Personal Health Record Use and Association with Immunizations and Well-Child Care Visits Recommendations

Jeffrey O. Tom, MD, MS[1], Chuhe Chen, PhD[2], and Yi Yvonne Zhou, PhD[3]

Objective To determine the association of parental use of integrated personal health records (PHRs) with children's adherence to immunization and well-child care (WCC) visit recommendations.

Study design For the immunization and WCC visit measures, we retrospectively analyzed, respectively, 766 and 639 matched pairs at Kaiser Permanente (KP) Hawaii and 2795 and 2448 pairs at KP Northwest who were ≤31 days old at enrollment and continuously enrolled for 2 years between January 2007 and July 2011. The independent variable (≥1 PHR feature used vs none) was matched using propensity scores on parental and children characteristics. The dependent variables were 2 measures from the 2010 Healthcare Effectiveness Data and Information Set: combination 2 immunization (all immunizations vs <all) and number of WCC visits through 15 months old (≥6 vs <6). We conducted multivariate logistic, propensity score-matched regression adjusting for parents' education and child's continuity of care.

Results Children whose parents used ≥1 PHR feature (vs none) had higher odds of adhering to the recommended immunizations only at KP Northwest (KP Hawaii: OR 1.1, 95% CI 0.8-1.4, $P > .05$; KP Northwest OR 1.2, 95% CI 1.0-1.3, $P < .05$). PHR use was associated with better adherence to WCC visit recommendations for both KP Hawaii (OR 1.9, 95% CI 1.3-2.9, $P < .001$) and KP Northwest (OR 2.5, 95% CI 2.1-2.9, $P < .001$).

Conclusions Young children whose parents used a PHR were more likely to adhere to the recommended WCC visits in both regions but immunizations in only 1 region. *(J Pediatr 2014;164:112-7)*.

Research has shown that regular attendance at well-child care (WCC) visits and receipt of immunizations improve health outcomes in young children.[1-3] Unfortunately, nearly one-quarter of US children under 2 years of age do not attend the recommended number of WCC visits or receive the recommended number of immunizations.[4] A significant challenge for parents of young children is that children under 2 years old have the highest number of recommended WCC visits and immunizations. One solution to help parents manage their children's care is the integrated personal health record (PHR).[5]

Integrated PHRs (ie, PHRs linked with an electronic medical record) are the preferred type of PHR among informatics experts and patients.[5,6] PHRs allow patients to view parts of their medical record (eg, immunizations, after-visit instruction summaries), manage their appointments, refill medications, and send secure messages to their health care providers using any Web-enabled device. Although there have been more than 50 studies on adults' use of PHRs, research into parental use of PHRs on behalf of their child is more limited.[7-11] Available evidence shows that parents are willing to use a PHR[7,9] and that PHR use is associated with improved immunization adherence.[10] Most studies of parental PHR use, however, have focused only on children with chronic disease[7-9,11] or have evaluated a small population of children.[8-10] Understanding how individuals can use PHR to manage chronic disease is important, but few studies have evaluated PHRs in the context of receipt of preventive care.[10,12-16]

We sought to determine whether parents' use of a PHR for their children is associated with children's adherence to 2 important measures of the Healthcare Effectiveness Data and Information Set (HEDIS): 2-year-old combination 2 immunization and 15-month-old WCC visits. To increase the generalizability of our findings, we conducted our study in 2 geographically and demographically distinct Kaiser Permanente (KP) regions.

Methods

We conducted a retrospective study using electronic medical record data that we extracted from the KP Hawaii and Northwest regions. These regions cover approximately 690 000 members (230 000 at KP Hawaii; 460 000 at KP Northwest). The memberships of each region are demographically representative of

HEDIS	Healthcare Effectiveness Data and Information Set
ICD-9	*International Classification of Disease, 9th revision*
KP	Kaiser Permanente
PHR	Personal health record
WCC	Well-child care

From the [1]Kaiser Permanente Center for Health Research Hawaii, Honolulu, HI; [2]Kaiser Permanente Center for Health Research Northwest; and [3]Kaiser Permanente Northwest, Portland, OR

Supported by a grant from The Permanente Federation's Sydney R. Garfield Memorial Fund. All authors are employees of Kaiser Permanente. This sponsor did not have any role in the following: (1) study design; (2) the collection, analysis, and interpretation of data; (3) the writing of the report; and (4) the decision to submit the manuscript for publication. The authors declare no conflicts of interest.

Portions of this study were presented as a poster at Kaiser Permanente's Hawaii Research Symposium, November 12, 2012, Honolulu, HI.

 http://dx.doi.org/10.1016/j.jpeds.2013.08.046

the service areas. KP Hawaii membership is approximately 38% Asian, 33% Native Hawaiian or other Pacific Islander, 27% White, and 1% African American, and KP Northwest has a largely White membership (~80%).

Children were eligible if they were KP members as of July 31, 2011; were enrolled prior to age 31 days; were born on or after January 1, 2007; were continuously enrolled for at least 2 years; and had at least 1 parent who was a KP member for 1 year prior to, and through, the end of the child's eligibility. For KP Hawaii, we excluded children residing on the islands of Kauai, Molokai, and Lanai because those KP members are covered by contracted providers that do not use KP's electronic medical record. We created 2 separate but overlapping study populations for our matched propensity score analysis because the timeframe for our 2 primary outcomes differed (15 months for WCC visits and 2 years for immunizations; Figure).

KP's PHR: Access and Features

KP members who want to obtain access to their child's PHR (ie, become a "PHR proxy") must first sign in to their own account and then activate access to the child's account. Available PHR features allow users to view components of the medical record (eg, test results, allergies, immunizations, prescriptions, past visit information, and current health conditions), complete a health assessment, sending a secure message, request health care reminders, view/cancel/schedule an appointment, and refill a prescription.

Immunization and WCC Visit Adherence

Our outcomes of interest were two 2010 HEDIS measures: 2-year-old combination 2 immunization (≥4 diphtheria, tetanus, and acellular pertussis, ≥3 inactivated polio vaccine, ≥1 measles, mumps, and rubella, ≥2 *Haemophilus influenzae* type b, ≥3 hepatitis B, and ≥1 varicella zoster virus) and 15-month-old WCC visits.[17] To ensure the most accurate vaccine data, we identified immunizations using the Vaccine Safety Datalink, a collaborative project of the Centers for Disease Control and Prevention and nine managed-care organizations.[18] We identified WCC visits using the standard *International Classification of Disease, 9th revision* (ICD-9) codes (eg, V20.2). We dichotomized our 2 outcomes as follows: "all vs <all" combination 2 immunizations at 2 years old and "≥ 6 vs <6" WCC visits at 15 months old.

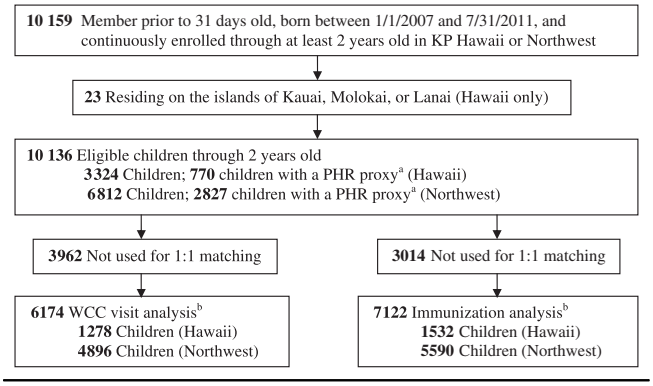

Figure. Patient eligibility. [a]A PHR proxy is defined as a parent who used at least one PHR feature for the child. [b]Two separate study populations were created for our 1:1 matched propensity score analysis because the study period for WCC visits (15 months) and immunizations (2 years) differed.

PHR Proxy Use

Our main independent variable, PHR proxy use, was based on whether a child had at least 1 proxy who used 1 or more PHR feature for the child during the period defined by each of our outcomes (15 months for WCC visits, 2 years for immunizations). When analyzing "secure message threads"—defined as the initial secure message along with all responses (either by the proxy or the health care provider) related to the initial message—we counted only 1 message per thread, similar to prior studies.[19-21] We decided a priori to count the use of each feature only once per day, except for labs, secure messaging, and prescription medication refills, because we were unable to determine whether multiple use of a feature on the same day were for different reasons.

Covariates

We collected characteristics previously shown to be associated with PHR use[7-9,19,22-25] for parents (race, age, number of years enrolled with health plan, sex, preferred language [English vs non-English]), and children (insurance, island of residence [Hawaii population only], and chronic disease). We assigned parents' level of education using 2000 US Census block-level data using the child's billing address. We identified children with a chronic disease if they had at least 1 outpatient visit or had a diagnosis for a chronic disease in their "problem list" based on a validated list of ICD-9 codes.[1,9,26] To reduce potential misclassification,[27] we required children to have 2 or more outpatient visits for asthma (ICD-9 493.00-493.99) before we classified them as having asthma. Because prior literature has established the importance of continuity of care,[28-32] we also calculated "continuity of primary care clinic" by dividing the total number of a child's outpatient visits to the clinic of his or her primary care provider by the total number of outpatient visits regardless of clinic or specialty.

Statistical Analyses

We conducted bivariate analyses to assess the relationships between PHR proxy use and child/parent characteristics. We also assessed the relationships between PHR proxy use and each of our outcomes. We used the χ^2 test of independence for categorical variables and the Student t test for continuous variables. We used conditional multivariate logistic regression stratified by propensity score matches (adjusting for the average of parents' education and "continuity of primary care clinic") and evaluated the association between PHR proxy use (any vs none) and (1) number of WCC visits (≥6 vs <6) through 15 months and (2) combination 2 immunizations (all vs <all immunizations) through 2 years. Within each KP