[1.25–1.37], 47.2% vs. 62.0% covered time) over 5 years. Fecal testing was responsible for almost all additional covered time. Compared to intervention participants, UC individuals were more likely never to have completed any CRC testing over 5 years (17.4% vs. 10.3%, net difference 7.2%, P < 0.001). Conclusions: An organized mail and phone program led to increased CRC screening adherence over 5 years, mainly because of regular fecal testing uptake.

Health System-Based HPV Vaccine Reminders: Randomized Trial Results

Henrikson N, Zhu W, Nguyen M, Baba L, Berthoud H, Hofstetter, A

Purpose: Evaluate the impact of health system-based outreach and reminders on human papillomavirus (HPV) vaccine series initiation and completion. Methods: We conducted a 12-month randomized trial at an integrated care system in the Pacific Northwest in 2015–2016. Parents of 10–12 year olds who had not received any doses of HPV vaccine were randomized to an intervention group (mailed letter and brochure followed by an interactive voice recognition (IVR) reminder call encouraging HPV vaccine initiation) or usual care control group. Parents could opt in to receive future messages via SMS text message on all calls. Parents of intervention group children who initiated vaccination were re-randomized to receive either no further reminders or reminders for doses 2/3. We interviewed a subset of 50 parents to assess acceptability of the program. Outcomes were HPV vaccine initiation (within 12 months or 120 days of the initial letter), on-time series completion (within 210 days of initiation), and time to vaccination, assessed with Kaplan-Meier survival analyses. Results: 1624 children were eligible for randomization (46% age 10, 32.9% age 11, 20.4% age 12). The sample was 48.3% female and 64.6% white. Rates of overall HPV vaccine initiation were similar between the intervention and control groups (49.0% and 45.8%, P = 0.26), but initiation within 120 days of outreach was higher in the intervention group (23.6% and 18.8%, P = 0.04). This effect continued through to completion within 12 months (10.3% vs. 6.8%, P = 0.04). Opt-in rates to SMS were low: 24 people completed the opt-in process. Rates of on-time series completion were similar in those who received dose 1 reminders only compared to those who received reminders for all vaccine doses (12.1% and 19.7%, P = 0.10); time-to-completion results were similar. Parent interviews suggested reminders were acceptable and useful. Conclusion: Reminder calls after an outreach letter led to more timely vaccine initiation and overall completion. Reminders beyond the initial letter and reminder call did not appear to impact vaccine series completion. The program was acceptable to parents, though there was low uptake of SMS reminders.

Decreasing Trends in Cervical Cancer Incidence among Young Women (15–34 Years) in the United States during the Human Papillomavirus (HPV) Vaccine Era

Guo F, Cofie LE, Berenson AB

Human papillomavirus (HPV) vaccine has been recommended for girls 11–12 years of age since 2006, with catch-up vaccination up to 26 years, to protect against most common types of HPV that cause cervical cancer. Cervical cancer incidence stabilized in women <50 years during 2008–2012. Comparing trends and incidence of cervical cancer before and during the vaccine era among vaccine-eligible young women (15–34 years) may
provide valuable insight about potential vaccine impact. Methods: We examined trends in the incidence of invasive cervical cancer by race and histology among young women (15–24 years and 25–34 years) during the prevaccine era (2000–2006) and the vaccine era (2007–2013). Data were from the Surveillance, Epidemiology, and End Results (SEER) Program, including 18 SEER registry areas (Hurricane Katrina impacted Louisiana population excluded). Incidence rates (per 1,000,000) were age-adjusted to the 2010 US standard population by the direct method, using SEER*Stat software. Confidence intervals were calculated using the Tiwari method. Jointpoint regression modeling was used to compare the difference in the trends between the prevaccine era and the vaccine era. Results: Cervical cancer incidence among young women 15–24 years of age was stable during 2000–2006 from 9.5 in 2000 to 9.1 in 2006, but decreased from 6.9 in 2007 to 5.3 in 2013 (annual percentage decrease [APD] 5.7, 95% confidence interval [CI] 1.1–10.2, significantly different from the APD during 2000–2006). Cervical cancer incidence among young females 25–34 years of age also decreased from 99.7 in 2000 to 78.2 in 2006 (APD 4.0, 95% CI 2.3–5.6), and from 78.6 in 2007 to 68.2 in 2013 (APD 2.5, 95% CI 0.5–4.5). A significance decrease in the incidence was only observed in Whites, but not in Blacks, Hispanics, or Asians/Pacific Islanders. A significance decrease was observed in the incidence of non-squamous cell carcinoma (SCC) rather than SCC among young females 15–24 years from 3 in 2007 to 1.5 in 2013 (APD 9.1, 95% CI 3.1–14.7). Conclusion: A significance decrease in the incidence of cervical cancer during the vaccine era among young females 15–24 years may indicate early effects of HPV vaccination. Further research is needed to confirm this trend.

Using Global Metabolomics to Identify Novel Biomarkers of Treatment-Associated Cognitive Impairment in Pediatric Acute Lymphoblastic Leukemia


Central nervous system-directed chemotherapy is a critical component of pediatric acute lymphoblastic leukemia (ALL) treatment, but is associated with long-term cognitive impairment. Because few strategies exist to identify children who are at risk for this adverse outcome, we employed global metabolomics to identify biomarkers of cognitive impairment using routinely collected, biologically relevant cerebrospinal fluid (CSF) samples from patients undergoing ALL chemotherapy. Methods: CSF samples were collected at 4 months post-induction on pediatric ALL patients enrolled in a multicenter prospective study of symptom toxicity. Metabolomics of CSF detected 314 metabolites by gas chromatography-mass spectrometry (MS) and liquid chromatography-MS/MS. Cognitive performance at 12 months post-induction was assessed with the validated Parent-Perceived Child Cognitive Function scale and categorized using published cut-points: mild (≥50), moderate (41–49), and severe (≤40). Ordinal logistic regression evaluated associations between normalized median-scaled metabolite values and cognitive function, adjusting for patient and treatment factors. A false discovery rate-corrected p-value (q) was calculated to account for multiple comparisons. Results: Among the 96 patients (diagnosed 2012–14), 43% exhibited moderate (n = 25) or severe (n = 16) cognitive impairment. Significant alterations were observed in several biomarkers, including methionine sulfoxide (Log2 Fold Change [FC] = 0.83, P = 5.2e−7, q = 0.001) and citramalate (FC = −0.29, P = 4.6e−5, q = 0.008). A pathway analysis of the top biomarkers (q < 0.3) revealed an enrichment of metabolites involved in methionine (P = 0.0015) and carnitine (P = 0.0052) metabolism. Finally, compared to clinical factors alone, CSF biomarkers significantly improved the ability to predict cognitively impaired patients (area under curve [AUC] = 0.68 vs. AUC = 0.91, P < 0.001). Conclusion: We identified several novel CSF biomarkers of treatment-related cognitive impairment among pediatric ALL patients. These findings may translate to clinical improvements in the management of cognitive impairment by introducing the opportunity to deliver targeted interventions to high-risk patients prior to detectable or irreversible cognitive impairment.

Birth Rates after Adolescent and Young Adult Cancer in North Carolina, 2000–2014

Nichols HB, Anderson C, Black KZ, Engel S, Mersereau J

Each year, >45,000 U.S. women are diagnosed with cancer during adolescence and young adulthood (AYA), defined by the National Cancer Institute as ages 15–39 years. ASCO first published guidelines on fertility counseling and preservation for cancer patients in 2006. Few studies have assessed birth rates after cancer among AYAs. We identified women with an incident cancer diagnosis at ages 15–39 during 2000–2013 in the North Carolina Cancer Registry. Cancer records were linked with statewide birth certificates through 2014 using a probabilistic algorithm. Hazard ratios (HR) and 95% confidence intervals (CI) for childbirth were calculated using Cox proportional hazards regression, with person-time accrued from cancer diagnosis until death, 46th birthday or December 31, 2014 and adjusted for age at diagnosis. Among 19,507 AYA cancer survivors, 2,343 had ≥1 post-diagnosis birth during 110,216 person-years. The 5- and 10-year cumulative incidence of post-diagnosis birth was 12% and 18%, respectively. The most common cancers were breast (25%), thyroid (14%), gynecologic (10%), melanoma (10%), and lymphoma (7%). The percent with a birth after diagnosis was lowest for breast and gynecologic cancer (6% for both) and highest for Hodgkin lymphoma (23%) and melanoma (24%). Survivors with a birth after diagnosis were more often younger, had not received radiation or chemotherapy, and had lower stage disease. African American women were less likely to have a post-diagnosis birth than white women overall (HR = 0.82; 0.73, 0.92), due in part to a higher proportion of breast cancers (35% vs. 23%). About 30% of births were <2 years from cancer diagnosis and 20% were >5 years after (mean = 3.5 years). Half (48%) were to women who...
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