Retail Clinic Visits and Receipt of Primary Care

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BACKGROUND: An increasing number of patients are visiting retail clinics for simple acute conditions. Physicians worry that visits to retail clinics will interfere with primary care relationships. No prior study has evaluated the impact of retail clinics on receipt of primary care.

OBJECTIVE: To assess the association between retail clinic use and receipt of key primary care functions.

DESIGN: We performed a retrospective cohort analysis using commercial insurance claims from 2007 to 2009.

PATIENTS: We identified patients who had a visit for a simple acute condition in 2008, the "index visit". We divided these 127,358 patients into two cohorts according to the location of that index visit: primary care provider (PCP) versus retail clinic.

MAIN MEASURES: We evaluated three functions of primary care: (1) where patients first sought care for subsequent simple acute conditions; (2) continuity of care using the Bice–Boxerman index; and (3) preventive care and diabetes management. Using a difference-in-differences approach, we compared care received in the 365 days following the index visit to care received in the 365 days prior, using propensity score weights to account for selection bias.

KEY RESULTS: Visiting a retail clinic instead of a PCP for the index visit was associated with a 27.7 visits per 100 patients differential reduction ($p < 0.001$) in subsequent PCP visits for new simple acute conditions. Visiting a retail clinic instead of a PCP was also associated with decreased subsequent continuity of care (10.9 percentage-point differential reduction in Bice–Boxerman index, $p < 0.001$). There was no differential change between the cohorts in receipt of preventive care or diabetes management.

CONCLUSIONS: Retail clinics may disrupt two aspects of primary care: whether patients go to a PCP first for new conditions and continuity of care. However, they do not negatively impact preventive care or diabetes management.

INTRODUCTION

Retail clinics are clinics located within retail stores, such as pharmacies or grocery stores, that provide walk-in care for simple acute and preventive concerns. By July 2012, 1,351 retail clinics were operating, a number projected to grow in future years.[1,2] Among commercially insured patients, retail clinic visits increased ten-fold between 2007 and 2009.[3]

Physicians' organizations are concerned that retail clinics negatively impact relationships between patients and primary care physicians (PCPs); each retail clinic visit could represent one fewer visit to a PCP, one fewer opportunity to build a primary care relationship. Primary care serves four principal functions: (1) first-contact access for new health needs, (2) long-term person-focused care (continuity), (3) comprehensive care for prevention and chronic disease needs, and (4) coordination of care.[4] When patients receive these from a usual source of care, they have greater satisfaction, superior outcomes, and lower utilization and costs.[5–12]

Unlike PCPs, retail clinics provide just one primary care function: first-contact care. Some physicians and policymakers worry that by displacing PCP visits, retail clinics could harm continuity and preventive and chronic care.[13,14] However, most retail clinic patients lack a usual source of care, and have no primary care relationship to disrupt.[15,16] In one study limited to Minnesota, patients who visited a retail clinic were as likely to receive a limited set of preventive services as those who visited a PCP.[17] Despite this controversy, no prior study has assessed the impact of retail clinics on multiple primary care functions. Using a national sample of health plan claims, we evaluated retail clinic visits' effect on three core primary care functions: (1) first-contact care, (2) continuity of care, and (3) preventive care.

METHODS

Study Design and Population

We obtained 2007–2009 claims data from Aetna, representing care received by 13.3 million enrollees in 20 insurance regions. The sample included all 367,488 patients who visited a retail clinic and a random sample of 1,010,910 patients who did not. Aetna provided claims with primary diagnosis codes corresponding to the following services types: primary care, specialist, ambulatory facility, emergency room, laboratory, radiology, and immunizations.

Inclusion Criteria and Primary Independent Variable

For each patient, our analyses centered on an "index visit", defined as a patient's first visit in 2008 to a retail clinic or PCP for one of 11 simple acute conditions treatable at a retail clinic. These conditions accounted for 88 % of acute retail clinic visits in our data, and were identified as an evaluation and management visit [Current Procedural Terminology (CPT) codes 99201–99205 or 99211–99215],[18] with an International Classification of Diseases (ICD)-9 primary diagnosis code for one of the 11 conditions: upper respiratory infection (460.xx, 465.xx), sinusitis (461.xx, 473.xx), bronchitis (490.xx, 466.xx), pharyngitis (462.xx, 463.xx, 034.xx), otitis media (381.xx, 382.xx), otitis externa (380.xx), conjunctivitis (372.xx), urinary tract infection (599.xx, 595.xx), allergic rhinitis (477.xx), influenza (487.xx), or unspecified viral infection (079.99).[19] We grouped patients by the location of the index visit: retail clinic versus PCP. We identified index visits in 2008, because this allowed us to compare 365 days of claims before and after the index visit. To ensure that the index visit captured a patient's first-recorded exposure to retail clinics, we excluded patients with any prior retail clinic claims. PCP visits were identified by a provider specialty coded as Family/General Practice, Internal Medicine, Obstetrics/Gynecology, or Pediatrics, and location of service coded as "Outpatient" or "Office." Lacking data on the clinical focus of Nurse Practitioners and Physician Assistants, we did not identify these as PCPs; we included these in sensitivity analyses (Online Appendix).

We excluded patients who were not continuously enrolled in the health plan for 365 days before and after the index visit, those aged 65 or older during the study period, and those who lived farther than 20 miles (32.2 km) from the nearest retail clinic, to ensure comparability in access to care (Details in Online Appendix). The vast majority of retail clinic patients (97.6 %) lived within this radius.

Outcomes Measures

For all measures, we compared the care received in the 365 days before the index visit to that in the 365 days after.

First-Contact Care for Simple Acute Conditions. First-contact care captures the idea of patients visiting their PCP as their first source of care when they develop a new problem. We evaluated where patients initiated care for the 11 simple acute conditions treatable at retail clinics. For this analysis, we excluded the index visit and focused on other instances of simple acute care. We calculated the number of such visits at retail clinics, PCPs, or Emergency Departments (EDs), defined via ICD-9 codes and CPT codes for evaluation and management (99201–99205, 99211–99215) or ED visits (99281–5). To distinguish visits representing first-contact care from follow-up care for the same condition, we excluded visits with the same 3-digit ICD-9 diagnosis code occurring within 21 days of an initial, first-contact visit. Sensitivity analyses using 14-day and 28-day cut-offs yielded similar results (Online Appendix).

Primary Care Continuity. We assessed continuity in three ways: (1) Bice–Boxerman Continuity of Care (COC) Index; (2) total visits to a retail clinic or a PCP; and (3) the frequency of repeat visits with the same PCP. The COC Index measures the dispersion of care across providers: $COC = \left[\left(\sum_{j=1}^{s} n_j^2\right) - N\right]/[N(N-1)]$, where n_j is the number of visits with provider j and N is the total number of visits across all s providers. A score of 1 corresponds to perfect continuity and 0 to no continuity. We calculated the index using all PCP and retail clinic visits for all diagnoses for evaluation and management (CPT Codes 99201–99205 and 99211–99215) and health maintenance (CPT Codes 99381–7 and 99391–7). Because the COC index lacks meaningful interpretation with only one visit, we excluded patients with fewer than two visits in either the 365 days preceding or following the index visit. In sensitivity analyses, we recalculated the index including varying visit types and sites and, because the COC index can be less reliable with fewer visits, including only patients with at least three or four visits before and after the index visit (Appendix). We also measured a patient's total number of PCP and retail clinic visits for evaluation and management or health maintenance for any diagnosis, and having one, two, or three or more of these visits with the same PCP. We excluded from all continuity measures the index visit and follow-up visits for the problem treated at the index visit (defined as above). We included follow-up visits in sensitivity analyses (Online Appendix).

Preventive Care and Diabetes Management. We assessed (1) preventive health examinations; (2) screenings; and (3)

diabetes management. Preventive health examinations were defined as PCP visits for evaluation and management or health maintenance services with ICD-9 codes V20.2, V70.0, V70.3, V70.8, V70.9, or V72.3.[18,19] We calculated rates of screening for cervical cancer, breast cancer, colon cancer, and Chlamydia, and diabetes management using HEDIS specifications modified to apply to 365 day periods (Definitions in Appendix).[20]

Covariables

Our analyses account for patient-level (gender, age, chronic diagnoses) and area-level confounders (distance from the nearest retail clinic, Health Professional Shortage Area [HPSA] status, and median household income). We identified chronic diagnoses using ICD-9 criteria described by Charlson and Kuhlthau, using claims in the year preceding the index visit.[21,22] Median income and HPSA status for the ZIP Code Tabulation Area (ZCTA) including each patient's address were drawn from the 2006 Primary Care Service Area Data sets.[23] When no ZCTA was available (2.5 % of patients), we imputed a value from the closest neighboring ZIP code.

Statistical Analyses

To account for selection bias due to measurable and unmeasurable differences between patients who visited retail clinics versus PCPs, we used a "doubly robust approach" of difference-in-differences analyses with propensity score weighting.[24,25]

Propensity Score Weighting. For each patient, we generated a propensity score representing the probability of having an index visit at a retail clinic instead of a PCP, based on patient and area-level predictors, the index visit primary diagnosis, and PCP visit patterns in the 365 days preceding the index visit (Details in Online Appendix). Using these propensity scores, we weighted PCP patients so that they had a similar distribution to retail clinic patients for observed characteristics. Statistical modeling using these weights tested the effect of an index visit to a retail clinic instead of a PCP among patients who were equally as likely to have sought retail clinic care (i.e., average treatment effect on the treated).[26]

Difference-in-Differences Approach. We compared each outcome in the 365 days before and after the index visit. This difference-in-differences approach allowed each patient to serve as his or her own longitudinal control, further reducing the potential for bias due to selection and unobservable confounders. The interaction between index visit location (retail clinic versus PCP) and time (before

index visit versus after) estimated the effect of visiting a retail clinic instead of a PCP.

We fit regression models using functional forms appropriate to each outcome: linear for first-contact visits for simple acute care, total primary care visits, and the COC index, and logistic for the remaining outcomes. We adjusted for patient and area-level confounders and the primary diagnosis of the index visit and applied propensity score weights. We report the marginal effect of a retail clinic index visit, defined as the average difference in the predicted value of each outcome attributable to visiting a retail clinic instead of a PCP (Details in Online Appendix).[27]

Subgroup Analyses. We repeated these analyses among pediatric and adult patients, and patients with and without chronic diagnoses. Because the effect of retail clinic visits might vary by prior primary care exposure, in sensitivity analyses, we stratified by the number of PCP visits in the year preceding the index visit (Online Appendix).

To address the testing of multiple comparisons, we calculated the critical *p*-value that limited the false discovery rate to 5 %, and considered *p*-values below this threshold statistically significant.[28] All statistical analyses were performed using SAS (SAS Institute Inc., Cary, NC). The University of Pittsburgh and RAND Institutional Review Boards reviewed and exempted the study.

RESULTS

Study Cohort

The study cohort consisted of 23,023 patients with retail clinic index visits and 104,335 with PCP index visits (Online Appendix). Compared to those visiting PCPs, retail clinic patients were disproportionately female (62.6 % vs. 57.5 %), young adult (50.7 % vs. 34.2 % between ages 18 and 44), higher income (81.4 % vs. 74.8 % in highest three income quartiles), and healthy (90.0 % vs. 85.3 % with no chronic diagnoses). After applying propensity score weights, there were no significant differences in these characteristics (Table 1).

First-Contact Care for Simple Acute Conditions

We examined where patients initiated care for subsequent instances of simple acute conditions (i.e., first-contact care). In adjusted difference-in-differences analyses, visiting a retail clinic instead of a PCP for the index visit was associated with a 27.7 visits per 100 patients relative reduction in subsequent PCP visits for new simple acute conditions (*p*<0.001, retail clinic index visit: 26.6 visits per 100 patients before and 40.0 visits per 100 patients after; PCP index visit: 27.5 visits per

<div align="center">**Table 1. Patient Characteristics**</div>

Characteristic	As Sampled[*]			Propensity Score Weighted[†]		
	Retail Clinic Index Visit[‡]	PCP Office Index Visit[‡]	p value[§]	Retail Clinic Index Visit[‡]	PCP Office Index Visit[‡]	p value[§]
N, Patients	23,023	104,335		23,023	104,335	
Gender, %						
Female	62.6	57.5	<.001	62.6	62.6	.99
Male	37.4	42.5		37.4	37.4	
Age[‖],%						
<6years	4.5	13.5		4.5	4.5	
6-17 years	16.2	24.2	<.001	16.2	16.2	.99
18-44 years	50.7	34.2		50.7	50.8	
45-64 years	28.6	28.1		28.6	28.5	
Income Quartile[‖], %						
1st Quartile: $52,276 or Less	18.6	25.2		18.6	18.6	
2nd Quartile: $52,277 to $68,308	26.9	25.1	<.001	26.9	27.0	.99
3rd Quartile: $68,309 to $84,869	28.2	24.8		28.2	28.2	
4th Quartile: $84,870 or Greater	26.3	25.0		26.3	26.2	
Chronic Diagnoses[**], %						
None	90.0	85.3		90.0	90.0	
1 Diagnosis	6.4	8.2	<.001	6.4	6.4	.99
2+ Diagnoses	3.6	6.5		3.6	3.6	
Lives in Health Professional Shortage Area[††], %						
Yes	9.8	10.9	<.001	9.8	9.8	.95
No	90.2	89.1		90.2	90.2	
Distance from Home to Retail Clinic[‡‡], %						
Less than 1 mile (1.5 km)	53.2	31.3		53.2	53.3	
1 to 4.9 miles (1.6 to 7.9 km)	34.4	42.0	<.001	34.4	34.4	.99
5 to 9.9 miles (8.0 to 16.0 km)	9.7	17.0		9.7	9.7	
10 to 20 miles (16.1 to 32.2 km)	2.7	9.7		2.7	2.7	

[*]*Weighted only to account for sampling (i.e. by inverse of probability of selection)*
[†]*PCP Office Index Visit Patients weighted by "Average Treatment effect on the Treated" (ATT) propensity score weights*
[‡]*Some values do not sum to 100 % because of rounding*
[§]*Represents p-value from Chi Square test; Critical p-value= 0.031, allowing for a maximum false discovery rate of 5 %*
[‖]*At time of index visit*
[¶]*ZCTA median household income*
[#]*Using Charlson et al. and Kuhlthau et al.*
[**]*Majority of ZIP code corresponds to ZCTA with HPSA designation*
[††]*Measured via straight-line distances from retail clinic and patient address ZIP Code centroids*

100 patients before and 68.5 visits per 100 patients after) (Table 2). Visiting a retail clinic instead of a PCP for the index visit was associated with a 33.8 visits per 100 patients relative increase in subsequent retail clinics visits for new simple acute conditions ($p < 0.001$, retail clinic index visit: 36.6 visits per 100 patients after; PCP index visit: 2.8 visit per 100 patients after). Of note, by definition, neither had any retail clinic visits before the index visit.

Primary Care Continuity

Compared to PCP patients, retail clinic patients had relative reductions in all measures of primary care continuity. Subsequent to the index visit, retail clinic patients experienced a 10.9 percentage-point relative reduction in COC index scores, ($p < 0.001$; retail clinic: 54.4 % before and 44.7 % after; PCP: 54.7 % before and 55.8 % after) (Table 3). Smaller, but still significant, reductions were seen when the COC index was calculated using PCP visits only (1.5 percentage-points, $p = 0.024$) or excluding visits for

simple acute conditions treatable at retail clinics (3.3 percentage-points, $p < 0.001$) (Online Appendix).

Retail clinic patients experienced a 9.2 percentage-point relative reduction in having one or more visits for any reason with a PCP ($p < 0.001$; retail clinic: 69.6 % before and 74.8 % after; PCP: 69.6 % before and 84.0 % after) and a 10.5 percentage-point relative reduction in having two or more such visits with the same PCP ($p < 0.001$; retail clinic: 34.9 % before and 41.1 % after; PCP: 34.9 % before and 51.6 % after) (Table 3). Similar effects were observed in stratified analyses (Table 5).

Preventive Care

There were no differences between PCP and retail clinic patients' rates of preventive health examinations; screening for breast cancer, cervical cancer, colorectal cancer, or Chlamydia; or diabetes management, including hemoglobin A1c testing, eye examinations, LDL testing, and nephropathy care (Table 4). Among pediatric patients, retail clinic

Table 2. Associations Between Retail Clinic Visits and Site of First-Contact Visits for Simple Acute Conditions (Propensity Score Weighted, Adjusted, Differences-in-Differences Analysis)

Measure	Mean, %				
	Before Visit	**After Visit**	**Difference**	**Difference in Differences**	***p* value**[*,†]
Retail Clinic First-Contact Visits for Simple Acute Care, *per 100 patients*[‡]					
Retail Clinic Index Visit	0.0	36.6	36.6	33.8	<.001
PCP Office Index Visit	0.0	2.8	2.8		
PCP Office First-Contact Visits for Simple Acute Care, *per 100 patients*[‡]					
Retail Clinic Index Visit	26.6	40.0	13.4	-27.7	<.001
PCP Office Index Visit	27.5	68.5	41.0		
ED First-Contact Visits for Simple Acute Care, *per 100 patients*[‡]					
Retail Clinic Index Visit	3.0	3.0	0.03	0.5	.07
PCP Office Index Visit	3.4	2.9	-0.5		
Total First-Contact Visits for Simple Acute Care, *per 100 patients*[‡]					
Retail Clinic Index Visit	29.6	79.6	50.0	6.6	<.001
PCP Office Index Visit	30.9	74.2	43.4		

[*]*p-values correspond to significance level of (treatment*time) interaction coefficient via the Partial F-test*
[†]*Critical p-value= 0.031, allowing for a maximum false discovery rate of 5 %*
[‡]*First-contact visits for simple acute care defined as visits for the 11 simple acute conditions treatable at retail-clinics, excluding follow-up visits with the same 3-digit ICD-9 occurring within 21 days*

patients experienced a 5.7 percentage-point relative reduction in preventive health examinations ($p< 0.001$; retail clinic: 45.7 % before, 46.6 % after; PCP: 45.7 % before, 52.3 % after) (Table 5).

Sensitivity Analyses

In the Online Appendix we present additional methodological detail; unadjusted analyses; and sensitivity analyses in which we stratified patients by baseline PCP visits, varied

definitions of PCPs and follow-up care, and recalculated the COC Index with varying visit types and eligibility criteria.

DISCUSSION

Retail clinics visits are associated with adverse impacts on two aspects of primary care: compared to similar patients who visited PCPs, patients who visited retail clinics subsequently had less first-contact care and less continuity with PCPs. However, there were no associations

Table 3. Associations Between Retail Clinic Visits and Continuity of Care (Propensity Score Weighted, Adjusted, Differences-in-Differences Analysis)

Measure	Mean, %				
	Before Visit	**After Visit**	**Difference**	**Difference in Differences**	***p* value**[*,†]
Total Visits to PCP or Retail Clinic, per patient					
Retail Clinic Index Visit	1.8	2.6	0.7	-0.07	.002
PCP Office Index Visit	1.9	2.7	0.8		
Continuity of Care Index, including all PCP Office and Retail Clinic Visits[‡]					
Retail Clinic Index Visit	54.4	44.7	-9.7	-10.9	<.001
PCP Office Index Visit	54.7	55.8	1.2		
≥1 Visits with Any PCP in Year					
Retail Clinic Index Visit	69.6	74.8	5.2	-9.2	<.001
PCP Office Index Visit	69.6	84.0	14.4		
≥2 Visits with Same PCP in Year					
Retail Clinic Index Visit	34.9	41.1	6.2	-10.5	<.001
PCP Office Index Visit	34.9	51.6	16.7		
≥3 Visits with Same PCP in Year					
Retail Clinic Index Visit	17.5	21.9	4.5	-7.4	<.001
PCP Office Index Visit	17.4	29.3	11.9		

[*]*p-values correspond to significance level of (treatment*time) interaction coefficient via Partial F-test and Wald's Chi Squared test for linear and logistic regressions, respectively*
[†]*Critical p-value= 0.031, allowing for a maximum false discovery rate of 5 %*
[‡]*COC Index analyses exclude patients with fewer than two eligible visits in the 365-days before or after the index visit; Analyses include 7,906 patients with Retail Clinic Index Visits, and 59,395 patients with PCP Office Index Visits*

Table 4. Associations Between Retail Clinic Visits and Preventive Care (Propensity Score Weighted, Adjusted, Differences-in-Differences Analysis)

	Mean, %				
Measure	Before Visit	After Visit	Difference	Difference in Differences	*p* value[*,†]
Preventive Health Examination					
Retail Clinic Index Visit (N=23,023)	39.3	41.8	2.5	-0.5	.35
PCP Office Index Visit (N=104,335)	39.2	42.3	3.1		
Breast Cancer Screening					
Retail Clinic Index Visit (N=5,753)	45.5	47.0	1.5	-1.8	.13
PCP Office Index Visit (N=21,188)	44.9	48.2	3.3		
Cervical Cancer Screening					
Retail Clinic Index Visit (N=37,779)	51.7	54.7	2.9	-1.3	.16
PCP Office Index Visit (N=11,245)	49.5	53.7	4.2		
Colon Cancer Screening					
Retail Clinic Index Visit (N=3,657)	21.0	21.1	0.2	-1.1	.37
PCP Office Index Visit (N=16,236)	20.7	22.0	1.2		
Chlamydia Screening					
Retail Clinic Index Visit (N=442)	29.6	26.5	-3.2	-0.8	.81
PCP Office Index Visit (N=2,193)	28.7	26.3	-2.3		
Diabetic Patients, Hemoglobin A1c Testing					
Retail Clinic Index Visit (N=503)	76.7	72.5	-4.2	0.3	.96
PCP Office Index Visit (N=2,933)	74.8	70.3	-4.5		
Diabetic Patients, Eye Examination					
Retail Clinic Index Visit (N=503)	35.3	34.5	-0.8	0.8	.83
PCP Office Index Visit (N=2,933)	35.4	33.9	-1.6		
Diabetic Patients, LDL-Cholesterol Testing					
Retail Clinic Index Visit (N=503)	69.1	68.7	-0.4	1.2	.74
PCP Office Index Visit (N=2,933)	66.6	65.1	-1.5		
Diabetic Patients, Nephropathy Testing or Treatment					
Retail Clinic Index Visit (N=503)	64.2	62.6	-1.6	-4.9	.19
PCP Office Index Visit (N=2,933)	58.4	61.7	3.3		

[*]*p-values correspond to significance level of (treatment*time) interaction coefficient via Wald's Chi Squared test*
[†]*Critical p-value= 0.031, allowing for a maximum false discovery rate of 5 %*

between retail clinic visits and preventive care or diabetes management.

Given retail clinics' emphasis on convenience and patient satisfaction,[29,30] it may be unsurprising that patients who visited retail clinics were likely to go back to a retail clinic for subsequent acute problems. Retail clinic patients are generally healthy and so these visits represent a sizeable portion of their primary care visits; therefore, the observed modest decreases in continuity may also predictable. However, we also observed decreased continuity when excluding retail clinic visits and simple acute visits from our measures of continuity, suggesting that the negative impact on continuity is not solely due to a shift of simple acute visits from PCP offices to retail clinics.

The lack of association between retail clinic visits and preventive care is consistent with previous studies.[17] Retail clinics did not offer these services during the years we observed, so retail clinics could not provide these services in PCPs' stead. We cannot comment as to the impact of retail clinics' more recent scope of care expansions to include more preventive and chronic disease management services.[31,32]

Taken together, the interpretation of our findings depends on one's view on the relative importance of different aspects of primary care. Some might contend that continuity is the cornerstone of primary care and, therefore, retail clinics' negative impact on continuity is critical. Others might argue that continuity and first-contact care are less important than preventive care, especially for a healthy patient population. In this light, retail clinics' impact on primary care may not be as great as feared.

While the patients and concerns that lead them to seek care were similar, the ultimate content of index visits likely differed between the two sites. This was reflected in the evaluation and management billing codes: PCPs coded 92.4 % at the more complex 3–4 range, while retail clinics coded 99.4 % in the less complex 2–3 range. We sought to assess how such differences between retail clinic and PCP visits for similar concerns impacted subsequent primary care.

One concern with our study is how we measure continuity. We focus on visit-continuity, rather than informational-continuity; the latter results when a provider can marshal complete information regarding a patient's history.[33] The relative importance of visit-continuity versus informational-continuity in primary care is unclear, especially as primary care moves towards a team-based model. Information-continuity could be achieved if retail clinic notes were sent and incorporated into PCPs' records. However, we do not know whether this is common, and strategies to increase informa-

Table 5. Patient Subsets: Associations Between Retail Clinic Visits and Continuity of Care and Preventive Care (Propensity Score Weighted, Adjusted, Differences-in-Differences Analysis)

Measure	Mean, %					Mean, %				
	Before Visit	After Visit	Differ-ence	Difference in Differences	*p* value[†,‡]	Before Visit	After Visit	Differ-ence	Difference in Differences	*p* value[*,†]
By Chronic Diagnoses	**No Chronic Diagnoses**					**≥1 Chronic Diagnoses**				
Total Visits to PCP or Retail Clinic, per patient[‡]										
Retail Clinic Index Visit	1.7	2.5	0.8	-0.07	.003	3.2	3.5	0.3	-0.08	0.30
PCP Office Index Visit	1.7	2.6	0.9			3.4	3.7	0.4		
Continuity of Care Index, including all PCP Office and Retail Clinic Visits[§]										
Retail Clinic Index Visit	53.1	43.4	-9.7	-10.9	<.001	60.8	51.0	-9.7	-10.9	<.001
PCP Office Index Visit	53.2	54.4	1.2			61.6	62.8	1.2		
≥1 Visits with Any PCP in Year[‡]										
Retail Clinic Index Visit	67.4	73.6	6.1	-9.7	<.001	88.9	85.5	-3.4	-5.2	<.001
PCP Office Index Visit	67.4	83.3	15.8			88.9	90.7	1.8		
≥2 Visits with Same PCP in Year[‡]										
Retail Clinic Index Visit	31.9	39.2	7.2	-10.8	<.001	61.7	58.7	-2.9	-8.0	<.001
PCP Office Index Visit	31.9	50.0	18.1			61.6	66.7	5.1		
≥3 Visits with Same PCP in Year[‡]										
Retail Clinic Index Visit	15.1	20.4	5.3	-7.2	<.001	38.6	36.1	-2.5	-9.4	<.001
PCP Office Index Visit	15.1	27.5	12.4			38.6	45.5	6.9		
Preventive Health Examination[‡]										
Retail Clinic Index Visit	39.2	41.9	2.7	-0.8	0.17	40.1	41.4	1.3	1.5	0.34
PCP Office Index Visit	39.1	42.6	3.5			40.0	39.8	-0.2		
By Patient Age	**<18 Years Old**					**≥18 Years Old**				
Total Visits to PCP or Retail Clinic, per patient[‡]										
Retail Clinic Index Visit	1.8	2.5	0.6	-0.1	.004	1.8	2.6	0.8	-0.07	.011
PCP Office Index Visit	1.9	2.7	0.7			1.9	2.7	0.8		
Continuity of Care Index, including all PCP Office and Retail Clinic Visits[§]										
Retail Clinic Index Visit	59.3	47.5	-11.8	-12.4	<.001	53.2	44.0	-9.2	-10.4	<.001
PCP Office Index Visit	59.6	60.2	0.6			53.2	54.4	1.1		
≥1 Visits with Same PCP in Year[‡]										
Retail Clinic Index Visit	72.3	75.1	2.8	-11.9	<.001	68.9	74.7	5.8	-8.8	<.001
PCP Office Index Visit	72.4	87.1	14.7			68.8	83.4	14.6		
≥2 Visits with Same PCP in Year[‡]										
Retail Clinic Index Visit	35.0	40.0	5.0	-13.0	<.001	34.9	41.4	6.5	-10.0	<.001
PCP Office Index Visit	35.0	52.9	18.0			34.9	51.4	16.6		
≥3 Visits with Same PCP in Year[‡]										
Retail Clinic Index Visit	17.5	19.7	2.1	-9.6	<.001	17.4	22.5	5.1	-6.9	<.001
PCP Office Index Visit	17.4	29.2	11.7			17.4	29.4	12.0		
Preventive Health Examination[‡]										
Retail Clinic Index Visit	45.7	46.6	0.9	-5.7	<.001	37.6	40.6	3.0	0.3	.66
PCP Office Index Visit	45.7	52.3	6.6			37.5	40.2	2.7		

[*]p-values correspond to significance level of (treatment*time) interaction coefficient via Partial F-test and Wald's Chi Squared test for linear and logistic regressions, respectively
[†]Critical p-value = 0.031, allowing for a maximum false discovery rate of 5 %
[‡]N, patients for visit counts and preventive health examination: no chronic diagnoses 20,717 retail clinic and 88,629 PCP patients; ≥1 chronic diagnoses 2,306 retail clinic patient and 15,706 PCP patients; <18 years 4,751 retail clinic and 42,449 PCP patients; ≥18 years 18,272 retail clinic and 61,886 PCP patients
[§]N, patients for COC Index: no chronic diagnoses 6,540 retail clinic and 47,322 PCP Patients; ≥1 chronic diagnoses 1,366 retail clinic and 12,073 PCP patients; <18 years 1,571 retail clinic and 24,688 PCP patients; ≥18 years 6,335 retail clinic and 34,707 PCP patients

tional-continuity, such as regional health information organizations, have proven challenging to implement.[2,13,14,34,35] Nonetheless, policies that establish better communication and collaboration between retail clinics and PCPs seem justified if informational-continuity can compensate for reductions in visit-continuity.[14,36–38] Further, the practical significance of the 10.9 percentage-point decrease in the COC Index is unclear. Decreases in the COC Index are associated with lower quality and coordination of care, but the Index varies across patient populations and settings.[9,10,39–41] Additionally, we could not

assess whether a provider was a patient's perceived usual source of care; our claims-based approach and look-back period precluded reliable definition of such relationships. Lastly, lacking practice-level identifiers, we assess only within-provider continuity and cannot address within-practice continuity, be it among physicians alone or among physicians and mid-level providers.

Our study compared the care received by patients who visited a retail clinic to patients who visited a PCP. Yet, most patients who visit retail clinics lack PCPs and those with a PCP may

not be able to obtain a timely appointment. These patients may instead stay home, visit a nurse practitioner in the practice, or visit an ED.[29,42] Future work might compare patients who visit a retail clinic to those who do not seek care, who visit a nurse practitioner in a primary care practice, or who go to an ED.

Given the novelty of retail clinics and the data available, we focused on the short-term (12 month) impact of retail clinics. Future studies should assess the impact over the longer term. Over time, a more negative impact of retail clinics on preventive care or continuity may be observed, particularly among younger, healthy patients who infrequently visit PCPs and preferentially visit retail clinics.

Our study has other limitations. While we use propensity score methods and a difference-in-difference design to account for selection bias, concerns about unobservable confounders might remain. Because we only had access to health plan claims, we cannot assess preventive services, counseling, or disease management services only available in the medical chart. We concentrate on commercially insured patients, the majority of retail clinic users;[15,16] however, our findings may not be generalizable to publicly-insured or uninsured patients. Our study lacked direct measures of health outcomes and costs of care. Finally, the increase in simple acute visits following the index visit is largely an artifact of how we identified index visits and our focus on patients most likely to visit retail clinics. Defined as the first simple acute visit in 2008, index visits, by default, had some preceding period with no such care, while no such restriction applied to the post-period. In addition, we used propensity score methods to ensure that PCP patients' demographics and baseline visit patterns were similar to retail clinic patients': lower baseline-users of primary care services for whom a year-to-year increase was inherently more likely. The definitional restriction was consistently applied to both groups and they were well-matched on baseline simple acute care utilization; consequently, comparisons of subsequent utilization between the two are not undermined.

In conclusion, we find that when substituting for PCP visits, retail clinic visits are associated with negative impacts on first-contact for simple acute care and continuity, but not on preventive and chronic disease care.

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