PUBERTY AS A WINDOW OF SUSCEPTIBILITY FOR BREAST CANCER RISK: EXPLORING THE PHYSIOLOGIC MECHANISMS

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**Purpose:** Earlier onset of menarche is consistently noted as a risk marker for breast cancer. For example, risk of pre-menopausal breast cancer decreased by 9% for each year that menarche is delayed. Other pubertal milestones have also been associated with risk of breast cancer, including peak height velocity (PHV) and age of PHV. The hormonal environment, including sex steroids and growth hormone, change rapidly during puberty, and others have proposed the estrone:androstenedione ratio (E:A ratio) may provide an index of aromatase activity. This study examined the relationships between pubertal milestones associated with breast cancer risk with the peripubertal hormonal milieu, to understand physiologic mechanisms and potential points of intervention.

**Methods:** Longitudinal study of pubertal maturation in girls, recruited at ages six and seven, and followed every 6-12 months from 2004 to present. Measures included ages of thelarche and menarche, PHV and age of PHV, age final height is attained, and peripubertal concentrations of insulin-like growth factor-1 (IGF-1) and E:A ratio (drawn at thelarche). Breast maturation was assessed through direct inspection by trained professionals. Hormones were measured using HPLC-tandem mass spectroscopy, (tenfold increased sensitivity of detection). Growth parameters were determined by Preece-Baines model 1. Relative timing of pubertal milestones (early, on-time, late) was race-specific. The study was IRB approved.

**Results:** There were 191 participants included in the analyses. Pubertal tempo (thelarche to menarche) was longest in girls with earlier thelarche (p<.001). PHV was greatest in girls with earlier thelarche (p<.005); and menarche (p<.0001). Higher IGF-1 concentrations were related to earlier age of PHV (p=.005), earlier menarche (p<.001), and marginally with greater PHV (p=.06); IGF-1 tracked significantly across the peri-pubertal period (intraclass correlation =.67, p<.001). Greater E:A ratio was associated significantly to earlier age of menarche (p<.001). BMIz and E:A ratio remained in the model in a regression with age of menarche as the outcome.

**Conclusions:** Factors driving the association of earlier menarche and pubertal growth with breast cancer risk may be explained through a unifying concept relating higher IGF-1 concentrations, greater life-long estrogen exposure, and longer pubertal growth period, with an expanded pubertal window of susceptibility.

**Sources of Support:** U01ES019453 (NCI and NIEHS); UL1RR026314 (USPHS); T71MC00009 (MCHB); P30ES006096 (NIEHS); R01ES029133 (NIEHS)
8.

EFFICACY OF A STUDENT-NURSE BRIEF PARENT-BASED SEXUAL HEALTH INTERVENTION TO INCREASE HPV VACCINATION AMONG ADOLESCENTS

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Purpose: Rates of HPV vaccination in Texas remain over 10 percentage points below the national average with less than ⅓ of 13-17 year olds initiating the vaccine and only one in three being up-to-date. Parents play a pivotal role in adolescent sexual health and HPV vaccination. Additionally, nurses are on the frontlines of healthcare, in a unique position of being highly trained to care for complex health conditions in individuals and being uniquely qualified to bridge the gap between health promotion science, practice, and adoption in communities. Therefore, we enhanced the Families Talking Together parent-based sexual health curriculum to include adolescent vaccinations herein, FTT+HPV, and trained student nurses to provide a strong HPV vaccination endorsement.

Methods: Using a randomized attention controlled trial design, we examined the efficacy of FTT+HPV among parents and their 11-14 year old youth from medically underserved communities between 2015 and 2018. Parents and youth were recruited from 22 after-school programs (e.g. Boys and Girls Clubs) and 19 charter schools in underserved communities. For parents, we examined the protective factors including parent-child sexual health communication and parental involvement. For youth, we examined sexual health knowledge, parent-child sexual health communication, and parent-child connectedness. Finally, to assess HPV vaccination initiation and completion rates, we pulled vaccination records from the IMMTRAC registry for 85% of youth and used parental report for youth without registry records. Group differences were calculated using the estimated mean difference at 1 and 6 months post intervention with significance set at the p< 0.05 level.

Results: Parents (n=519) were majority female (90.3%), African American (38.4%) and Hispanic (57.0%) with majority having Medicaid (42.1%) or private insurance (32.6%). The intervention group experienced a greater increase in frequency of communication and parental involvement at 1 month (p = 0.002) that was maintained through 6 months (p = 0.001). For parental involvement, the intervention group had a greater increase in scores at both time points (1 mo: p = .03; 6 mo: p= 0.02). For youth, baseline rates of HPV vaccination were low at 55.7%. No significant difference between the groups was seen in vaccination initiation or completion rates by 1 month post-intervention. However, by 6 months post intervention, there was a significant difference between the groups with 70.3% of the intervention group initiating the HPV vaccination series vs. 60.6% for the control group (p = 0.02). No difference between the groups was found for HPV series completion at 6 months. Significant differences were also found in condom knowledge (p = 0.04), parent-child connectedness (p = 0.04), and communication frequency (p = 0.001) with greater improvement in the intervention vs. the control group. Rates of sexual activity remained low in both groups throughout the 6-month follow up.

Conclusions: A brief parent-based adolescent sexual health and vaccination intervention delivered by student nurses can improve sexual health outcomes including protective parental factors, adolescent sexual health knowledge, and HPV vaccination initiation rates.

Sources of Support: This study was supported by a grant funded through the National Institutes of Health NICHD (R15HD081364).
9.

SHORT-TERM OUTCOMES OF A MULTI-CENTER RANDOMIZED CONTROLLED TRIAL OF REFEEDING IN ANOREXIA NERVOSA: THE STUDY OF REFEEDING TO OPTIMIZE INPATIENT GAINS (STRONG)

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**Purpose:** Lower calorie refeeding (LCR) has been the standard of care for refeeding inpatients with anorexia nervosa (AN). Aimed at patient safety, LCR is associated with slow weight gain and prolonged hospital stay. Limited data suggest that higher calorie refeeding (HCR) improves hospitalization outcomes without increasing the risk of refeeding syndrome. The short-term goal of this Randomized Clinical Trial (RCT) was to compare the efficacy, safety and cost of LCR vs. HCR.

**Methods:** Participants were enrolled within 24 hours of admission to the inpatient eating disorders programs at two large tertiary care hospitals. Inclusion criteria were ages 12-24 with diagnosis of AN or atypical AN, and medical instability (2015 SAHM criteria); those < 60% median BMI (mBMI) were excluded. Participants were randomly assigned to LCR (1400 kcal/d, increasing by 200 kcal every other day), or HCR (2000 kcal/d, increasing by 200 kcal/d). All calories were provided by meals, with oral liquid formula only to replace refused food. Data were collected prospectively by trained study personnel, daily measures included calories, weight (morning), vital signs and serum electrolytes; hypophosphatemia (<3.0 mg/dL), hypomagnesemia (<1.8 mg/dL) and hypokalemia (< 3.5 mmol/L) during refeeding were corrected orally. Generalized linear mixed effect models examined group differences in heart rate (HR) and %mBMI over time. Wilcoxon rank sum or independent t-tests compared groups; Wilcoxon signed rank or paired t-tests compared days (within groups). Cost was determined using 2018 National Healthcare Cost and Utilization Project.

**Results:** Of N=120 enrolled, N=111 were included in modified intention-to-treat analyses. Participants were mean (SD) 16.4±2.5 yrs; 57% were diagnosed with AN, 43% with AAN, and 91% were girls. Admission %mBMI was not different between HCR and LCR (83.3±11.1 vs. 86.6±12.2%, p=.100). There were significant differences over the course of hospitalization in %mBMI [P<0.0001] and HR [P<0.001]. %mBMI increased in HCR by Day 2 (.377±.711 %, p<0.001) and decreased in LCR (-.310±.77 %, p=0.004). Overall gain was greater in HCR (5.43±2.97 vs. 3.16±.5.71%, p=0.003) during a significantly shorter LOS [9.37±5.25 vs. 12.07±4.64, P<0.001]. Among those with bradycardia (N=95), HR was restored to ≥ 45 bpm earlier in HCR (6.3±4.0 vs. 8.5±3.9 days, p=0.011). During refeeding, there were no differences in proportion with hypophosphatemia (6.7 vs. 5.9%, p=1.00), hypomagnesemia (11.7 vs. 24.5%, p=0.051), and hypokalemia (5.0 vs. 9.8%, p=0.466) between HCR and LCR. However, nadirs occurred earlier in HCR for phosphorus (4.6±1.9 vs. 5.8±2.5 days, p=0.004) and magnesium (5.1±2.5 vs 6.2±2.7 days, p=0.028), but not potassium (4.0±2.7 vs. 4.8±3.1 days, p=0.157). Savings associated with shorter LOS in HCR was $4,319/participant stay in cost (p=0.002) and $ 14,796/participant stay in charges (p=0.002).

**Conclusions:** In the first RCT in the U.S., and the largest internationally, to directly compare refeeding approaches in AN: HCR was more efficacious and equally safe with significant cost savings as compared to LCR. These data support updated evidenced-based refeeding recommendations for hospitalized
adolescents who are not extremely low weight (<60% mBMI). Follow-up is ongoing to compare long-term outcomes including clinical remission, rehospitalization and cost-effectiveness.

**Sources of Support:** National Institute Child Health & Human Development #R01HD082166; ClinicalTrials.gov Identifier NCT02488109

10.

**MIND-BODY SKILLS GROUPS: A POSSIBLE APPROACH FOR ADDRESSING ADOLESCENT DEPRESSION IN PRIMARY CARE**

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**Purpose:** About 3.2 million adolescents (13.3% of the population) experienced a major depressive disorder in 2017, and only 44% received treatment by a healthcare professional. Given increased emphasis on integration of mental and physical health care, innovative behavioral interventions that target depression - and attract youth - are warranted in primary care settings. The Center for Mind-Body Medicine (CMBM) has developed a program that incorporates various methodologies (e.g., guided imagery, meditation, biofeedback) to increase individuals’ self-awareness and self-regulation. This program has shown promise in treating PTSD in adolescents, but little research has investigated its effects on adolescent depression or its feasibility within primary care settings. The objective of this pilot study was to determine feasibility and preliminary effectiveness for Mind-Body Skills Groups (MBSGs) for treating adolescent depression in primary care.

**Methods:** Adolescents were recruited by behavioral health clinicians from 3 primary care clinics in Marion County, Indiana. Eligible adolescents were screened for depression and completed baseline self-report measures. After participating in a 10-week MBSG program, post-evaluation measures were completed. Measures included the Patient Health Questionnaire (PHQ-9) for depression, the Suicidal Ideation Questionnaire – high school (grades 10-12) and junior high (grades 7-9) versions (SIQ-HS, SIQ-JR), and the Self-Efficacy Questionnaire for Depression in Adolescents (SEQ-DA). Individual, qualitative interviews were also collected. Linear mixed models that account for clustering of the MBSG participants and repeated measures over time were used to analyze the PHQ-9 and SEQ-DA outcomes. A marginal model with an unstructured covariance matrix of the residuals was used to analyze the SIQ data. Fixed factors in all the models included time, age, sex, ethnicity, and attendance. Pairwise comparisons at each timepoint were performed using a Sidak correction. Content analysis techniques were used to interpret qualitative interviews.

**Results:** Participants included 47 adolescents. Most were female (77%), Hispanic or Latino (72%), 14 years old (Mean (SD) 14.7 (1.3)), and in junior high (57%). After participation in the MBSGs, there was a significant improvement in depression (mean difference (MD) -7.4, 95% CI [-9.5,-5.4], p < .001), and self-efficacy (MD 7.5, 95% CI [5.0, 10.1], p < .001). Suicidal ideation significantly decreased for both junior high (MD -11.9, 95% CI [-18.8, -5.1], p < .001) and high school students (MD -27.2, 95% CI [-38.6, -15.9], p < .001). There was a significant sex x time interaction (p = .029) for suicidal ideation in high school boys, meaning high school boys’ suicidal ideation showed greater improvement than in high school girls.
Nearly all the adolescents reported the MBSGs were helpful. Adolescents described feeling more connected to others and feeling better equipped to understand and regulate their emotions.

**Conclusions:** Innovative approaches are needed to address growing concerns about adolescent depression. MBSGs appear to be a feasible and effective treatment option in primary care settings. Nonetheless, additional studies, such as randomized control trials, are needed to properly ensure treatment effectiveness.

**Sources of Support:** Eskenazi Health Midtown Community Mental Health and the Simon Foundation (070241-00002B).

11.

**ADOLESCENT SEXUAL WELLNESS: EMBRACING SOME RISK WHILE PROMOTING HEALTHY SEXUAL BEHAVIOR THROUGH CHAT**
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**Purpose:** Established with the goal of reducing STI and teen birth rates among youth across the city, the Chicago Healthy Adolescents and Teens (CHAT) program uses an innovative approach by bringing sex-positive education and testing services to students in Chicago Public Schools. This intervention begins with a non-judgmental “just the facts” presentation on reducing risk of STIs and unintended pregnancy while promoting students’ autonomy in making their own sexual health decisions. To normalize testing and address needs of students at risk for STIs, the presentation is followed by an optional, confidential STI test at school and one-on-one session with a health counselor. CHAT acknowledges the risk adolescents may take when engaging in sexual activity while also equipping them with tools they need for sexual wellness. The evaluation of this program aims to establish CHAT as an evidence-based program by determining the effect of the intervention on adolescent sexual health outcomes including STI testing, pregnancy, condom use, contraceptive use, and health care utilization.

**Methods:** Using a quasi-experimental design and two waves of recruitment, the evaluation included 15 schools that received the CHAT program and 15 comparison schools matched based on size, racial/ethnic makeup, economic status, and type (charter vs. district-run). Cohort 1 included 8 intervention (n=567 students) and 8 comparison schools (n=767). Cohort 2 included 7 intervention (n=409) and 7 comparison schools (n=369). Mixed-methods data collection consisted of a 65-question survey completed at baseline, 6-months, and 15-months post-intervention followed by focus groups and in-depth interviews.

**Results:** Preliminary results from the 15-month cohort 1 surveys (n=1334) demonstrate that the intervention and comparison groups were equivalent on key demographic variables: grade, gender, and race/ethnicity. Key findings from cohort 1 show that 75.7% (n=429) of CHAT participants knew that under Illinois law, they could see a doctor/nurse about birth control, STIs, or pregnancy at 12 years of age or older compared to 51.8% (n=397) of comparison students (p<.0001). Of those reporting ever having vaginal sex, 15.9% (n=90) of CHAT participants compared to 11.2% (n=86) of comparison students reported having been tested for an STI (p=0.013). Additionally, all CHAT students who tested
positively for an STI received treatment compared to only 50% of comparison students (p=0.016). Importantly, rates of positive tests did not differ between the two groups (p=.113). Finally, only 2.6% of CHAT participants compared to 10.6% of comparison students reported having been or gotten someone pregnant in the last year (p=.005).

**Conclusions:** While these findings are preliminary and have limitations (e.g., cohort 1 only, small sample sizes), they suggest that the CHAT program is associated with positive sexual health outcomes. This presentation will introduce CHAT’s innovative, wellness-centered approach as well as key findings from current analysis of the 15-month survey and explanatory qualitative data from both cohort 1 and 2. This presentation will aim to demonstrate through rigorous evaluation findings that empowering adolescents with essential knowledge and rightful sexual health care can improve healthy decision making and health outcomes in this population.

**Sources of Support:** US Department of Health and Human Services, Office of Population Affairs Award No. 5 TP2AH000033-05-0

12.

**DIGITALLY TARGETED MESSAGING BOOSTS ADOLESCENT VACCINE ADMINISTRATIONS AT THE POINT OF CARE**

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**Purpose:** Rates of adolescent vaccination in the U.S. lag behind national goals, particularly for human papillomavirus (HPV), the 2nd dose of Meningococcal ACWY (MenACWY), and Meningococcal B (MenB) vaccines. The purpose of this study was to evaluate the effects of targeted adolescent vaccination infographics and videos widely disseminated to clinical practices throughout the U.S.

**Methods:** The UNITY Consortium, a group organized to promote adolescent health through vaccination, designed the infographics and videos, which emphasized the importance of adolescent vaccination. In collaboration with Outcome Health, which operates technology platforms in thousands of medical offices across the U.S., the media were shown in the waiting rooms (via TV) and exam rooms (via Wallboards & Tablets) of over 40,000 adolescent health care providers (HCPs) from May through December 2018. 11,489 of these HCPs (exposed condition) were matched to an equal number of non-exposed comparison HCPs on medical specialty, geographic location, adolescent patients seen, and payer mix. The outcomes of interest were the number of vaccine doses (Tetanus-diphtheria-pertussis booster or Tdap, HPV, MenACWY, and MenB) administered to patients 11-18 years of age. Analysis of covariance (ANCOVA) was used to evaluate statistical significance, comparing the exposed group to the non-exposed group during the exposure period, while adjusting for any pre-exposure differences between the groups.

**Results:** The exposed and non-exposed groups had very similar rates of vaccination in the pre-exposure period (May 2017 through April 2018). Across all vaccines, the media campaign resulted in an increased administration volume of 3.7% (P<.02) in the exposed group over the comparison group, representing an increase of nearly 8,500 doses of vaccine. The intervention had a particularly strong effect on MenB
(14.4% increase; P<.001), Tdap (8.8% increase; P<.001), and MenACWY (5.7% increase; P<.001). HPV vaccination also increased significantly, though less than the others (3.7% increase; P<.05).

**Conclusions:** Outcome Health’s delivery of infographics and videos designed by UNITY represents a unique partnership to improve adolescent health. The media campaign, which was implemented with minimal cost, resulted in significant increases in vaccine administration, suggesting that this approach represents a valuable strategy in national efforts to improve immunization coverage of adolescents.

**Sources of Support:** Outcome Health, in kind support for educational campaign; Unity members, including vaccine manufacturers, for Unity educational materials development.