Predictors of Timing of Transfer From Pediatric-to Adult-Focused Primary Care

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IMPORTANCE A timely, well-coordinated transfer from pediatric- to adult-focused primary care is an important component of high-quality health care, especially for youths with chronic health conditions. Current recommendations suggest that primary-care transfers for youths occur between 18 and 21 years of age. However, the current epidemiology of transfer timing is unknown.

OBJECTIVE To examine the timing of transfer to adult-focused primary care providers (PCPs), the time between last pediatric-focused and first adult-focused PCP visits, and the predictors of transfer timing.

DESIGN, SETTING, AND PARTICIPANTS Retrospective cohort study of patients insured by Harvard Pilgrim Health Care (HPHC), a large not-for-profit health plan. Our sample included 60,233 adolescents who were continuously enrolled in HPHC from 16 to at least 18 years of age between January 2000 and December 2012. Pediatric-focused PCPs were identified by the following provider specialty types, but no others: pediatrics, adolescent medicine, or pediatric nurse practitioner. Adult-focused PCPs were identified by having any provider type that sees adult patients. Providers with any specialty provider designation (eg, gastroenterology or gynecology) were not considered PCPs.

MAIN OUTCOMES AND MEASURES We used multivariable Cox proportional hazards regression to model age at first adult-focused PCP visit and time from the last pediatric-focused to the first adult-focused PCP visit (gap) for any type of office visit and for those that were preventive visits.

RESULTS Younger age at transfer was observed for female youths (hazard ratio [HR], 1.32 [95% CI, 1.29-1.36]) who had complex (HR, 1.06 [95% CI, 1.01-1.11]) or noncomplex (HR, 1.08 [95% CI, 1.05-1.12]) chronic conditions compared with those who had no chronic conditions. Transfer occurred at older ages for youths who lived in lower-income neighborhoods compared with those who lived in higher-income neighborhoods (HR, 0.89 [95% CI, 0.83-0.95]). The gap between last pediatric-focused to first adult-focused PCP visit was shorter for female youths than male youths (HR, 1.57 [95% CI, 1.53-1.61]) and youths with complex (HR, 1.35 [95% CI, 1.28-1.41]) or noncomplex (HR, 1.24 [95% CI, 1.20-1.28]) chronic conditions. The gap was longer for youths living in lower-income neighborhoods than for those living in higher-income neighborhoods (HR, 0.80 [95% CI, 0.75-0.85]). Multivariable models showed an adjusted median age at transfer of 21.8 years for office visits and 23.1 years for preventive visits and an adjusted median gap length of 20.5 months for office visits and 41.6 months for preventive visits.

CONCLUSIONS AND RELEVANCE Most youths are transferring care later than recommended and with gaps of more than a year. While youths with chronic conditions have shorter gaps, they may need even shorter transfer intervals to ensure continuous access to care. More work is needed to determine whether youths are experiencing clinically important lapses in care or other negative health effects due to the delayed timing of transfer.
The transition from adolescence to adulthood is a critically important developmental period during which youths become independent and learn how to navigate normative adult experiences, including interactions with the health care system. Ensuring continuous access to a primary-care medical home during this transition is vital for addressing acute and chronic health issues, promoting positive health behaviors, and supporting youths’ overall health and well-being.9,10 Guaranteeing continuous access to health care during this life-course transition often involves transferring care from a pediatric-focused to an adult-focused provider, a complicated process that can present numerous challenges to patients and families, especially those with chronic conditions,3–6 ultimately leading to disruptions in access.

It is well accepted that ensuring a timely, well-coordinated transfer from pediatric- to adult-focused providers is an important component of high-quality health care.7,8 Ideally, discussions with patients, families, and providers about transition should begin in early adolescence, well in advance of actual transfer, which guidelines suggest should occur between 18 and 21 years of age.7–9 These discussions should involve individualized planning, development of self-management skills, and assessment of transition readiness, in addition to identifying an appropriate adult-focused provider and communicating key information about the patient to the receiving provider.7 However, transition preparedness is often inadequately or infrequently discussed, and many youths do not receive recommended transition services, particularly those from socioeconomically vulnerable populations.10–14

To measure and improve the quality of the transfer from pediatric- to adult-focused care, it is necessary to understand the current epidemiology of transfer timing and the factors that influence it. In the present study, we sought to examine the timing of transfer to adult-focused primary care providers (PCPs), the time between last pediatric-focused and first adult-focused office visits, and the predictors of transfer timing among youths enrolled in a health plan.

**Methods**

**Design and Setting**

This retrospective cohort consisted of 60,233 adolescents who were enrolled in Harvard Pilgrim Health Care (HPHC), a large not-for-profit health plan with more than 1 million members in commercial plans concentrated in Massachusetts, New Hampshire, and Maine. Members receive care in a variety of settings, including medical groups, community health centers, independent physician practices, and a preferred provider network. Data for our study were obtained from HPHC enrollment and claims data. The HPHC institutional review board approved the study. We did not obtain consent because we used existing secondary claims data in the form of a limited data set, and we obtained a Health Insurance Portability and Accountability Act waiver from the HPHC institutional review board to do so.

**At a Glance**

- We examined the timing of transfer from pediatric- to adult-focused primary care providers (PCPs), the gap between last pediatric-focused and first adult-focused PCP visits, and the predictors of transfer timing.
- Multivariable models showed an adjusted median age at transfer of 21.8 years and an adjusted median gap length of 20.5 months between last pediatric-focused and first adult-focused office visit with a PCP.
- Adjusted median age at transfer and adjusted median gap length were longer for preventive visits (23.1 years and 41.6 months, respectively) than for all office visits.
- Female enrollees and youths with chronic conditions transferred at younger ages and had shorter gaps than male enrollees and youths without chronic conditions, respectively.
- Youths living in lower-income neighborhoods transferred at older ages and had longer gaps than youths in higher-income neighborhoods.

**Study Population**

The study cohort included 60,233 HPHC members who were enrolled continuously from 16 through at least 18 years of age, and up to 26 years of age or disenrollment, at any point between January 2000 and December 2012. Disenrollment was defined as a lapse in HPHC coverage of more than 2 months. Included participants were required to have had at least 1 pediatric-focused PCP office visit before turning 18 years of age, and participants were excluded if they had office visits before turning 18 years of age from only adult-focused PCPs.

**Measures**

**Primary Outcomes**

The 2 primary outcome measures were (1) transfer timing, measured from 16 years of age to first adult-focused PCP visit, and (2) transfer gap, measured from last pediatric-focused PCP visit to first adult-focused PCP visit. These outcomes were determined separately for any type of office visit and for the subset of office visits that were preventive visits. Provider specialty codes from claims data were used to categorize providers as pediatric- or adult-focused PCPs; each provider could have up to 5 specialty provider codes. Pediatric-focused PCPs were defined as those with any of the following provider specialty types, but no others: pediatrics, adolescent medicine, or pediatric nurse practitioner. Adult-focused PCPs were defined as having provider types that see primarily adult patients (internal medicine, adult nurse practitioner, and geriatric medicine), provider types that may see both adult and pediatric patients (family practice, general practice, and family nurse practitioner), or providers with these adult-focused provider types in combination with any of the pediatric-focused provider types (eg, those with both internal medicine and pediatrics). Providers with any specialty provider designation (eg, gastroenterology or gynecology) were not considered PCPs.

Office visits were identified by having one of the following Current Procedural Terminology codes (identifying general and preventive office and outpatient visits): 99201 to 99205, 99211 to 99215, 99241 to 99245, 99384 and 99385, 99394 and 99395; along with one of the following encounter types: outpatient...
Timing of Transfer From Pediatric to Adult Primary Care

We created a time-varying covariate to categorize the provider network of the participant’s health plan as either a more restricted provider network (eg, a health maintenance organization [HMO] plan or a tiered network plan) or a less restricted network (eg, a preferred provider organization [PPO] or point-of-service [POS] plan). We also created a fixed variable for whether participants changed from one type of provider network to another in the 12 months prior to the outcome or censoring.

Analytic Approach
Multivariable Cox proportional hazards regression was used to model transfer timing (ie, time to first visit with an adult-focused PCP) and transfer gap (ie, time from the last pediatric-focused PCP visit to the first adult-focused PCP visit). Models included sex, chronic condition, residence in a low-income neighborhood, provider network, change in provider network in the prior 12 months, and state fixed effects. To account for temporal trends, we included a continuous variable for the calendar year in which the participant turned 16 years of age. Models for transfer gap also adjusted for age at last pediatric-focused PCP visit. Survival functions output from the multivariable Cox models were used to estimate the adjusted median age at transfer and the adjusted median gap length. All analyses were conducted separately for any office visits and preventive visits only.

Results

Descriptive Characteristics of the Study Sample
For the 60,233 youths with eligible pediatric-focused PCP office visits, the mean (SD) enrollment length after 16 years of age was 4.8 (2.2) years. For the 62,761 youths with eligible pediatric-focused PCP preventive visits, the mean (SD) enrollment length was 4.9 (2.2) years. Based on all PCP office visits, 36.9% of the youths in our sample transferred from a pediatric-focused to an adult-focused provider during their enrollment, while 36.0% were censored by disenrollment from the health plan, 0.3% were censored by reaching 26 years of age, and 26.8% were censored by the end of the study period. Among those who transferred during their enrollment, the (unadjusted) mean (SD) age at transfer for office visits was 19.8 (1.7) years. Kaplan-Meier survival plots for unadjusted age at transfer were presented in eFigures 1 and 2 in the Supplement.

Age at Transfer to Adult-Focused PCP Office Visit
Younger age at transfer (ie, faster rate of transfer) was observed for female youths (hazard ratio [HR], 1.32 [95% CI, 1.29-1.35]; Table 1) who had complex (HR, 1.06 [95% CI, 1.01-1.11]) or noncomplex (HR, 1.08 [95% CI, 1.05-1.12]) chronic conditions compared with those who had no chronic conditions. Transfer occurred at older ages (ie, was slower) for youths who lived in higher-income neighborhoods than for those who lived in lower-income neighborhoods (HR, 0.89 [95% CI, 0.83-0.95]). Compared with youths who had no change in plan network, youths who switched from PPO/POS to HMO/tiered network plans in the prior year transferred at younger ages (HR,
1.29 [95% CI, 1.20-1.39]), and youths who switched from HMO/tiered network plans to PPO/POS plans in the prior year transferred at older ages (HR, 0.78 [95% CI, 0.73-0.84]).

Transfer Gap Between Pediatric- and Adult-Focused PCP Office Visits

The gap between last pediatric-focused to first adult-focused PCP visit was shorter (ie, faster transfer) for female youths than male youths (HR, 1.57 [95% CI, 1.53-1.61]) and youths with complex (HR, 1.35 [95% CI, 1.28-1.41]) or noncomplex (HR, 1.24 [95% CI, 1.20-1.28]) chronic conditions. The gap was longer for youths living in lower-income neighborhoods than for those living in higher-income neighborhoods (HR, 0.80 [95% CI, 0.75-0.85]). The transfer gap was shorter in HMO/tiered plans vs PPO/POS (HR, 1.05 [95% CI, 1.01-1.09]) and for youths who changed from a PPO/POS to an HMO/tiered network plan in the prior year (HR, 1.18 [95% CI, 1.10-1.27]), but it was longer for youths who changed from an HMO/tiered network plan to a PPO/POS plan in the prior year (HR, 0.82 [95% CI, 0.76-0.88]).

Table 1. Predictors of Transfer From Pediatric- to Adult-Focused PCP Office Visits

<table>
<thead>
<tr>
<th>Predictor</th>
<th>% Total (N = 60 233)</th>
<th>Hazard Ratio (95% CI)</th>
<th>Transfer Timinga</th>
<th>Transfer Gapb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51.7</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td></td>
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<tr>
<td>Female</td>
<td>48.3</td>
<td>1.32 (1.29-1.36)</td>
<td>1.57 (1.53-1.61)</td>
<td></td>
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<tr>
<td>Chronic conditions</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>8.4</td>
<td>1.06 (1.01-1.11)</td>
<td>1.35 (1.28-1.41)</td>
<td></td>
</tr>
<tr>
<td>Noncomplex</td>
<td>22.4</td>
<td>1.08 (1.05-1.12)</td>
<td>1.24 (1.20-1.28)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>69.2</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td></td>
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<td>Neighborhood poverty</td>
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<td></td>
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<tr>
<td>≥20% in poverty</td>
<td>5.1</td>
<td>0.89 (0.83-0.95)</td>
<td>0.80 (0.75-0.85)</td>
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<tr>
<td>&lt;20% in poverty</td>
<td>93.7</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
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<tr>
<td>Unknown</td>
<td>1.3</td>
<td>1.02 (0.91-1.15)</td>
<td>0.97 (0.87-1.09)</td>
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<tr>
<td>Provider networkc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMO/tiered</td>
<td>69.0</td>
<td>1.00 (0.97-1.04)</td>
<td>1.05 (1.01-1.09)</td>
<td></td>
</tr>
<tr>
<td>PPO/POS</td>
<td>11.4</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
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</tr>
<tr>
<td>Both</td>
<td>19.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in networkd</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td>92.7</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
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<tr>
<td>From PPO/POS to HMO/tiered</td>
<td>2.9</td>
<td>1.29 (1.20-1.39)</td>
<td>1.18 (1.10-1.27)</td>
<td></td>
</tr>
<tr>
<td>From HMO/tiered to PPO/POS</td>
<td>4.4</td>
<td>0.78 (0.73-0.84)</td>
<td>0.82 (0.76-0.88)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: HMO, health maintenance organization; PCP, primary care provider (see Methods); POS, point of service; PPO, preferred provider organization.

* Measured from 16 years of age to first adult office visit; a hazard ratio of greater than 1.0 indicates faster rate of transfer and thus younger age at transfer. Analyses also adjusted for state fixed effects and calendar year in which the participant turned 16 years of age.

b Measured from last pediatric to first adult office visit; a hazard ratio of greater than 1.0 indicates faster rate of transfer and thus shorter gap. Analyses also adjusted for state fixed effects, calendar year in which the participant turned 16 years of age, and age at last pediatric visit.

c Because youths could switch between plans with different provider network types during the observation period, provider network was treated as a binary time-varying covariate (ie, HMO/tiered vs PPO/POS) in the multivariable Cox regression models. The “both” category is used only in the descriptive “% Total” column to indicate the prevalence of switching between plans with different provider networks at any point during the observation period.
d Change in the 12 months prior to transfer or censoring.

Transfer for All Office Visits vs Preventive Visits

Using adjusted survival curves from the Cox models, we found that the median age at transfer overall was 21.8 years (Figure 1) and the median gap length was 20.5 months (Figure 2). Differences between subgroups in adjusted median age at transfer and adjusted median gap length are presented in Figures 1 and 2, respectively.

Cox models for preventive-visit transfer yielded similar results to models for all office visits (Table 2). Based on adjusted survival curves from the Cox models, the median age at transfer was 23.1 years (Figure 1), and the median gap length was 41.7 months (Figure 2).

Discussion

Among a commercially insured population, we estimate that nearly half of youths transfer from pediatric- to adult-focused primary care later than recommended based on the timing of all office visits with an adult-focused PCP, with even later transfers occurring for preventive visits. Although there are no clear recommendations for the length of time over which such a transfer will occur, findings from our study suggest that potentially extended gaps in office and preventive visits also exist. Moreover, our results demonstrate that there are important differences in transfer timing by sociodemographic and health characteristics that could have important implications for delivery of high-quality health care for adolescents as they progress to adulthood.
Although there is consensus that the specific timing for optimal transfer from pediatric- to adult-focused primary care will vary according to the circumstances of each person, guidelines suggest that this transfer should ideally occur between 18 and 21 years of age,\(^7\) and that adolescents are recommended to have yearly preventive visits through 21 years of age.\(^18\) Our study documents that the majority of youths transferring to adult-focused providers are not receiving care according to these guidelines; instead, they are transferring later and with wider gaps between preventive visits than recommended. Multiple factors may have contributed to delayed transfer, including insurance barriers, lack of coordinated delivery systems, absence of mechanisms to ensure follow-up, and unfamiliarity with adult systems of care.\(^4,6\) The causes and effects of these delays merit additional study.

Notably, we found wide variation in transfer timing depending on whether preventive visits or all office visits were considered. The earlier transfers and shorter gaps for office visits may reflect acute care or introductory visits to an adult-focused PCP, rather than a purposeful transition. Although many youths do not go more than 2 years before making first contact with an adult-focused PCP after their last visit to a pediatric-focused PCP, the majority of youths who had a gap of at least 3 years before a first preventive visit with an adult-focused PCP may be at risk for adverse health and utilization outcomes due to decreased continuity of care.\(^19-22\) The de-

![Figure 1. Multivariable-Adjusted Age at Transfer](https://example.com/figure1.png)

Modified box plots depicting the adjusted 25th, 50th (median), and 75th percentiles for age at transfer to first adult office visit (A) and first adult preventive visit (B) for the overall sample and by primary predictors. Multivariable Cox models were used to construct the adjusted survival functions, from which these percentiles were obtained. The inset table on the left describes the sample size for each subgroup and the adjusted median age at transfer (also identified by the thick black bar within each box plot). For the provider network variable, subgroup totals do not sum to the total sample because individuals could contribute person-time to both categories of this time-varying covariate. HMO indicates health maintenance organization; POS, point of service; and PPO, preferred provider organization.
gree to which such gaps are clinically meaningful depend on the patient’s health status and other considerations; however, 2- to 3-year gaps may not be inappropriate for preventive care for healthy young adults, whereas a 1-year gap may be too long for those with chronic conditions, such as cystic fibrosis or diabetes.

Female youths in this sample transferred at younger ages and had shorter gaps in care than male youths for both office and preventive visits, which is consistent with findings that women have higher baseline use of health care and may be more comfortable accessing care than men. Moreover, as young women may begin seeking reproductive care during this time, the observed sex differences may be partially explained by gynecologists promoting transfer to an adult PCP for non-reproductive primary care services. Our findings also identified that youths with chronic conditions transferred at slightly younger ages and had slightly shorter transfer gaps. While it is noteworthy that primary care transfers for youths with chronic conditions are timelier than for their healthy counterparts, contrary to other studies, it is possible that they should have even shorter transfer gaps to address their health care needs. A limited availability of qualified adult-focused providers comfortable with childhood-onset chronic conditions may be one reason for delayed transfer for these youths.

In addition, we found that youths living in low-income neighborhoods transferred at older ages and had longer transfer gaps than youths in higher-income neighborhoods. Neighborhood poverty may be a proxy for access barriers related to...
socioeconomic status or living in an under-resourced setting. For youths in lower-income neighborhoods who may be at a particularly increased risk for obesity, sexually transmitted infections, and other negative health behaviors or conditions, socioeconomic disparities in transfer timing and continuity of primary care during this critical period may have important consequences for receipt of needed treatment(s) and long-term health.

Finally, our study suggests that changes in provider network may affect transfer timing because youths who moved from a less (ie, PPO/POS) to more (ie, HMO/tiered) restrictive network transferred at slightly younger ages and with shorter gaps. Limiting choice or assigning a PCP for new enrollees may make for a less overwhelming decision for youths looking to transfer, or may stimulate choosing an adult-focused provider if the prior pediatric-focused PCP is no longer in their network, although the Affordable Care Act may mitigate some of these barriers. Second, with claims data, we are unable to identify which provider a person considers as their PCP, which may be an issue for women who seek primary care from a gynecologist. Third, it is possible that our study does not capture transfer for youths receiving primary care at college if such visits are not paid by their HPHC insurance, leading to a potential underestimation of transfer prevalence in our study. Fourth, youths may not have an observable transfer during their enrollment period because of loss of dependent coverage prior to transfer, which may have skewed our estimates. However, 65% of youths who never transferred continued to see a pediatric-focused PCP after 18 years of age, which suggests that many of those remaining covered into young adulthood do not transfer during this time period, in which case our sample may accurately reflect population-level trajectories in health care use.

Several limitations should be considered when interpreting our findings. First, our data are from a single, regional private health plan, so these results may have limited generalizability to other regions and insurance types. Specifically, youths with public coverage or lapses in coverage may face additional barriers to accessing timely care from adult-focused providers, although the Affordable Care Act may mitigate some of these barriers. Second, with claims data, we are unable to identify which provider a person considers as their PCP, which may be an issue for women who seek primary care from a gynecologist. Third, it is possible that our study does not capture transfer for youths receiving primary care at college if such visits are not paid by their HPHC insurance, leading to a potential underestimation of transfer prevalence in our study. Fourth, youths may not have an observable transfer during their enrollment period because of loss of dependent coverage prior to transfer, which may have skewed our estimates. However, 65% of youths who never transferred continued to see a pediatric-focused PCP after 18 years of age, which suggests that many of those remaining covered into young adulthood do not transfer during this time period, in which case our sample may accurately reflect population-level trajectories in health care use.

Conclusions

Ensuring a smooth, timely transfer from pediatric- to adult-focused primary care is a crucial component of high-quality health care, especially for youths with chronic conditions. Our
study identified that youths who are male, without chronic conditions, or from low-income neighborhoods are vulnerable to later transfer and longer transfer gaps, and that PCP transfer occurs later and with longer gaps for preventive visits compared with all office visits. Although youths with chronic conditions have shorter transfer gaps than those without chronic conditions, continuous care for this population may require even shorter transfer intervals. Ultimately, care transition is a complex, longitudinal process, of which the transfer from pediatric-to-adult-focused providers is only one part. More work is needed to study the effect of transfer timing on health outcomes to know whether youths are experiencing clinically important lapses in care, and to determine and promote optimal transfer timing and high-quality transition.

REFERENCES


39. Irwin CE Jr, Burg SJ, Uhler Cart C. America's adolescents: where have we been, where are we going? J Adolesc Health. 2002;31(6)(suppl):91-121.
