

Clinical Research

# The Affordable Care Act Decreased the Proportion of Uninsured Patients in a Safety Net Orthopaedic Clinic

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Received: 19 July 2017 / Accepted: 17 November 2017 / Published online: 9 February 2018  
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## Abstract

**Background** The Patient Protection and Affordable Care Act (ACA) was approved in 2010, substantially altering the economics of providing and receiving healthcare services in the United States. One of the primary goals of this legislation was to expand insurance coverage for under- and uninsured residents. Our objective was to examine the

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Each author certifies that his institution approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research. This work was performed at Department of the Orthopaedic Surgery, Warren Alpert Medical School of Brown University, Rhode Island Hospital, Providence, RI, USA.

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effect of the ACA on the insurance status of patients at a safety net clinic. Our institution houses a safety net clinic that provides the dominant majority of orthopaedic care for uninsured patients in our state. Therefore, our study allows us to accurately examine the magnitude of the effect on insurance status in safety net orthopaedic clinics.

**Questions/purposes** (1) Did the ACA result in a decrease in the number of uninsured patients at a safety net orthopaedic clinic that provides the dominant majority of orthopaedic care for the uninsured in the state? (2) Did the proportion of patients insured after passage of the ACA differ across age or demographic groups in one state?

**Methods** We retrospectively examined our longitudinally maintained adult orthopaedic surgery clinic database from January 2009 to March 2015 and collected visit and demographic data, including zip code income quartile. Based on the data published by the Rhode Island Department of Health, our clinic provides the dominant majority of orthopaedic care for uninsured patients in our state. Therefore, examination of the changes in the proportion of insurance status in our clinic allows us to assess the effect of the ACA on the state level. Univariate and multivariable logistic regression analyses were used to determine the relationship between demographic variables and insurance status. Adjusted odds ratios and 95% CIs were calculated for the proportion of uninsured visits. The proportion of uninsured visits before and after implementation of the ACA was evaluated with an interrupted time-series analysis. The reduction in the proportion of patients without insurance between demographic groups (ie, race, gender, language spoken, and income level) also was compared using an interrupted time-series design.

**Results** There was a 36% absolute reduction (95% CI, 35%-38%;  $p < 0.001$ ) in uninsured visits (73% relative reduction; 95% CI, 71%-75%;  $p < 0.001$ ). There was an

immediate 28% absolute reduction (95% CI, 21%-34%;  $p < 0.001$ ) at the time of ACA implementation, which continued to decline thereafter. After controlling for potential confounding variables such as gender, race, age, and income level, we found that patients who were white, men, younger than 65 years, and seen after January 2014 were more likely to have insurance than patients of other races, women, older patients, and patients treated before January 2014.

**Conclusions** After the ACA was implemented, the proportion of patients with health insurance at our safety net adult orthopaedic surgery clinic increased substantially. The reduction in uninsured patients was not equal across genders, races, ages, and incomes. Future studies may benefit from identifying barriers to insurance acquisition in these subpopulations. The results of this study could affect orthopaedic practices in the United States by guiding policy decisions regarding health care.

**Level of Evidence** Level III, therapeutic study

## Introduction

The Patient Protection and Affordable Care Act (ACA) was approved in 2010, substantially altering the economic and insurance aspects of health care in the United States [23]. One of the primary objectives of this legislation was to expand insurance coverage for under- and uninsured residents. Although previous investigations have suggested that the ACA has improved access to health care, the ACA's effect on insurance status of patients presenting to orthopaedic safety net clinics has not been investigated [7, 20].

As the provider of the dominant majority of uninsured orthopaedic care in the state, our adult orthopaedic surgery clinic is a safety net clinic that cares for patients whose insurance status would most likely be affected by the ACA. The clinic is staffed by residents, subspecialty fellows, and attending surgeons. The clinic accepts patients who may be referred by primary care providers, the emergency department, or other providers, regardless of insurance status. Patients may be seen in either a general or specific subspecialty (spine, hand, foot and ankle, sports medicine, shoulder and elbow) clinic. If uninsured, the patient meets with the patient financial advocate to obtain some form of insurance coverage, if eligible (Medicaid, ACA type, or others). Their care, including surgical and nonsurgical options, is not affected by their insurance status. Waiting times for appointments are variable and depend on urgency and availability with an average of 3 months. Patients with or without insurance are followed longitudinally and are provided with comprehensive care. The purpose of this investigation was to explore the effect of the ACA on the payer mix of our safety net orthopaedic

surgery clinic. We aimed to examine the effect of the ACA on orthopaedic care for uninsured, low-income patients on the state level. Specifically, we asked: (1) did the ACA result in a decrease in the number of uninsured patients at one safety net orthopaedic clinic that provides the dominant majority of orthopaedic care for the uninsured in the state, and (2) did the proportion of patients insured after passage of the ACA differ across age or demographic groups in one state.

## Methods and Methods

In Rhode Island, charity care is defined as the delivery of free or discounted care for uninsured, low-income residents of the state [18]. According to the Rhode Island Department of Health, our health system provides USD 48.4 million of the total USD 64.9 million (74.6%) of charity care in our state [9]. The orthopaedic surgery clinic at our institution is the only clinic in this health system where un- or underinsured patients are referred for orthopaedic surgery interventions. A total of 9172 patients had 27,808 visits from January 2009 to March 2015. Before implementation of the ACA, more than 50% of visits to our clinic were from uninsured patients. Based on the data from the Rhode Island Department of Health, our clinic provides the dominant majority of orthopaedic care for uninsured patients in our state [9]. Therefore, examination of the change in the proportion of insurance status in our clinic allows us to assess the effect ACA on the state level.

After institutional review board approval, we retrospectively examined our longitudinally maintained adult orthopaedic surgery clinic database from January 2009 to March 2015. This database includes a range of demographic, referral, and clinic data, including type of insurance at the time of the patient's appointment. Insurance information was limited to the insurer and general plan classification; copays were not available. Demographic information included age, gender, race, preferred language, and home zip code. The median income by zip code for 2013 (the most recent year available) was obtained from the Internal Revenue Service, and this was linked to each patient's zip code and stratified into quartiles [12]. Visits were counted on a monthly basis.

Between January 2009 and March 2015, 9371 patients had 27,808 visits to the adult surgery clinic, of which 12,149 visits (43.7%) were not covered by insurance (Table 1). Of these patients, 3937 had greater than one visit. There was a mean of 371 patient visits per month (range, 243–496 visits), with some seasonal variation; the annual number of visits remained similar ( $p = 0.11$ ) (Table 2). The

**Table 1.** Demographics

| Demographic       | Number of visits in sample | Percent uninsured |
|-------------------|----------------------------|-------------------|
| Overall           | 27,808                     | 44                |
| Gender            |                            |                   |
| Male              | 16,394                     | 46                |
| Female            | 11,414                     | 40                |
| Race              |                            |                   |
| White             | 17,012                     | 44                |
| Nonwhite          | 10,796                     | 44                |
| Language          |                            |                   |
| English           | 17,104                     | 40                |
| Non-English       | 5741                       | 49                |
| Missing           | 4963                       |                   |
| Age group (years) |                            |                   |
| < 26              | 3959                       | 49                |
| 26-64             | 22,092                     | 45                |
| 65+               | 1757                       | 11                |
| Zip code income   |                            |                   |
| 1                 | 18,429                     | 44                |
| 2                 | 4330                       | 49                |
| 3                 | 1961                       | 53                |
| 4                 | 863                        | 57                |
| Missing           | 2225                       |                   |
| Visit date        |                            |                   |
| Pre-ACA           | 22,959                     | 50                |
| Post-ACA          | 4849                       | 14                |

ACA = Affordable Care Act.

median patient age was 44 years (range, 17-103 years). Fifty-nine percent of all clinic visits were from men, 61% of the patients were white, and 62% of the patients spoke English as the preferred language.

The proportion of insured visits was calculated for each demographic group (ie, race, gender, language spoken, and income level) before and after implementation of the ACA. The change in the proportion of insured visits was assessed using the chi-square test. Univariable and multivariable logistic regressions were used to determine the relationship between each demographic variable group and insurance status for each visit. Adjusted odds ratios (OR) and 95% CIs were calculated for the proportion of uninsured visits. An autoregressive interrupted time-series analysis was used to evaluate the effect of the ACA on the proportion of uninsured visits. The reduction in the proportion of uninsured among demographic groups also was compared using an interrupted time-series design. Unless otherwise noted, all data were analyzed by insurance status at each visit. For patients who had more than one visit, we determined if there was any change in their insurance status. We also determined the median monthly rates of patients changing insurance status. Statistical analyses were performed using SAS<sup>®</sup> statistical software, Version 9.4 (SAS Institute, Inc, Cary, NC, USA). Statistical significance was set at a probability less than 0.05.

**Results**

**Proportion of Patients Insured After Passage of the ACA**

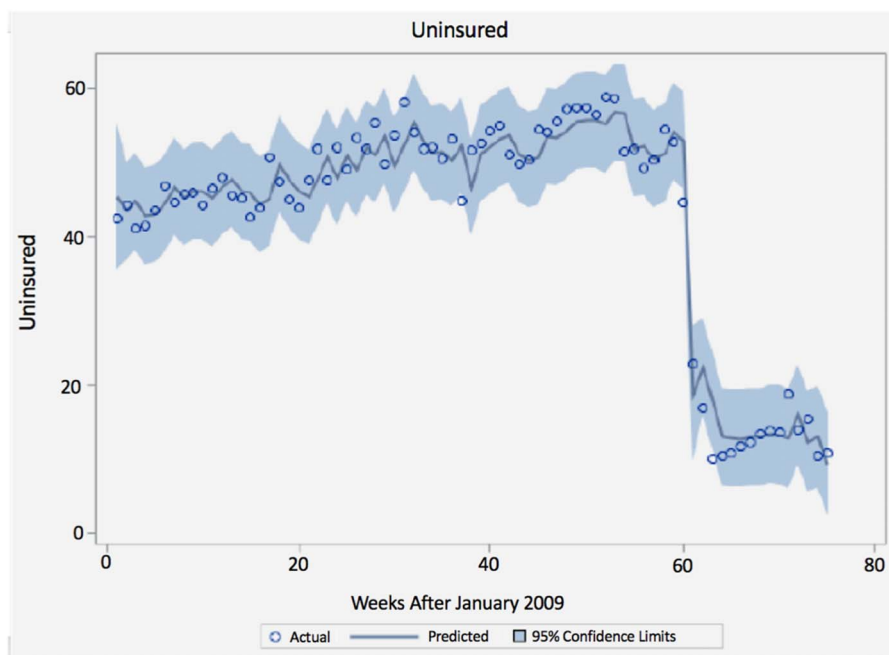
There was a substantial increase in the proportion of patients seen at our clinic who had insurance after passage of the ACA. Before implementation of the insurance provisions of the ACA in January 2014, nearly 4 years after the law was passed, patients with 50% of the overall visits (11,480 of 22,959 total visits) were uninsured. After implementation of these provisions, patients with 14% of visits (679 of 4849 total visits) were uninsured, representing a 36% absolute reduction (95% CI, 35%-38%;

**Table 2.** Number of visits per year

| Variable       | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total  |
|----------------|------|------|------|------|------|------|------|--------|
| Insured        | 2696 | 2519 | 2011 | 2113 | 2134 | 3475 | 711  | 15,659 |
| Percent        | 55   | 53   | 47   | 47   | 46   | 86   | 88   |        |
| Standard error | 0.7  | 0.7  | 0.8  | 0.7  | 0.7  | 0.5  | 1.2  |        |
| 95% CI         | 54   | 52   | 46   | 46   | 45   | 85   | 86   |        |
|                | 57   | 55   | 49   | 49   | 48   | 87   | 90   |        |
| Uninsured      | 2163 | 2224 | 2255 | 2351 | 2493 | 564  | 99   | 12,149 |
| Percent        | 45   | 47   | 53   | 53   | 54   | 14   | 12   |        |
| Standard error | 0.7  | 0.7  | 0.8  | 0.7  | 0.7  | 0.5  | 1.2  |        |
| 95% CI         | 43   | 45   | 51   | 51   | 52   | 13   | 10   |        |
|                | 46   | 48   | 54   | 54   | 55   | 15   | 14   |        |
| Total          | 4859 | 4743 | 4266 | 4464 | 4627 | 4039 | 810  | 27,808 |

**Table 3.** Percent reduction in uninsured visits after ACA implementation by patient demographic

| Variable                 | Pre-ACA          |              |      |         | Post-ACA         |              |      |             | Relative reduction            |      |         |                | p Value |          |         |
|--------------------------|------------------|--------------|------|---------|------------------|--------------|------|-------------|-------------------------------|------|---------|----------------|---------|----------|---------|
|                          | Number of visits | % Un-insured | SE   | 95% CI  | Number of visits | % Un-insured | SE   | 95% CI      | Absolute reduction (pre-post) | SE   | 95% CI  | (post-pre/pre) |         | SE       | 95% CI  |
| <b>Gender</b>            |                  |              |      |         |                  |              |      |             |                               |      |         |                |         |          |         |
| Female                   | 9422             | 45%          | 0.5% | 44%-46% | 1992             | 14%          | 0.8% | 12.8%-15.9% | 31%                           | 1.2% | 29%-33% | 68%            | 1.8%    | 65%-72%  | < 0.001 |
| Male                     | 13,537           | 53%          | 0.4% | 53%-54% | 2857             | 13%          | 0.6% | 12.0%-14.4% | 40%                           | 1.0% | 38%-42% | 75%            | 1.2%    | 73%-78%  | < 0.001 |
| <b>Race</b>              |                  |              |      |         |                  |              |      |             |                               |      |         |                |         |          |         |
| White                    | 14,322           | 50%          | 0.4% | 49%-51% | 2690             | 9%           | 0.6% | 8.0%-10.2%  | 41%                           | 1.0% | 39%-43% | 82%            | 1.1%    | 80%-84%  | < 0.001 |
| Nonwhite                 | 8637             | 50%          | 0.5% | 49%-51% | 2159             | 19%          | 0.9% | 17.7%-21.1% | 30%                           | 1.2% | 28%-33% | 61%            | 1.8%    | 57%-64%  | < 0.001 |
| <b>Language</b>          |                  |              |      |         |                  |              |      |             |                               |      |         |                |         |          |         |
| English                  | 13,498           | 48%          | 0.4% | 47%-49% | 3606             | 8%           | 0.5% | 7.2%-8.9%   | 40%                           | 0.9% | 38%-42% | 83%            | 1.0%    | 81%-85%  | < 0.001 |
| Non-English              | 4498             | 54%          | 0.7% | 53%-55% | 1243             | 30%          | 1.3% | 27.5%-32.6% | 24%                           | 1.6% | 21%-27% | 44%            | 2.5%    | 39%-49%  | < 0.001 |
| <b>Age group (years)</b> |                  |              |      |         |                  |              |      |             |                               |      |         |                |         |          |         |
| < 26                     | 3258             | 57%          | 0.9% | 56%-59% | 701              | 12%          | 1.3% | 10.0%-14.9% | 45%                           | 2.0% | 41%-49% | 78%            | 2.2%    | 74%-83%  | < 0.001 |
| 26-64                    | 18,319           | 52%          | 0.4% | 51%-52% | 3773             | 14%          | 0.6% | 12.8%-15.1% | 38%                           | 0.9% | 36%-39% | 73%            | 1.1%    | 71%-75%  | < 0.001 |
| 65+                      | 1382             | 11%          | 0.8% | 9%-13%  | 375              | 13%          | 1.8% | 9.9%-16.8%  | -2%                           | 1.9% | -6%-1%  | -23%           | 18.7%   | -60%-14% | 0.18    |
| <b>Zip-code income</b>   |                  |              |      |         |                  |              |      |             |                               |      |         |                |         |          |         |
| 1                        | 15,139           | 50%          | 0.4% | 49%-51% | 3290             | 15%          | 0.6% | 13.9%-16.4% | 35%                           | 0.9% | 33%-37% | 70%            | 1.3%    | 67%-72%  | < 0.001 |
| 2                        | 3641             | 56%          | 0.8% | 54%-57% | 689              | 13%          | 1.3% | 10.3%-15.3% | 43%                           | 2.0% | 39%-47% | 77%            | 2.3%    | 72%-82%  | < 0.001 |
| 3                        | 1693             | 59%          | 1.2% | 57%-61% | 268              | 15%          | 2.2% | 10.3%-18.8% | 45%                           | 3.1% | 38%-51% | 75%            | 3.7%    | 68%-83%  | < 0.001 |
| 4                        | 734              | 65%          | 1.8% | 62%-69% | 129              | 9%           | 2.6% | 4.2%-14.4%  | 56%                           | 4.3% | 47%-64% | 86%            | 4.0%    | 78%-94%  | < 0.001 |
| Overall                  | 22,959           | 50%          | 0.3% | 49%-51% | 4849             | 14%          | 0.5% | 12.7%-14.6% | 36%                           | 0.8% | 35%-38% | 73%            | 1.0%    | 71%-75%  | < 0.001 |



**Fig. 1** An interrupted time-series analysis of the fraction of patients with no health insurance, by month, during the study period is shown.

$p < 0.001$ ) and 73% relative reduction (95% CI, 71%-75%;  $p < 0.001$ ) in uninsured patient visits (Table 3). Notably, interrupted time-series analysis showed that the uninsured patient visits had been increasing by 1.6 percentage points per year before ACA implementation in January 2014 (Fig. 1). In contrast, after implementation, the uninsured patient visits continued to decrease by 13.3 percentage points per year (Fig. 1).

Differential Effects of the ACA by Age, Gender, and Ethnicity/Race

After controlling for potentially confounding variables such as gender, age group, race, and zip code income, patients who were younger (younger than 26 years: OR, 9.4 [95% CI, 7.5-12.0]; 26-64 years: OR, 6.6 [95% CI, 6.0-7.3]; 65+ years: OR, 0.8 [95% CI, 0.6-1.1];  $p < 0.001$ ), men (women/men: OR, 0.7; 95% CI, 0.5-0.8;  $p < 0.001$ ), white (white/nonwhite: OR, 2.5; 95% CI, 2.1-3.0;  $p < 0.001$ ), and who lived in the highest income quartile zip code (level 1 [lowest income]: OR, 5.6 [95% CI, 5.1-6.2]; level 2: OR, 8.5 [95% CI, 6.7-10.7]; level 3: OR, 8.5 [95% CI, 6.0-12.0]; level 4: OR, 18.3 [95% CI, 9.9-33.8];  $p < 0.001$ ) were more likely than their counterparts to become insured during this time.

Other Findings

Of the 792 patients (9%) who were seen multiple times and changed their insurance status between visits, 621 (78% of those who switched) became insured, whereas 171 patients (22%) became uninsured. Beginning in January

2014, after implementation of the major provisions of the ACA, the increase in patients newly insured was higher than it was before (18 patients per month versus 8.7 patients per month, or 4.8% and 2.4% of monthly visits) (Fig. 1). Of the approximately 370 patients seen monthly, this fraction of current patients who became insured was relatively small. Therefore, the majority of the decrease in uninsured clinic visits was the result of new patients who presented to the clinic with insurance rather than those who switched between visits.

Discussion

The primary objective of the ACA was to “make coverage more secure for those who have insurance, and extend affordable coverage to the uninsured” [23]. Federal, state, and local governments have used numerous policy levers to achieve this objective, including establishing and expanding insurance marketplaces, providing premium tax credits and other cost-sharing assistance, expanding Medicaid coverage, empowering organizations to provide outreach and enrollment assistance, mandating the purchase of insurance coverage, and more [23]. We aimed to examine the effect of the ACA on orthopaedic care for uninsured, low-income patients on the state level. Specifically, we asked: (1) did the ACA result in a decrease in the number of

uninsured patients at one safety net orthopaedic clinic that provides the dominant majority of orthopaedic care for the uninsured in Rhode Island, and (2) did the proportion of patients insured after passage of the ACA differ across age or demographic groups in one state. We found that there was a substantial increase in the proportion of patients seen at our clinic who had insurance after passage of the ACA. After controlling for potentially confounding variables such as gender, age group, race, and zip code income, patients who were younger (younger than 26 years), men, white, and who lived in the highest (level 4) income quartile zip code were more likely than their counterparts to become insured during this time.

There are some limitations to this study. First, although our clinic is the safety net clinic in the state that provides a dominant majority of all aspects of orthopaedic care, there is no obligation to seek care here, and our database is not an all-inclusive registry. Therefore, there inevitably will be loss to followup. This data loss is potentially most serious as patients may become insured and seek care elsewhere, although this may be mitigated because the total number of annual visits was relatively consistent, which suggests that the number of available appointments was the limiting factor. Furthermore, Rhode Island has the lowest Medicaid reimbursement rate in the United States [21]. Given that ACA is a Medicaid expansion, ACA policies offer similar reimbursement rates, which substantially discourages provider acceptance of the patients with these policies [16]. This is another factor that likely caused our clinic population to remain captured even after the patients obtained ACA insurance. Second, although our study examines the effect of the ACA on orthopaedic care for low-income, uninsured patients in our state, it is not possible to definitively say that our results are generalizable to other states. Each state has a considerable influence on the access to care afforded by insurance made available through the ACA depending on reimbursement rates and the extent to which providers participate. Third, our database does not track patient outcomes, but rather insurance status as a process measure of ACA success. Therefore, we did not examine the effect of increased access to health insurance on outcomes of orthopaedic interventions. Currently, there is no consensus regarding the effect of access to health insurance on health outcomes. Although a previous study [4] showed that improving access to health care is not associated with improve health outcome, other studies suggest otherwise [1, 11]. Fourth, it is impossible to know the precise fraction of income that patients spend on health care and therefore to determine who is “underinsured” [8]. A counterintuitive result from our study is that patients residing in the wealthiest zip codes were the least likely to be insured before implementation, although these patients benefitted disproportionately, eventually having a higher proportion of insured than those in the

lowest three quartiles. Further study is needed regarding the effect of the ACA on the financial viability of such safety net clinics, especially given the changing funding mechanisms and their abilities to change capacity to meet patient demand.

Studies regarding the ACA have shown improved access to care, with up to an 11% decrease in the likelihood of being uninsured, and suggested the possibility of health improvements [7, 20]. The US Census Bureau’s Small Area Health Insurance Estimates showed that the proportion of uninsured people decreased from 13% in 2009 to 7% in 2016, a 7% absolute reduction (and 50% relative reduction) [22]. From 2013 to 2014, across the period of ACA implementation, the fraction of uninsured patients in Rhode Island declined from 13% to 9%, representing an almost 30% decrease [24]. After the ACA was implemented, more patients were likely to become insured after a visit at our clinic, despite the similar volume of appointments. Although patient financial advocates and education programs helped connect patients with insurance, these programs became more successful after ACA implementation. Interestingly, after implementation of the ACA, the fraction of uninsured patients continued to decrease, suggesting the full effects had not been realized by the end of 2015. The proportion of our clinic’s uninsured patient visits decreased more dramatically, with a 36% absolute reduction and 73% relative reduction. A previous study showed improving access to health care is associated with improved health outcomes in patients with nonorthopaedic conditions like HIV [2]. Future studies should examine the effect of increased access to care on health outcomes of orthopaedic interventions.

Although evidence generally suggests that the ACA led to a higher proportion of patients with insurance coverage, the effect of the ACA on health insurance may vary with socioeconomic status and other demographic characteristics [3, 5, 15]. For example, Hispanics may be less likely to have employer-sponsored health insurance, which may be associated with lower income, immigration status, and a higher likelihood of having a part-time job in which the employer did not offer an insurance plan [5]. Although the ACA specifically sought to address these disparities, the effect of the ACA remains mixed. An investigation examining the effect of the ACA revealed that young Hispanic adults (ages 19-25 years) did not benefit from implementation of the ACA at the rate at which they obtained dependent insurance coverage in comparison to young white adults [5]. In our study, patients who were 26 years old or younger, men, and English speakers were more likely to be insured across all times, and patients who were young, white, men, and lived in a wealthier zip code became insured disproportionately higher during the time of ACA implementation as compared with their counterparts. There are numerous possible reasons for these differences between



groups, including financial, logistic, language, and educational barriers [3, 6, 10, 13, 14, 19]. Although increasing insurance access is only one component of efforts to improve the incredibly complex system of health care in the United States, other aspects of the ACA seek to overcome barriers and improve the quality of and access to care.

The direction of health policy and insurance markets in the United States remains unclear. Although the ACA resulted in a dramatic reduction in uninsured patients in the United States, legislators have highlighted the limitations of the ACA, and want reform of the ACA [17]. Regardless of the perceptions of the quality of the insurance policies that stemmed from the ACA, a previous study showed that improving access to health care is associated with improved health outcomes in patients [2]. We recognize that these benefits may not translate to surgical specialty care. However, we believe that improved access to care is a step in the right direction and must be recognized as discussion regarding healthcare reform ensues. Future investigations should examine the effect of the ACA on the quality of orthopaedic care that is supported by ACA insurance. If the ACA is repealed, studies regarding its effect on the proportion of patients who can access healthcare should be evaluated.

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