

[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.

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### Effect of Diindolylmethane on Estrogen-related Hormones, Metabolites and Tamoxifen Metabolism: Results of a Randomized, Placebo-controlled Trial

Thomson CA, Chow SHH, Roe D, Wertheim B, Chalasani P, Altbach M, Thompson P, Stopek A, Maskaranic G

Dietary supplement use is high among breast cancer survivors. One compound natural to cruciferous vegetables, diindolylmethane (DIM), is among the supplements commonly used. This bioactive compound has significant experimental evidence for bioactivity in breast chemoprevention. Sparse evidence in the form of well-designed human clinical trials exist to test its efficacy or safety. Methods: In this double-blind placebo-controlled study women taking tamoxifen for breast cancer primary or tertiary prevention were randomly assigned to receive 150 mg DIM (BioResponse(BR)-DIM) twice daily or a placebo for a minimum period of 12 months. Primary outcome was change in urinary estrogen metabolites 2-hydroxyestrone and 16 $\alpha$ -hydroxyestrone (baseline to 6 weeks, 6 and 12 months). Secondary endpoints included breast density by mammogram and fat:water ratio MRI (baseline to 12 months) and serum estrogens (baseline to 6, 12 months). Safety data were also evaluated, including tamoxifen metabolites. Results: Adherence to study pills was >91% by pill count and urinary DIM metabolite assessment. In participants assigned DIM there was a significant and sustained shift in urinary estrogen metabolism favoring a higher 2-OH:16 $\alpha$ -OH ratio; sex hormone binding globulin (SHBG) was also increased. No change in breast density was demonstrated. Safety analysis showed no appreciable differences in adverse events by treatment arm; however, tamoxifen metabolism for the parent compound as well as endoxifen and 4-OH endoxifen were appreciably reduced in women assigned to the DIM arm. Conclusions In this first large study of DIM in the setting of breast cancer chemoprevention, a favorable shift in estrogen metabolism and SHBG was demonstrated. However, the reduction in tamoxifen metabolites raises concern regarding the potential interaction between DIM and tamoxifen, an area in need of continued research. Impact Given the widespread and generally unsupported use of dietary supplementation by breast cancer survivors, these data will help to inform the use of DIM as a dietary supplement for breast cancer patients receiving tamoxifen.

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### Health System-Based HPV Vaccine Reminders: Randomized Trial Results

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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.

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### 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

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