Cost Saving and Quality of Care in a Pediatric Accountable Care Organization

Kelly J. Kelleher, MD, MPHa; Jennifer Cooper, PhDa; Katherine Deans, MDa; Pam Carr, RNb; Richard J. Brilli, MDb; Steven Allen, MDb, MBAa; William Gardner, PhDc

abstract

BACKGROUND AND OBJECTIVES: Accountable care organizations (ACOs) are responsible for costs and quality across a defined population. To succeed, the ACO must improve value by reducing costs while either maintaining or improving the quality of care. We examined changes from 2008 through 2013 in the cost and quality of care for Partners for Kids (PFK), a pediatric ACO serving an Ohio Medicaid population.

METHODS: We measured the historical cost of care for PFK and gathered comparison statewide Ohio Medicaid fee-for-service (FFS) and managed care (MC) cost histories. Changes in quality of care measures were assessed by using 15 Agency for Healthcare Research and Quality Pediatric Quality Indicators and 4 indicators targeted by PFK.

RESULTS: PFK per-member-per-month costs were lower in 2008 than either FFS or MC (P < .001) costs and grew at a rate of $2.40 per year compared with FFS increases of $16.15 per year (P < .001) and MC increases of $6.47 per year (P < .121) with ~3.5 million member-months each year. The quality of care of children in PFK improved significantly (P < .05) in 2011–2013 versus 2008–2010 on 5 quality measures (including 2 composite measures) and declined significantly on 3 measures. Other measures did not change or were rare events with no measureable change.

CONCLUSIONS: PFK reduced the growth in costs compared with FFS Medicaid and averages less than MC Medicaid. This slowing in cost growth was achieved without diminishing the overall quality or outcomes of care. PFK thus improved the value of care for Medicaid children.

WHAT’S KNOWN ON THIS SUBJECT: Accountable care organizations are expanding. In pediatrics, however, there is no information on cost savings or quality generated by such organizations.

WHAT THIS STUDY ADDS: Partners for Kids is a pediatric accountable care organization that increased value for Medicaid children in 34 Ohio counties, primarily through cost savings. This slowing in cost growth was achieved without diminishing the overall quality or outcomes of care. PFK thus improved the value of care for Medicaid children.

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Dr Kelleher participated in the conceptualization of the study, wrote the initial draft, and helped revise the text; Dr Cooper gathered data, analyzed data, and helped draft the text; Dr Deans participated in the conceptualization of the study, helped draft the text, and revised the text; Ms Carr helped obtain the data, conceptualized the article, and helped revise the text; Drs Brilli and Allen helped revise the text and participated in the conceptualization of the project; and Dr Gardner helped conceptualize the study, helped draft and revise the text, and analyzed data.


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Accountable care organizations (ACOs) are growing in number and size because of advantages from the Patient Protection and Affordable Care Act, early reports of savings generation, and dollars proffered by the Centers for Medicaid & Medicare Innovation. Derived in part from the early health maintenance organizations of the late 1970s and from accountable health plans in the Clinton administration’s Health Security Act in the mid-1990s, ACOs apply the responsibility for costs and quality across a defined population to a network of providers who offer health and behavioral health services, with an increased emphasis on prevention and population health. ACOs are integrated groups of clinicians and health care organizations with medical homes and care coordination that are contracted for specific patient lives and often bear some financial risk for reducing savings and improving health.

To succeed, the ACO must improve the value of care; that is, reduce the cost while either maintaining or improving quality. Specifically, ACOs contract with payers to assist in eliminating unnecessary expenses and improving quality. The ACO therefore focuses providers’ attention on areas of health care delivery that are fragmented, inefficient, inconvenient for patients, or financially irrelevant for providers under the current fee-for-service (FFS) system.

Pediatric ACOs have 2 additional challenges not faced by adult ACOs. First, pediatric populations have proportionally fewer complex, high-cost patients, which means there are fewer targets for costs saving even though there are many quality improvement targets. Second, most children are as healthy as they will ever be over the rest of their lives, which suggests fewer opportunities are available to improve health outcomes. However, because children have many more years of life ahead compared with adults, cost savings and improvements in health and health care quality can have longer-lasting effects than in adults. Thus, the comprehensive picture of benefits to children from a pediatric ACO may not be seen until many years later. Despite these challenges, pediatric ACOs have arisen in several states and regions in response to local market and regulatory conditions.

The critical question is whether adult or pediatric ACOs can increase the value of health care. Medicare ACOs for the elderly are expanding rapidly, and there are no conclusive results available indicating their ability to reduce costs or broadly improve quality. A few pilot studies funded by the Centers for Medicare & Medicaid Services produced mixed results. Although the question of value in pediatric ACOs is largely untested, at least 10 children's hospitals have partnered with physician networks in the past few years to take on risk-bearing contracts for various pediatric populations.

Partners for Kids (PFK), a physician/hospital organization in central and southeast Ohio, is the oldest and 1 of the largest exclusively pediatric ACOs in the United States. PFK has engaged in full financial and clinical risk for Medicaid enrollees aged 0 to 18 years for ~20 years and has embraced population health and integration strategies for the past 6 years. The present report describes that experience and the results related to increasing the value of care through cost reductions and improvement in quality measures over the past 6 years.

**METHODS**

Nationwide Children’s Hospital (NCH) in Columbus, Ohio, is a large academic medical center with >1 million patient-visits per year and 25 000 inpatient admissions. In 1994, NCH partnered with community pediatricians to create PFK, a physician/hospital organization with governance shared equally between NCH and representatives of physician primary and specialty practice groups. The majority of PFK physicians work under a salaried model as hospital or practice partners, whereas the remaining physicians are community practitioners. Nonemployed primary care physicians receive a percentage over the Medicaid fee schedule as quality-based incentive payments. PFK was designed to address rising costs and concerns about the quality of care delivered to low-income patients. Since 2008, PFK has operated as a pediatric ACO, covering >300 000 low-income children in central and southeastern Ohio. Forty percent of the children live in Franklin County, the most urban county in the region, with the remainder spread throughout 33 other counties in Ohio, most of which are rural and many of them Appalachian. The children are evenly divided between boys and girls, with >95% enrolled through Ohio’s Covered Families and Children eligibility category for poor children, and the remainder are covered under the Medicaid category of Aged, Blind, and Disabled. The latter group was recently added (after the period of current analysis) and therefore is not included in these analyses.

**Financial Model**

Through a subcontracted arrangement with Ohio’s 5 Medicaid managed care (MC) plans, PFK is paid an age- and gender-adjusted capitation fee for each child each month, which when averaged out, is the per-member per-month (PMPM) payment for care. PFK is then held responsible for managing and reimbursing providers for care. Although the MC organizations retain a percentage of the Medicaid premium to provide claims processing, member relations, and standard insurance management functions, PFK is considered an
Examined by using 2 groups of measures (Table 1).

**AHRQ Measures**

Quality was measured in part by using the AHRQ set of Pediatric Quality Indicators. We measured changes in these indicators to determine whether the quality of care declined as PFK looked for ways to reduce costs. The AHRQ measures were chosen because they: (1) have been shown to have face validity among pediatric experts and reliability in a nationally representative pediatric inpatient administrative database; (2) focus on potentially preventable complications and hospitalizations; (3) allow us to track system- and population-level changes over time; and (4) provide targets for interventions at both the provider and patient level. These measures were not the subjects of targeted PFK quality improvement initiatives during the study period. Data were not yet available at the time of analysis to calculate the AHRQ measures for the last quarter of 2013.

**PFK Quality Targets**

Four measures were the subject of targeted quality improvement efforts developed by the PFK board: (1) NICU days per 1000 member-months; (2) asthma emergency department visits per 1000 member-months; (3) rate of 3- to 6-year-old well-child checks; and (4) hemoglobin A1c (HbA1c) among children with diabetes cared for through NCH or their affiliated laboratories.

**Analysis**

**Population Characteristics**

To describe the demographic and socioeconomic characteristics of PFK members, the population of all children who were members of PFK for at least 1 month in 2008–2013 was examined. These characteristics included age, gender, and duration and continuity of enrollment in PFK. Standard family socioeconomic status indicators, such as parental education level and household income, were not available in the PFK claims database. Therefore, zip code–level data obtained from the 2007–2011 American Community Survey 5-year estimates were applied. These indicators included median household family income, percentage of the population ≥25 years of age with a bachelor’s degree or higher, percentage of individuals living below the poverty level, percentage of children <5 years old living below the poverty level, and urban versus rural residence. To identify changes in patient characteristics over time, the demographic and socioeconomic characteristics of children in PFK during 2008–2010 were compared with those in PFK during 2011–2013.

**Cost Analysis**

To determine whether PFK reduced the cost of care, ordinary least squares regressions were conducted to compare initial costs and rates of growth for PFK, Ohio Medicaid FFS, and Ohio Medicaid MC costs.

**Quality Analysis**

Quality of care during 2011 to 2013 was analyzed by comparing measures during 2008–2010 with those during 2011–2013. For measures that counted events per 1000 member-months, Fisher’s exact test was used. For measures calculated as monthly rates, t tests were used to compare the averages of the monthly rates during the 2 periods. All statistical analyses were performed by using SAS version 9.3 (SAS Institute, Inc, Cary, NC) or R version 3.0 (www.r-project.org; R Foundation for Statistical Computing, Vienna, Austria). Two-sided P values <.05 were considered statistically significant.

**RESULTS**

**Patient Demographic Characteristics**

Table 2 presents data describing the PFK patient population in 2008–2010 and 2011–2013. Population
TABLE 1 Definitions of Quality Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental puncture or laceration rate</td>
<td>Accidental punctures or lacerations (secondary diagnosis) during procedure per 1000 discharges for patients aged ≤17 y</td>
</tr>
<tr>
<td>Asthma admission rate</td>
<td>Hospital admissions with a principal diagnosis of asthma per 100 000 population aged 2 through 17 y</td>
</tr>
<tr>
<td>Central venous catheter-related bloodstream infection rate</td>
<td>Central venous catheter-related bloodstream infections (secondary diagnosis) per 1000 medical and surgical discharges for patients aged ≤17 y</td>
</tr>
<tr>
<td>Diabetes short-term complications admission rate</td>
<td>Admissions for a principal diagnosis of diabetes with short-term complications (ketoacidosis, hyperosmolarity, or coma) per 100 000 population aged 6 through 17 y</td>
</tr>
<tr>
<td>Gastroenteritis admission rate</td>
<td>Admissions for a principal diagnosis of gastroenteritis or for a principal diagnosis of dehydration with a secondary diagnosis of gastroenteritis per 100 000 population, ages 3 mo to 17 y</td>
</tr>
<tr>
<td>Iatrogenic pneumothorax rate</td>
<td>Iatrogenic pneumothorax cases (secondary diagnosis) per 1000 discharges for patients aged ≤17 y</td>
</tr>
<tr>
<td>Perioperative hemorrhage or hematoma rate</td>
<td>Perioperative hemorrhage or hematoma cases with control of perioperative hemorrhage, drainage of hematoma, or a miscellaneous hemorrhage- or hematoma-related procedure after surgery per 1000 surgical discharges for patients aged ≤17 y</td>
</tr>
<tr>
<td>Postoperative respiratory failure rate</td>
<td>Postoperative respiratory failure (secondary diagnosis), mechanical ventilation, or reintubation cases per 1000 elective surgery discharges for patients aged ≤17 y</td>
</tr>
<tr>
<td>Postoperative sepsis rate</td>
<td>Postoperative sepsis cases (secondary diagnosis) per 1000 surgery discharges for patients aged ≤17 y. Includes metrics for discharges grouped according to risk category</td>
</tr>
<tr>
<td>Pressure ulcer rate</td>
<td>Stage III or IV pressure ulcers (secondary diagnosis) per 1000 discharges among patients aged ≤17 y</td>
</tr>
<tr>
<td>Urinary tract infection admission rate</td>
<td>Admissions with a principal diagnosis of urinary tract infection per 100 000 population aged 3 mo to 17 y</td>
</tr>
<tr>
<td>Pediatric patient safety for selected indicators</td>
<td>The weighted average of the observed-to-expected ratios for: accidental puncture or laceration rate, pressure ulcer rate, iatrogenic pneumothorax rate, perioperative hemorrhage or hematoma rate, postoperative respiratory failure rate, postoperative sepsis rate, postoperative wound dehiscence rate, central venous catheter-related bloodstream infection rate</td>
</tr>
<tr>
<td>Pediatric quality acute composite</td>
<td>Composite of gastroenteritis or urinary tract infection per 100 000 population aged 6 to 17 y</td>
</tr>
<tr>
<td>Pediatric quality chronic composite</td>
<td>Composite of admissions for asthma or diabetes with short-term complications per 100 000 population aged 6 to 17 y</td>
</tr>
<tr>
<td>Pediatric quality overall composite</td>
<td>Discharges, for patients aged 6 to 17 y, that meet the inclusion and exclusion rules for any of the following: asthma admission rate, diabetes short-term complications admission rate, gastroenteritis admission rate, urinary tract infection admission rate</td>
</tr>
</tbody>
</table>

Targeted measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICU days</td>
<td>NICU days per 1000 PFK member-months</td>
</tr>
<tr>
<td>Well-child visits</td>
<td>Well-child visits per 1000 PFK member-months for 3- to 6-year-olds</td>
</tr>
<tr>
<td>Asthma emergency department admissions</td>
<td>Averages of monthly asthma emergency department admissions per 1000 member-months</td>
</tr>
<tr>
<td>HbA1c levels</td>
<td>Monthly Median HbA1c levels for all known patients with diabetes mellitus who were aged &lt;20 y and followed up through a network laboratory where results were available</td>
</tr>
</tbody>
</table>

* AHRQ Definitions from AHRQ QI Version 4.5, Pediatric Quality Indicators (www.qualityindicators.ahrq.gov).

characteristics were similar between the 2 time periods.

Costs

Figure 1 shows the comparison of the PMPM cost increases over the period from 2008 through 2013 for PFK, Medicaid FFS, and Medicaid MC. The analysis uses 2008 as the baseline year. During that year, PFK had $108.53 PMPM costs on ~3.5 million member-months per year. FFS cost $67.03 PMPM more than PFK ($P < .001) and MC cost $23.75 more than PFK ($P < .001). Looking at cost growth from 2008 forward, the PFK PMPM grew at a rate of $2.40 per year, and MC grew at a rate of $6.47 per year. This rate was not significantly greater than the cost growth rate of PFK ($P < .121). FFS grew at a rate of $16.15 per year, significantly greater than the rate of growth in PFK ($P < .001).

Quality

AHRQ Measures

Table 3 compares performance on the AHRQ indicators between 2008–2010 and 2011–2013. There was a modest improvement in gastroenteritis admission rate, pediatric quality acute composite, and pediatric quality overall composite. Performance declined on diabetes short-term admission rates and perioperative hemorrhage or hematoma rates. There were no significant differences on the other 10 measures.

PFK Quality Targets

Improvements in the quality of care included a significant decrease in NICU days per 1000 PFK member-months and a significant increase in
the number of well-child visits per 1000 PFK members (Table 4). The average monthly median HbA1c value deteriorated, although this difference may not be clinically relevant.

**DISCUSSION**

PFK successfully improved the value of pediatric health care over time, primarily through cost containment. We believe this is the first evaluation of a pediatric ACO, and our data demonstrate the potential for an ACO to minimize the growth in the cost of care for a pediatric population compared with a state Medicaid FFS program (ie, Ohio).

The lower rate of cost growth achieved by PFK bodes well for the short-term success of PFK’s business model and other pediatric ACOs. PFK’s PMPM costs were consistently lower than those of other Ohio Medicaid MC organizations, with no overlap after 2008 in the confidence intervals surrounding the regression lines describing the growth. MC organization PMPM costs were higher than PFK and grew slightly faster than PFK PMPMs, but the latter difference was not significant, possibly due to the relatively brief period of comparative years. Over 5 years, PFK experienced a 15.1% increase in PMPM. How would this finding compare with national measures of Medicaid cost growth? To our knowledge, there is no single national estimate of spending increases per child enrolled in Medicaid for these years. However, each indicator of cost growth that we could locate reflects higher growth than occurred at PFK. The Consumer Price Index for health care services increased 17.1% during the same years as our study, whereas overall Medicaid spending per enrollee has been estimated to have increased from 3% to 4% per year on average over the 5 years of our study, which would be 16% to 22% increases over 5 years.

Quality measures of PFK care remained generally stable over our study period. Although there were several modest improvements in AHRQ quality indicators, because these measures were not specifically targeted by PFK, it is unclear whether these improvements resulted from our organizational initiatives. The quality of care improved for NICU days per 1000 PFK members and well-child visits. The PFK board specifically targeted these measures, however. They were addressed directly by multidisciplinary and multi-institutional quality improvement teams and resulted in improved outcomes. In contrast, asthma emergency department visits and HbA1c values did not improve, with the latter showing a small but significant deterioration.

In summary, the PFK model substantially reduced growth in the cost of care relative to the growth experienced by other Ohio Medicaid enterprises serving children. At the same time, quality of care measures held steady, with a mix of several small improvements and minor improvements.
deteriorations. Therefore, PFK delivered on the promise of the ACO to reduce the rate of health care cost growth while maintaining or improving the quality of care.

We suggest that the PFK model achieved these results because pediatric ACOs are better positioned to bridge coordination gaps in care than either an individualized patient-centered medical home or an insurer could do alone; the ACOs are, in effect, the medical neighborhood for the medical home. Individualized medical practices are limited in their ability to track health care use across the system because their records reflect only visits to their individual practices or hospitals. Our recent data on quality of care for attention-deficit/hyperactivity disorder underscore this issue. In contrast, PFK manages care coordination, patient enrollment in digital communications and health record portals, coaching, and scheduling for many specialty pediatric patients area; it also provides pediatricians with report cards and follow-up data. Health plans are limited in their ability to influence practices and coordinate multiple quality initiatives because they invariably have only partial penetration of all children in the community. In Ohio, 5 different Medicaid MC organizations enroll pediatric members using different formularies, care guidelines, and care coordination models. For central and southeastern Ohio, PFK is able to provide a single set of provider guidelines for common conditions, a single set of collaborative activities for clinicians, and unified care coordination with pediatric specialty teams. As a physician/hospital organization, PFK is also more directly involved in the specialty care than a typical insurance company and can provide a unified voice on coordination and guidelines.

Although the low rate of medical inflation is important for sustainability, improvements in the value of health care should ideally be achieved by affecting both sides of the value equation. Value in health care can be achieved through improvements in quality as well as reductions in costs. It is disappointing that we did not identify a greater improvement in the quality of care. We believe there are several reasons for this outcome. First, the lack of widely accepted, clinically meaningful quality measures for pediatric ACOs limits the ability to demonstrate changes in quality. Second, the relative scarcity of many specialty pediatric conditions even in a population this size prevents reliable measurement of change in outcomes over time. Third, the AHRQ Pediatric Quality Indicators have serious limitations in terms of their

![Figure 1](image)

In 2008, FFS cost more than PFK \( (P < .001) \) and MC cost more than PFK \( (P < .001) \). The growth in FFS costs was faster than the growth for PFK \( (P < .001) \). The difference between the MC organizations’ cost growth and PFK growth was not significant \( (P < .121) \).

**TABLE 3** AHRQ Pediatric Quality Indicators: Comparison of 2008–2010 Versus 2011–2013

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Events/1000 2008–2010</th>
<th>Events/1000 2011–2013</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental puncture or laceration rate</td>
<td>0.46</td>
<td>0.38</td>
<td>.706</td>
</tr>
<tr>
<td>Asthma admission rate</td>
<td>0.44</td>
<td>0.43</td>
<td>.439</td>
</tr>
<tr>
<td>Central venous catheter–related bloodstream infection rate</td>
<td>0.17</td>
<td>0.21</td>
<td>.999</td>
</tr>
<tr>
<td>Diabetes short-term complications admission rate</td>
<td>0.13</td>
<td>0.15</td>
<td>.027</td>
</tr>
<tr>
<td>Gastroenteritis admission rate</td>
<td>0.16</td>
<td>0.11</td>
<td>.000</td>
</tr>
<tr>
<td>Iatrogenic pneumothorax rate</td>
<td>0.14</td>
<td>0.07</td>
<td>.442</td>
</tr>
<tr>
<td>Perioperative hemorrhage or hemotoma rate</td>
<td>0.00</td>
<td>3.69</td>
<td>.048</td>
</tr>
<tr>
<td>Postoperative respiratory failure rate</td>
<td>7.71</td>
<td>5.02</td>
<td>.445</td>
</tr>
<tr>
<td>Postoperative sepsis rate</td>
<td>14.58</td>
<td>17.63</td>
<td>.695</td>
</tr>
<tr>
<td>Pressure ulcer rate</td>
<td>0.82</td>
<td>0.26</td>
<td>.358</td>
</tr>
<tr>
<td>Urinary tract infection admission rate</td>
<td>0.08</td>
<td>0.08</td>
<td>.326</td>
</tr>
<tr>
<td>Pediatric patient safety for selected indicators</td>
<td>1.39</td>
<td>1.44</td>
<td>.918</td>
</tr>
<tr>
<td>Pediatric quality acute composite</td>
<td>0.12</td>
<td>0.09</td>
<td>.018</td>
</tr>
<tr>
<td>Pediatric quality chronic composite</td>
<td>0.46</td>
<td>0.43</td>
<td>.288</td>
</tr>
<tr>
<td>Pediatric quality overall composite</td>
<td>0.58</td>
<td>0.53</td>
<td>.046</td>
</tr>
</tbody>
</table>

\( P \) values are results from Fisher’s exact tests.
All of these activities are essential infrastructure steps that should yield changes in quality outcomes over time, if they are sustained.5,19 We plan to more robustly implement these infrastructure changes in PFK. Although an additional 30 million Americans will have access to health coverage under the Patient Protection and Affordable Care Act, the difficult work of creating a system of better care, better health, and lower cost (what former Centers for Medicare & Medicaid Services administrator and pediatrician Don Berwick calls the “triple aim” of health care reform) will occur gradually. These reforms will come about through pilot projects designed to encourage innovation, increase effectiveness, and improve costs.

One of the primary vehicles through which the new law encourages such innovation is through provisions that establish ACOs in Medicare and, for pediatrics, in Medicaid/Children’s Health Insurance Program. The fact that pediatric ACOs were singled out in the legislation reflects 2 points. First, it shows an understanding that pediatric care is a critical intervention point where, as a nation, we can shift from a culture of acute care to a culture of prevention in its most primary representation: children. Second, it reflects an appreciation for the different market forces in pediatric health care.8

Our results suggest that, at least for Medicaid, pediatric ACOs may be efficient models of reforming health care. At the same time, there are also challenges for improving pediatric quality of care and for measuring that quality. The National Committee for Quality Assurance is developing an accreditation and measurement proposal for ACOs, and PFK will be participating in its testing.

**CONCLUSIONS**

NCH’s PFK has demonstrated part of the vision behind pediatric ACOs by reducing costs while maintaining quality of care. PFK had many attributes working in its favor that contributed to the successful implementation of the ACO model, including an institutional emphasis on quality and safety outcomes, strong partner Medicaid MC plans, a highly integrated network of pediatricians with strong market share, state Medicaid support, second- and third-generation technology, and a 120-year hospital history in the community. Many providers seeking to implement pediatric ACOs will have additional factors to contend with in their environment.
1. 11th US Congress. Patient Protection and Affordable Care Act; 2010
9. Colla CH, Lewis VA, Shortell SM, Fisher ES. First national survey of ACOs finds that physicians are playing strong leadership and ownership roles. *Health Aff (Millwood)*. 2014;33(6):964–971
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