained in critical condition status post right hemicraniectomy, requiring multiple blood products. Initial peripheral blood smear and

flow cytometry was concerning for acute promyelocytic leukemia (APML). While additional testing was pending, APML chemotherapy was empirically started. Ultimately, fluorescence in situ hybridization (FISH) and reverse transcription polymerase chain reaction (RT-PCR) testing was negative for APML and further oncologic testing was consistent with AML. Thus, AML chemotherapy was started per AAML1031 protocol. The patient's hospital course was complicated by febrile neutropenia, presumed fungal infections, typhlitis, and subdural hygroma. She remained in PICU for 3 months for chemotherapy, speech/physical therapy, and management of complications related to chemotherapy but was eventually able to be discharged home in stable condition with mild left-sided weakness.

**Discussion:** This case highlights the importance of early recognition and treatment of ICH in a pediatric patient. Notably, hemorrhage risk in APML has been documented due to the significant coagulopathy on presentation and remains the largest cause of mortality among those with APML. There are less data about the incidence of ICH in the setting of new-onset AML in pediatric patients. Given the severity of initial presentation, this patient's overall outcome was favorable, highlighting the importance of early recognition and treatment in ICH on improved patient outcome.

### **Sclerosing Angiomatoid Nodular Transformation Appearing as Metastatic Disease in a Patient With Multiple Endocrine Neoplasia Type I**

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**Introduction:** Sclerosing angiomatoid nodular transformation (SANT) is a rare benign pathology of the spleen often mistaken for cancer, leading to splenectomy. Most SANT lesions are asymptomatic and found incidentally but may cause abdominal complaints such as pain and difficulty eating. It is not possible to differentiate SANT clinically from other disease processes via biopsy due to intentional avoidance of splenic biopsy, which has high risk of postinterventional bleeding and risk of intraperitoneal seeding if the lesion is malignant. SANT is thought to be benign since splenectomy has been curative in every case, but the natural course of SANT remains unknown. We present the first case of SANT associated with multiple endocrine neoplasia type 1 (MEN-1) causing splenectomy due to concern for neuroendocrine tumor metastasis.

**Description:** A 45-year-old female with a history of MEN-1 syndrome had a spleen-sparing total pancreatectomy at the age of 21 due to multiple neuroendocrine lesions. Since her surgery she has complained of multiple abdominal issues, including early satiety, bloating, and pain. A computed tomographic scan of her abdomen and pelvis identified

splenic lesions that were concerning for metastatic disease. Patient had a dotatate positron emission tomographic scan and magnetic resonance imaging of the abdomen, but neither ruled out malignancy. Patient underwent a robotic splenectomy, liver wedge biopsy, and peritoneal biopsies for what appeared to be metastatic disease. Final pathology was consistent with SANT without evidence of metastatic disease. The patient had resolution of her abdominal symptoms, and there was no evidence of postoperative complication.

**Discussion:** This is the first case of SANT associated with MEN-1 syndrome in the literature. In patients with tumor syndromes, aggressive management of abnormal findings on surveillance imaging is important to minimize risk of cancer progression. However, this needs to be weighed with the risk of overtreatment of these patients. Since there was no way to safely rule out cancer as the cause of the enlarging masses in the spleen, this patient underwent a splenectomy and has done well postoperatively, but splenectomy is not without lifetime risks. Further research should focus on improved diagnostics in evaluation of splenic lesions, improved management of this rare disease, and improved patient care.

### **ACTH-Producing Pituitary Adenoma Found After Transsphenoidal Resection of Meningioma**

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**Introduction:** ACTH-dependent Cushing's disease is a condition characterized by pituitary hypersecretion of ACTH, leading to adrenal cortisol upregulation. Hypercortisolism has long-term complications of metabolic syndrome, cardiovascular disease, and osteoporosis, to name a few. The incidence of Cushing's is approximately 1–2 cases per million. ACTH can be secreted by pituitary macroadenomas, microadenomas, and ectopic sources. This case report describes a case of ACTH-dependent Cushing's caused by a pituitary microadenoma with a history of planum sphenoidal meningioma.

**Description:** A 48-year-old female with a past medical history of planum sphenoidal meningioma status post transsphenoidal partial resection, central hypothyroidism on levothyroxine, and hypogonadotropic hypogonadism presented with worsening truncal obesity and prediabetes. Physical exam was positive for obesity and skin hyperpigmentation. Labs were significant for elevated a.m. cortisol of 27.2 mcg/dL with elevated ACTH level of 81.8 pg/L. Saliva cortisol at 11 p.m. also was elevated (0.154 ug/dL). The cortisol level was not suppressed with the low-dose dexamethasone suppression test, while high-dose dexamethasone suppressed cortisol to 2.0 mcg/dL, indicating

a possible pituitary source. Prolactin, TSH, and HGH levels were normal. Magnetic resonance imaging (MRI) of the pituitary was significant for bilateral synchronous pituitary microadenomas (9×5 mm right and 4×4 mm left). A dotatate positron emission tomographic scan confirmed the pituitary MRI findings. To confirm the pituitary source of ACTH prior to surgery, the patient underwent inferior petrosal sinus sampling. This revealed an elevated ACTH secretion from the right microadenoma. Transsphenoidal resection of the pituitary tumor was performed. Postprocedure, a.m. cortisol levels were undetectable and ACTH level was low (5.8 pg/mL). She was then started on hydrocortisone for presumed adrenal insufficiency post-pituitary lesion resection. No signs of diabetes insipidus were shown after surgery — the patient will follow up with endocrinology for eventual weaning off hydrocortisone.

**Discussion:** Simultaneous pituitary adenoma and meningioma without a history of radiotherapy is extremely rare, with only 49 cases described before 2019. Even more rare is an ACTH-secreting pituitary adenoma coexisting with a meningioma. In approximately 1 out of 3 patients, remission is not achieved with surgical excision alone. For this reason, patients need postoperative monitoring and secondary medications to control their symptoms.

### **Novel Mutation in Two Siblings With X-Linked Agammaglobulinemia of Heterogenous Leaky Phenotype**

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**Introduction:** X-linked agammaglobulinemia (XLA) is a primary humoral immunodeficiency caused by pathogenic variants of the gene, which leads to defective or absent expression of Bruton tyrosine kinase (BTK), a signal-transduction molecule involved in B-cell maturation. This results in low to absent mature B-lymphocytes and, consequently, significantly decreased immunoglobulins of all classes. As a result, patients with XLA experience serious illnesses caused by encapsulated organisms. Diagnosis of XLA is based on clinical history, family history, laboratory tests, recurrent infection with low immunoglobulin level, history of XLA in maternal male relatives, and confirmed *BTK* gene mutation. The aim of this case report and literature review is to inform the readers of a novel XLA mutation and to prevent misdiagnosis or delay of proper treatment in the case of leaky phenotype or in the absence of previously identified mutation.

**Description:** We report a case of a 3-year-old male who presented with a 2-day history of fever, emesis, diarrhea, altered mental status, and inability to sit or stand. The patient

was found to have *Haemophilus influenzae* meningitis and bacteremia, complicated by septic arthritis of the left hip joint and bocavirus infection. Further investigation revealed family history concerning for immunodeficiency. Initial genetic test identified the patient's *BTK* gene mutation as a variant of uncertain significance. Repeat analysis after case discussion reported a new pathogenic variant of *BTK* gene, c.1361A>C (p.His454Pro). Ultimately, our patient and his 5-year-old brother were diagnosed with a novel mutation presenting as a heterogenous leaky phenotype of XLA.

**Discussion:** Our proband and his brother demonstrate phenotypic variations of a novel mutation. The delayed presentation of severe illness (compared to traditional XLA),

with low but present immunoglobulin M levels, suggests a leaky phenotype. Additionally, the older sibling with the same mutation but a milder phenotype speaks to the heterogeneity of this mutation. Diagnostic delay can lead to life-threatening infections, as seen in our patient, as well as long-term complications. Timely diagnosis, initiation of intravenous immunoglobulin therapy, and antibiotic prophylaxis can prevent such adverse events and their sequelae. Therefore, one should suspect XLA even if the disease manifestation deviates from well-established findings.

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