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## Hospitalization rates among persons with HIV who gained Medicaid or private insurance after the Affordable Care Act in 2014

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### Abstract

**Background:** It is unknown whether gaining inpatient healthcare coverage had an effect on hospitalization rates among persons with HIV (PWH) following implementation of the Affordable Care Act (ACA) in 2014.

**Methods:** Hospitalization data from 2015 were obtained on 1634 adults receiving longitudinal HIV care at 3 U.S. HIV clinics within the HIV Research Network. All patients were engaged in care and previously uninsured and supported by the Ryan White HIV/AIDS Program (RWHAP) in

2013. We evaluated whether PWH who transitioned to either Medicaid or private insurance in 2014 tended to have a change in hospitalization rate compared to PWH who remained uncovered and RWHAP-supported. Analyses were performed by negative binomial regression with robust standard errors, adjusting for gender, race/ethnicity, age, HIV risk factor, CD4 count, viral load, clinic site, and 2013 hospitalization rate.

**Results**—Among PWH without inpatient healthcare coverage in 2013, transitioning to Medicaid (adjusted incidence rate ratio 1.26, [0.71,2.23] or to private insurance (0.48[0.18, 1.28]) in 2014 was not associated with 2015 hospitalization rates, after accounting for demographics, HIV characteristics, and prior hospitalization rates. The factors significantly associated with higher hospitalization rates include age 55–64, CD4 <200 cells/ $\mu$ L, viral load >400 copies/mL, and 2013 hospitalization rate.

**Conclusions:** Acquiring inpatient coverage was not associated with a change in hospitalization rates. These results provide some evidence to allay the concern that acquiring inpatient coverage would lead to increased inpatient utilization.

### Keywords

HIV; hospitalizations; Affordable Care Act

### Introduction:

Following implementation of the Affordable Care Act (ACA) in 2014, many persons with HIV (PWH) who were previously uninsured but nevertheless consistently engaged in outpatient HIV care through support from the Ryan White HIV/AIDS Program (RWHAP) gained inpatient healthcare coverage when they transitioned to Medicaid or private insurance. While the RWHAP annually supports over 500,000 insured and uninsured PWH to access ambulatory HIV care in various ways, it does not pay for inpatient care. In 2014, in our multisite longitudinal HIV cohort, 54% of uninsured PWH in Medicaid expansion state sites (about 15% of the total cohort in these sites) transitioned from relying completely on RWHAP support to Medicaid coverage. In Medicaid non-expansion state sites, 2–3% of uninsured patients transitioned from relying completely on RWHAP support to Medicaid, presumably through qualifying disabilities, and a similar number transitioned to private insurance<sup>1</sup>. All PWH who transitioned to Medicaid or private insurance gained inpatient coverage.

Medicaid coverage has previously been associated with greater than 60% higher hospitalization rates than RWHAP-supported uninsured status or private coverage<sup>2,3</sup>. Thirty-day hospital readmissions were also more common among PWH with Medicaid, even after adjusting for multiple factors in a Texas study<sup>4</sup> as well as in multi-center studies<sup>5–7</sup>. Accordingly, we hypothesized that acquiring inpatient coverage may be associated with an increased rate of hospitalization.

In this study, we evaluated whether PWH who transitioned from uncovered and RWHAP-supported status to either Medicaid or private insurance in 2014 tended to have a change in hospitalization rate compared to PWH who remained uncovered and RWHAP-supported.

## Methods:

### Data Source

The HIVRN is a prospective open cohort study based at 12 adult and 6 pediatric HIV care sites in the U.S.<sup>8</sup> Adult sites with incomplete healthcare coverage and/or hospitalization data, location in a state (NY or MA) that previously expanded Medicaid, and pediatric sites were excluded, leaving three sites (2 in Medicaid expansion states, 1 in a non-expansion state). Institutional review boards at each site and at the data coordinating center at Johns Hopkins University approved the study.

We included patients 18–64 years-old who were actively engaged in care from 2012 through 2015 and were enrolled in RWHAP and without other coverage in 2013. Engagement in care was defined as having at least 1 HIV provider visit and 1 CD4 measurement each year. We excluded patients with Medicare since coverage generally remains lifelong, once enrolled.

### Variables

**Exposure**—The exposure of interest was a change in healthcare coverage in 2014. All patients were RWHAP-supported in 2013 without other coverage and were then classified according to the primary coverage reported on billing records at the final 2014 HIV provider visit (remained uncovered and RWHAP-supported, transitioned to Medicaid, transitioned to private). Those who changed coverage in 2015 were excluded to ensure that we were observing the effect of only a single change in coverage. Patients who received financial assistance through RWHAP to pay for private insurance were classified as private.

**Outcome**—Our primary outcome was the number of hospitalizations in 2015 per 100 person years (PY). All hospitalizations in the hospitals associated with the outpatient sites were included. Because patients transitioned coverage throughout 2014, we studied hospitalizations for 2015 and not 2014.

**Other Variables**—Gender, race/ethnicity, age (assessed on July 1, 2015), HIV risk factor, first CD4 count in 2015, and first viral load in 2015 were assessed and categorized as shown in Table 1. Each patient's hospitalization rate in 2013 was included to control for one's prior hospital utilization behaviors. Clinical site was included to control for any site or state-specific confounders that may affect hospitalizations. We suppressed site coefficient results in the table because of HIVRN cohort agreement, which prohibits revealing site identities.

### Analysis

The primary objective was to evaluate differences in 2015 hospitalization rates between patients who remained uncovered in RWHAP, transitioned to Medicaid, and transitioned to private. Analyses were carried out on the PY level. We evaluated incidence rate ratios for hospitalization in 2015 using a negative binomial regression model with robust standard errors, adjusting for gender, race/ethnicity, age, HIV risk factor, CD4 count, viral load and clinic site. Since we anticipated that prior hospitalizations would be associated with future hospitalizations, we also controlled for the number of hospitalizations in 2013 (when all

patients had only RWHAP-uncovered status). Analyses were performed using Stata 14 (StataCorp) with an  $\alpha$  value of 0.05.

### Diagnoses

Using ICD-9 codes, we assigned hospitalizations to one of 20 diagnostic categories (AIDS defining illness, cardiovascular, etc.) according to previously published methods<sup>9–11</sup> that were based on AHRQ's Clinical Classification Software<sup>12</sup>. Any ICD-10 codes were back-coded to ICD-9 and grouped accordingly. Within diagnostic categories, we combined similar diagnoses into clinically-meaningful groupings, e.g. ICD codes for cellulitis at various body sites grouped as "cellulitis".

### Results:

Of 1634 patients who were uncovered and RWHAP-supported in 2013, 352 (21.5%) transitioned to Medicaid and 108 (6.6%) to private insurance, while 1174 (71.8%) remained uncovered and RWHAP-supported in 2014–2015.

Patients who transitioned to Medicaid were more likely to be female, White or Black, older, have IDU, lower CD4 count, and unsuppressed viral load, while those who transitioned to private insurance were more likely to be White or Black, older, and virally suppressed compared to those who remained uncovered and RWHAP-supported (Supplementary Table 1).

The 2013 hospitalization rate was much higher for those who transitioned to Medicaid (21.3 hospitalizations/100PY) compared to both those who remained uncovered and RWHAP-supported (8.4 hospitalizations/100PY) and those who transitioned to private insurance (7.4 hospitalizations/100PY). In 2015, all three groups experienced declines in unadjusted hospitalization rates (20.2, 6.3, and 3.7, respectively for Medicaid, Uncovered/RWHAP-supported, and private) (Figure 1).

After accounting for 2013 hospitalization rates and other cofactors (including clinical site), the transitions to Medicaid (multivariate IRR 1.26, 95% CI 0.71–2.23) or to private insurance (0.48, 95% CI 0.18, 1.28), when compared to those who remained uncovered and RWHAP-supported, were not significantly associated with 2015 hospitalization rates in the multivariate model (Table 1). Other factors significantly associated with higher hospitalization rates include age 55–64, CD4 <200 cells/ $\mu$ L, viral load >400 copies/mL, and 2013 hospitalization rate.

### Sensitivity Analysis

Some of the hospitalizations measured in 2015 would have preceded the first CD4 (median 74 days [interquartile range 35–123] from 1/1/2015 to first CD4 measurement) and viral load (71 [34–123]) in 2015. To address this, we performed a sensitivity analysis substituting the final CD4 and HIV RNA measures of 2014 (similar distribution of intervals prior to 1/1/2015). Results (not shown) were unchanged from the primary analysis.

## Diagnoses

The top diagnostic categories for hospitalizations in 2013 and 2015 combined were non-AIDS defining infections (20.3%), renal/genitourinary (12.1%), endocrine (9.7%), and AIDS-defining illnesses (9.4%) (Supplementary Table 2). When stratified by year and 2015 insurance status, non-AIDS defining infections remained the most common reasons for hospitalization in 2013 and 2015 across all groups except for those who transitioned to private insurance (Supplementary Table 3).

## Discussion:

In our study population, transitioning from uncovered and RWHAP-supported to Medicaid or private insurance in 2014 was not associated with 2015 hospitalization rates. These data show that gaining inpatient coverage does not appear to increase inpatient utilization among PWH, as we had hypothesized. Instead, there were pre-existing differences in hospitalization rates, likely reflecting unmeasured chronic illnesses and/or socioeconomic factors among the three groups even though they were all uncovered and RWHAP-supported in 2013. Those who transitioned to Medicaid in 2014 had much higher hospitalization rates even in 2013. The lack of association between hospitalizations and gaining Medicaid coverage is consistent with overall trends among the general population which have shown insignificant changes in overall hospitalizations in 2013 and 2014 in Medicaid expansion and non-expansion states<sup>13</sup>. However, our findings are unique in isolating a specific population of PWH, all of whom had no inpatient coverage prior to 2014. While not significant in adjusted analysis, the 50% decrease in crude hospitalization rate among those who transitioned to private is intriguing and worthy of future studies. One possibility is that healthier people would tend to become employed and thus gain private insurance.

In addition, the RWHAP has been shown to have excellent outcomes in HIV retention in care<sup>14</sup> and viral suppression<sup>14,15</sup>, which may explain why a change in coverage may not have been associated with increased hospitalization rates. Furthermore, patients who transitioned to Medicaid remained eligible for RWHAP's essential support services including case management and transportation. This likely buffered the effects of coverage transitions and may partially explain our findings. The role of the RWHAP remains vital, not only in the direct provision of medical care, but also in helping PWH navigate structural and health policy changes, especially as the future of the ACA and Medicaid expansion is uncertain. The RWHAP also provides critical access to HIV medications through the AIDS Drug Assistance Program (ADAP), for PWH with and without coverage, which has been associated with improved virologic suppression<sup>16,17</sup>. Finally, patients with RWHAP coverage may also be enrolled in locally-sponsored indigent care programs that provide subsidies for inpatient care, which may explain why a change in coverage may not significantly impact hospitalization rates.

Our study has some limitations. Our sample size may limit the ability to identify associations. Moreover, we only had 3 clinical sites. However, we adjusted for site in our model to account for any site-specific differences or local trends. We are unaware of any local policies or changes that may explain differential findings by coverage category. A larger number of sites is needed to conclusively demonstrate if the findings may differ in

states with and without Medicaid expansion. Additionally, our hospitalization data were limited to the health system hospitals affiliated with our HIVRN clinical sites. Prior work has shown that 73–91% of hospitalizations among clinical cohort patients occur within the affiliated academic hospitals, and non-health system hospitalizations do not differ by demographic characteristics<sup>4,11,18</sup>. Furthermore, we do not have reason to expect that missing hospitalization data from outside institutions would alter any pattern associated with coverage transitions. Finally, our findings may not be generalizable to all PWH since our study only included those consistently engaged in care before 2014 to isolate the effect of the actual change in insurance on hospitalization rates. Whether hospitalization rates differ based on healthcare coverage among those with a new diagnosis of HIV or returning to care in the immediate post-ACA period is unknown.

In sum, our study found that patient characteristics and prior healthcare utilization were significant predictors of hospitalization rates and that acquiring inpatient coverage was not associated with a change in hospitalization rates. These results may allay the concern from HIV providers and policy makers that acquiring inpatient coverage would result in increased inpatient utilization. They also reinforce the important ongoing role of the RWHAP in providing comprehensive medical and support services for PWH across the United States.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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HIVRN Details

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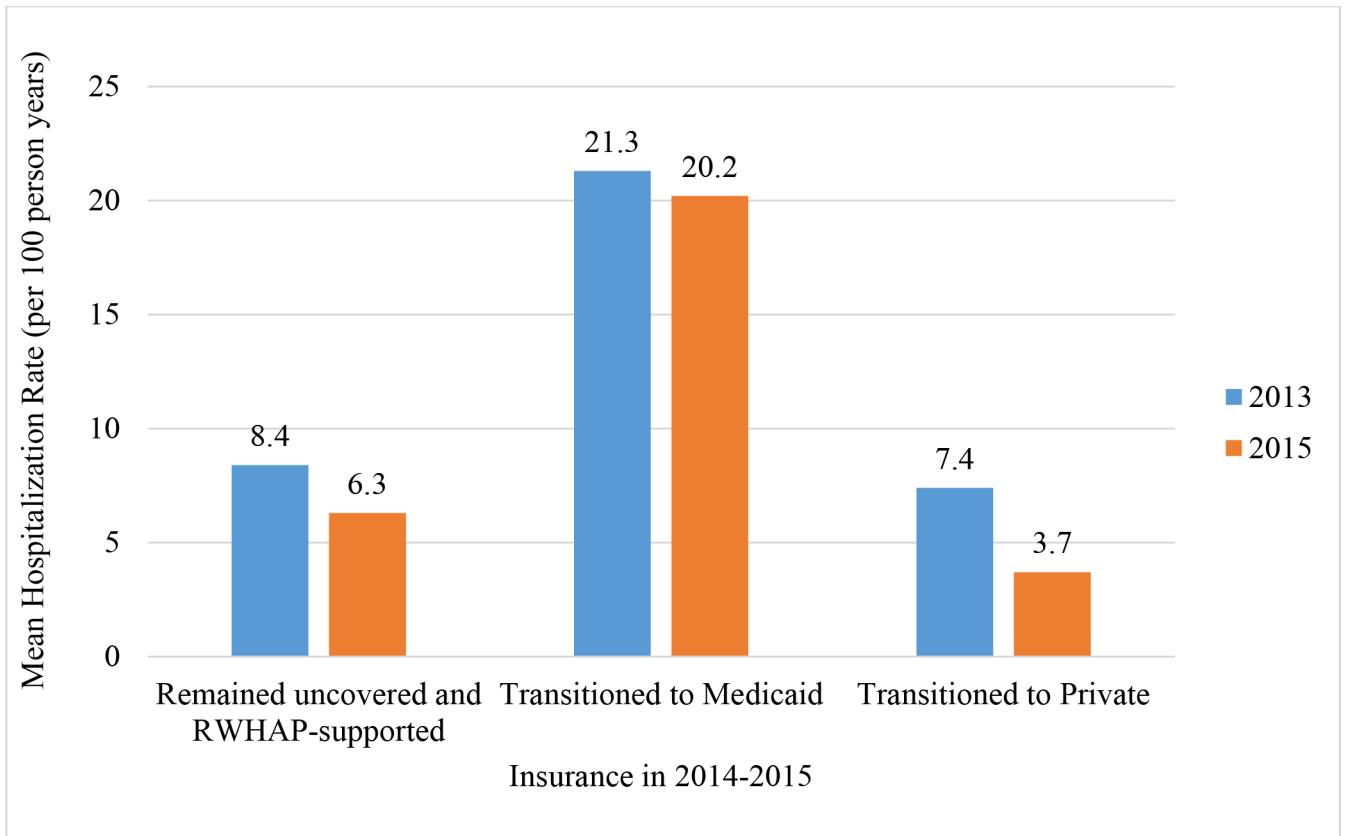
All other authors report no potential conflicts.

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**Figure 1:** Mean Hospitalization Rates in 2013 and 2015. This figure depicts changes in mean hospitalization rates between 2013 and 2015, stratified by 2014–2015 insurance status. Abbreviations: RWHAP, Ryan White HIV/AIDS Program.

**Table 1:**  
Factors Associated with 2015 Hospitalization (n=1634)

Characteristic	Univariate IRR (95% CI)	Multivariate IRR (95% CI)
Insurance in 2014 and 2015		
Remained uncovered and RWHAP-supported	ref	ref
Transitioned to Medicaid	3.20 (1.94–5.29)	1.26 (0.71–2.23)
Transitioned to Private	0.59 (0.21–1.62)	0.48 (0.18–1.28)
# of hospitalizations, 2013 <sup>a</sup>	2.85 (1.94–4.19)	1.97 (1.44–2.68)
Gender		
Female	ref	ref
Male or transgender	1.37 (0.84–2.23)	0.86 (0.47–1.58)
Race/ethnicity		
White or other	ref	ref
Black	1.33 (0.76–2.34)	1.19 (0.62–2.27)
Hispanic	0.60 (0.31–1.17)	0.83 (0.40–1.72)
Age		
18–34	ref	ref
35–44	0.90 (0.38–2.14)	0.91 (0.45–1.83)
45–54	1.32 (0.68–2.57)	1.51 (0.75–3.07)
55–64	2.15 (1.04–4.43)	2.18 (1.08–4.41)
Risk factor		
Heterosexual or other	ref	ref
IDU	2.28 (1.14–4.57)	1.77 (0.68–4.60)
MSM	1.40 (0.84–2.33)	1.68 (0.92–3.05)
CD4 count (cells/μL)		
<200	7.09 (3.92–12.83)	5.00 (2.60–9.61)
200–499	1.51 (0.86–2.65)	1.26 (0.71–2.22)
500	ref	ref
Viral Load (copies/mL)		
400	0.26 (0.16–0.44)	0.55 (0.32–0.94)
>400	ref	ref

We estimated the relationship between insurance coverage and 2015 hospitalizations using a Negative binomial regression model with robust standard errors. The multivariate model included all covariates listed in the table. We also controlled for HIV Research Network clinical site but suppressed results per the cohort data use agreement.

<sup>a</sup>The number of hospitalizations is a continuous linear variable

Abbreviations: IRR, Incidence Rate Ratio; CI, Confidence Interval; RWHAP, Ryan White HIV/AIDS Program; MSM, men who have sex with men; IDU, Injection drug use.