

Multi-centered Evaluation of an Acute Respiratory Tract Infection Audit-Feedback Intervention: Impact on Antibiotic Prescribing Rates and Patient Outcomes

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Abstract

Background: Audit-feedback of antibiotic prescribing rates for acute respiratory infections (ARIs) is a promising approach to reduce antibiotic use; however, the generalizability and sustainability are unknown. We describe an audit-feedback intervention and outcomes across multiple seasons in different clinic settings.

Methods: Two VA Medical Centers distributed audit-feedback reports targeting providers with frequent ARI visits in emergency department (ED) and primary care (PC) during 2015-16 and 2016-17. An academic detailing visit delivered by local peers accompanied the initial audit-feedback report. The intervention was expanded to ED and PC clinics (n=10) in three other VA facilities in 2017-18. Outcomes included rates of antibiotics prescribed, recurrent visits for ARIs within 30 days, and adverse events. We assessed intervention sustainability in initiating VAs, and intervention generalizability in expansion VAs. Mixed-effect logistic regression models were used to assess intervention effect on antibiotic prescribing and outcomes.

Results: Antibiotic prescribing for uncomplicated ARI visits (n=7,814) declined from 53.8% to 27.9% post intervention. The intervention was associated with a reduction in odds of prescribing antibiotics in initiating facilities (Odds Ratio [OR] 0.6 [95% CI 0.3, 0.9]), which declined further with an annual OR 0.8 [95% CI 0.7, 1.1] per year. Preliminary 6-month post-intervention results were available from pilot clinics (n=3) within two of the expansion VAs, which indicated similar effectiveness (OR 0.5 [0.4, 0.7]). Recurrent visits for ARIs (8.2% vs. 8.6%, p=0.14) and adverse events (2.3% vs. 2.1%, p=0.90) were not different pre/post intervention. Receipt of an antibiotic was not associated with recurrent visits for ARI (8.6% vs. 8.0%, p=0.45) or adverse events (1.9% vs. 1.7%, p=0.11).

Conclusion: An audit-feedback intervention sustained a reduction in antibiotic prescribing for ARIs over three years, and resulted in similar reductions in antibiotic use in varied ED and PC settings without affecting ARI-related return visit rates.

Introduction

Acute respiratory tract infections (ARI), including rhinosinusitis; pharyngitis; bronchitis and colds (URI-NOS), are among the most common illnesses diagnosed within outpatient settings. ARIs often have a viral etiology and antibiotics are indicated in a minority of cases. Antibiotic overprescribing is common, and provider-directed interventions such as audit-feedback and academic detailing have been demonstrated to reduce unnecessary antibiotic use.^{1,2} Limited data characterize the sustainability, generalizability, and impact of these interventions on patient benefits or harms. We implemented a provider-directed intervention designed to reduce unnecessary antibiotic prescribing for ARIs in diverse primary care (PC), urgent/episodic, and emergency care (ED) settings across four regions in the US. Intervention impact on antibiotic utilization and patient outcomes are reported

Method

This intervention began in two VA Medical Centers that distributed audit-feedback reports targeting providers with frequent ARI visits in ED and PC settings during 2015-16 and 2016-17. An academic detailing visit delivered by local peers accompanied the initial audit-feedback report. The intervention was continued in 2017-18 and expanded to ED and PC clinics (n=10) in three other VA Medical Centers in 2017-18. ARIs were identified by ICD9 and ICD10 diagnostic codes. Patient with complicated ARIs were excluded from intervention and analysis.³ Definitions for appropriate therapy was based upon guideline recommendations.^{4,5}

Figure 1. Intervention Components



Analysis

Data from January 2014 through June 2018 were extracted from the VA Corporate Data Warehouse.

Aggregate antibiotic prescribing, appropriate prescribing, and patient outcomes were assessed pre/post intervention: 30-day ARI-related return visits, 30-day adverse events/allergic reactions; 30-day hospitalization; 90 day *Clostridium difficile* infections.

Mixed-effect logistic regression models were used to assess intervention effect on antibiotic prescribing and outcomes while controlling for covariates and seasonal ARI trends.

Provider and Facility Audit-Feedback

Facility Stewards accessed dashboard and printed baseline reports for providers with ≥ 15 uncomplicated ARI visits/year, then reviewed the dashboard at 2-3 month intervals to distribute follow-up Audit-Feedback reports with Clinic Champions. (Figure 3) The Best Provider comparison group consisted of the lowest 20% of providers antibiotic prescribing rates within each VA Medical Center. All providers received an introductory AD visit and as needed subsequent AD visits.

Figure 2 Academic Detailing

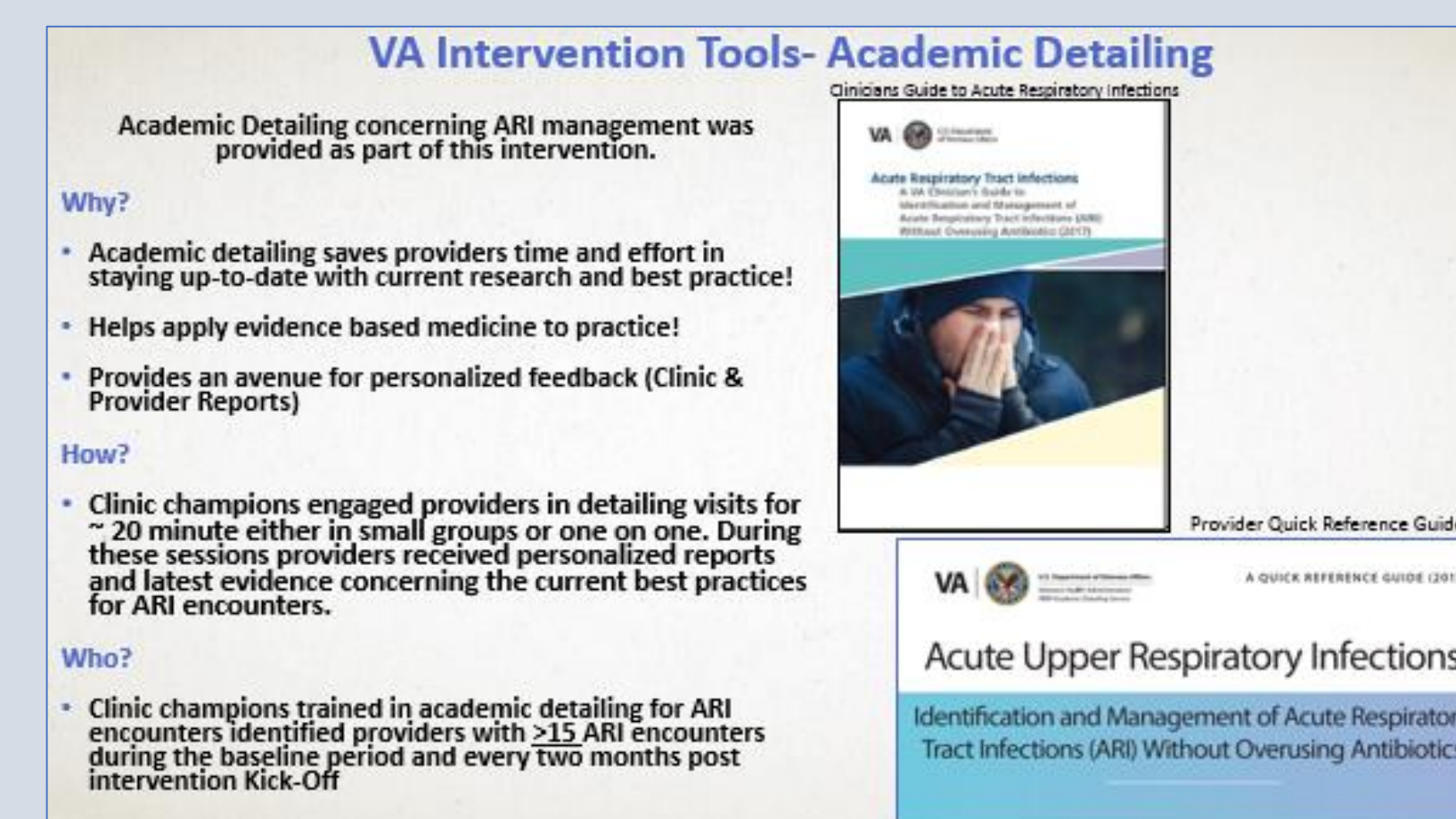
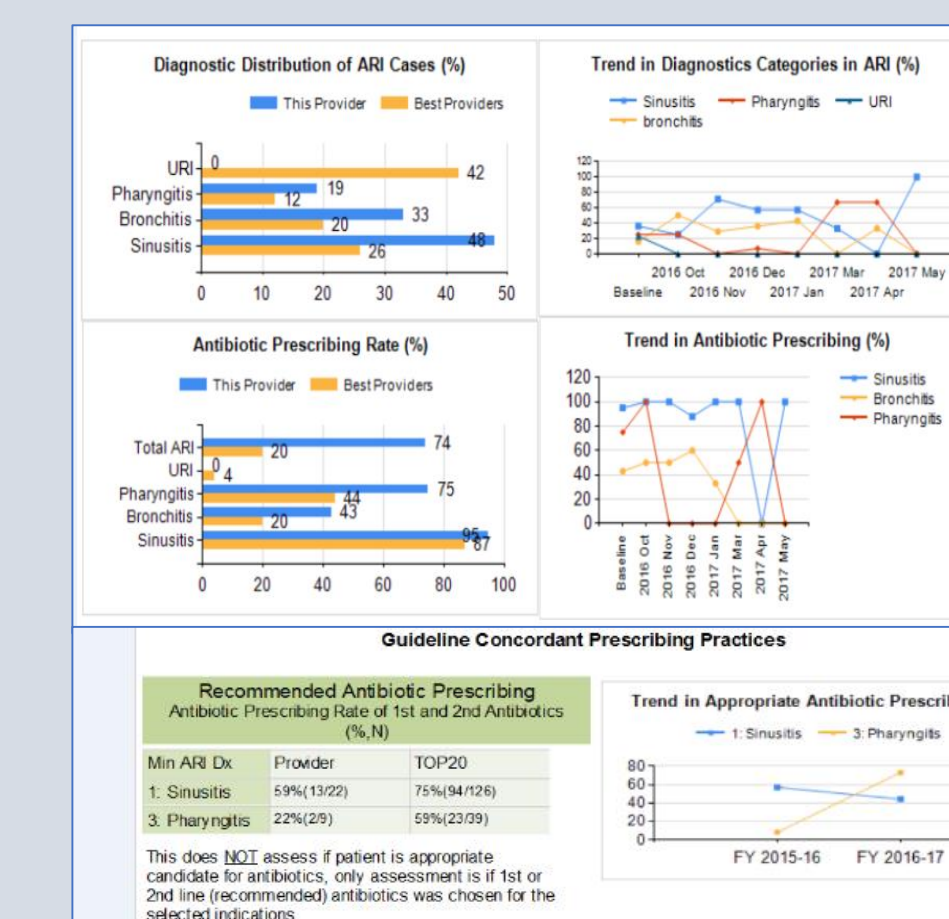


Figure 3 Provider Feedback Report



Results

Clinics varied in size, setting, and location and the annual ARI visit rates were stable over time. (Table 1) The proportion of uncomplicated ARI visits increased post-intervention, while the proportion of ARI visits diagnosed as rhinosinusitis decreased. (Table 2) Antibiotic prescribing reduced post-intervention among all ARI Diagnostic groups. (Table 3) All clinics exhibited reductions in antibiotic prescribing proportions from the preceding year, post-intervention. (Figures 4 & 5) ARI associated return visits, hospitalization, and CDI were rare and did not change post-intervention. (Table 4) Antibiotic-related adverse events were reduced post-intervention.

Table 1. Annualized Rates of Uncomplicated ARIs Pre/ Post- Intervention

Facility/Clinic	Participating Clinic			
	Clinic Setting	Priority Providers (N)	Annual Rate of Uncomplicated ARIs Pre-Intervention (N)*	Annual Rate of Uncomplicated ARIs Post-intervention (N)**
Total Targeted Providers /ARI visits	14 Clinics	135	6,821	6,765
Initiating VAMC/Clinics				
Boise	ED	7	450	480
Boise	PC	14	801	762
Salt Lake City	ED	17	724	763
Salt Lake City	PC	1	208	273
Expansion VAMC/Clinics				
Salt Lake City-West Valley	CBOC	2	115	92
Durham	ED	21	1317	1270
Durham	PC	4	388	352
Durham-Greenville	CBOC	5	197	137
Greater Los Angeles-West LA	ED	16	633	674
Greater Los Angeles-West LA	PC	12	352	417
Greater Los Angeles-Sepulveda	PC	12	572	612
Greater Los Angeles-Bakersfield	CBOC	8	257	125
Eastern Kansas -Leavenworth	ED	8	469	370
Eastern Kansas-Topeka	ED	8	338	438

*Annual rate of uncomplicated ARI based on 12 months observation immediately preceding the intervention in each clinic.
** Total post-intervention uncomplicated ARI visits (n=8,369). Post-intervention time of observation ranges from 5-31 months depending on clinic.

Table 2. Diagnostic Distribution Pre/ Post Intervention for all Sites

Diagnosis	Absolute Difference	Prevalence Ratio*	± 95% C.I.	P value
Uncomplicated ARI/All ARI	6.0	1.10	(1.06,1.14)	<0.001
Rhinosinusitis/All uncomplicated ARI	-1.44	0.91	(0.84,0.99)	0.02
Pharyngitis/All uncomplicated ARI	-0.49	1.04	(0.88,1.22)	0.68
URI-NOS or Bronchitis/All uncomplicated ARI	1.94	1.01	(0.98,1.05)	0.50

*Adjusted for seasonal effect
** Total Uncomplicated ARI Visits: Pre-intervention (n=29,782)[1.9% of total visits]; Post-Intervention (n=12,578), [2.2% of total visits]. All Visits: Pre-intervention (n=1,569,188); Post-Intervention (n=562,147)

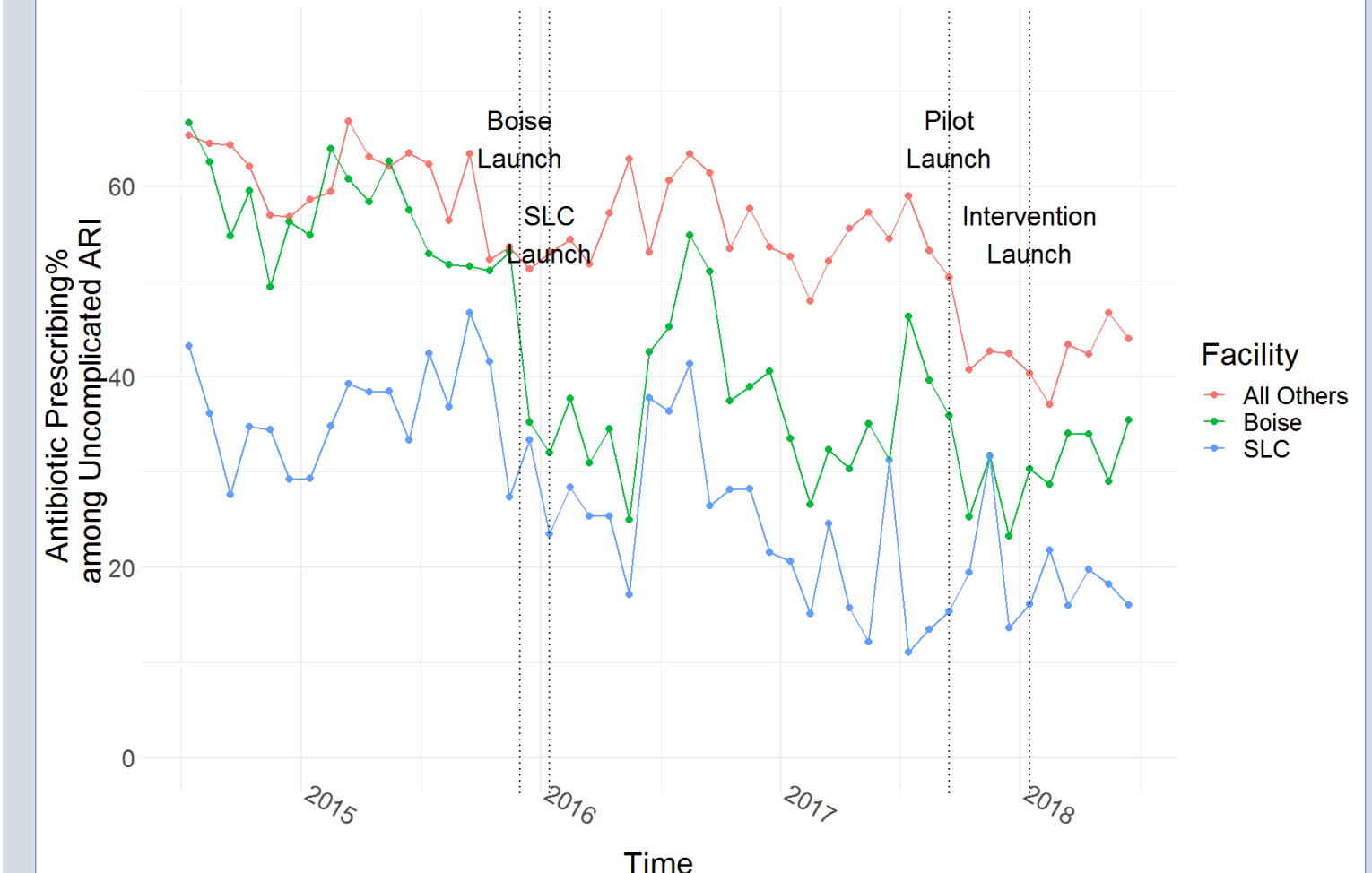
Results Cont.

There were significant reductions in antibiotic prescribing for all ARI diagnostic groups ranging from -11.1% to 25.7% (Table 3)

Diagnosis	Absolute Difference	Prevalence Ratio*	P-Value	Confidence Interval
Uncomplicated ARI w Abx/All uncomplicated ARI	-23.0%	0.58	<0.001	(0.49, 0.68)
Rhinosinusitis w Abx/All uncomplicated rhinosinusitis	-11.1%	0.87	<0.001	(0.83,0.91)
Pharyngitis w Abx /All uncomplicated pharyngitis	-23.4%	0.59	<0.001	(0.49,0.70)
URI-NOS or Bronchitis w Abx /All uncomplicated URI-NOS or Bronchitis	-25.7%	0.40	<0.001	(0.32, 0.50)

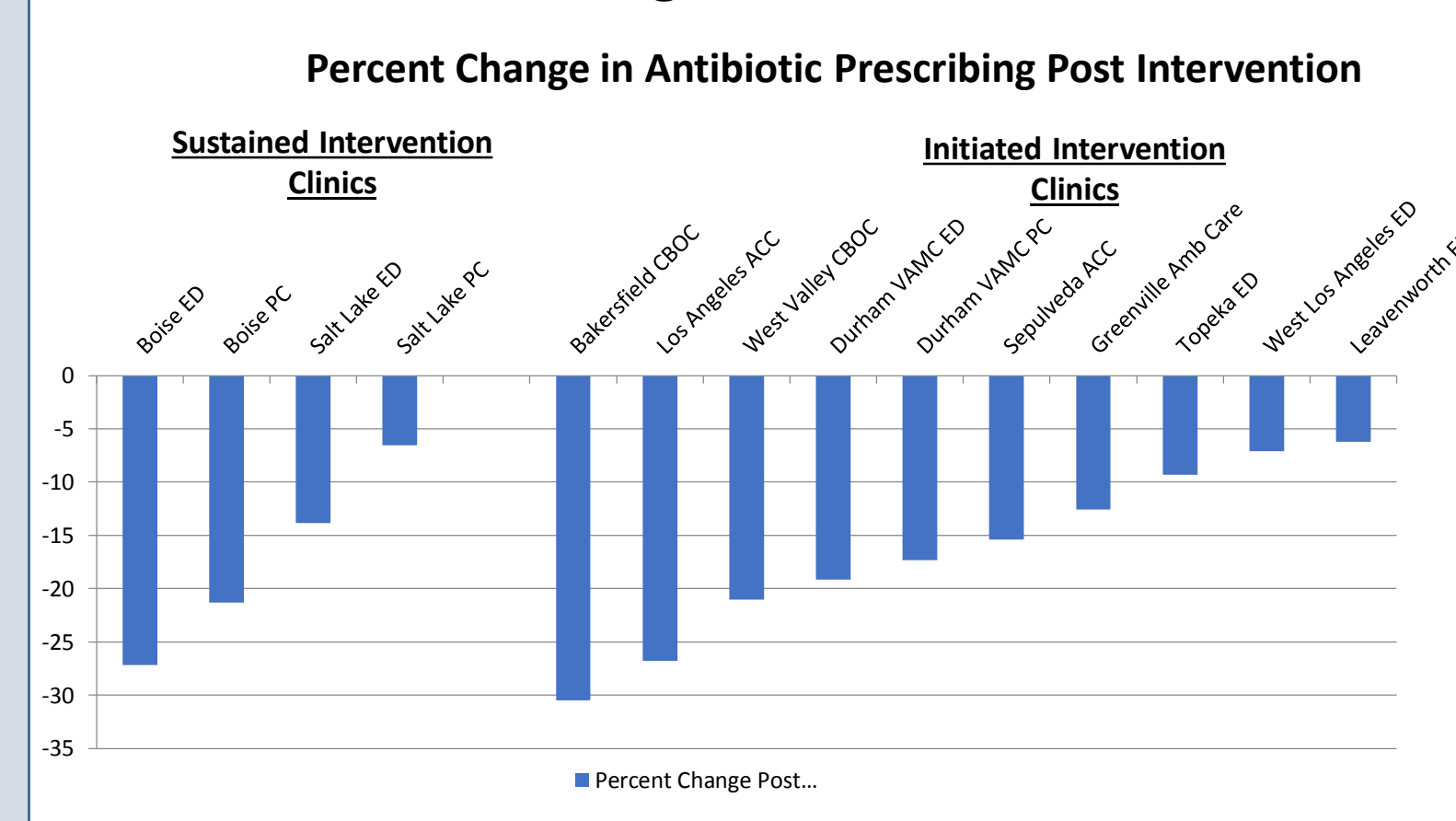
* Adjusted for seasonality

Figure 4. ARI Prescribing Rate for all Participating Clinics



The overall antibiotic prescribing rate declined over time. Reduction in antibiotic prescribing are evident following intervention launches. (Figure 4)

Figure 5. Absolute Change in Overall ARI Prescribing Pre/Post Intervention



All participating clinics had a reduction in antibiotic prescribing proportions post-intervention. Changes noted in Boise and SLC have been sustained for three ARI seasons. (Figure 5)

Table 4. Patient Outcomes Post- Intervention

	Aggregate Patient Outcomes Pre and Post Intervention			
	Absolute Difference (%)	Risk Ratio*	95% C.I.	P Value
30 Day ARI Related Revisits	0.07	1.03	(0.95, 1.13)	0.44
30 Day ADR/Allergies	-0.39	0.84	(0.76, 0.94)	0.002
30-Day Hospitalizations***	0.01	1.15	(0.57,2.34)	0.69
90-Day CDI***	0.04	**	**	**

*Adjusted for seasonal effect
** Regression model did not converge
*** The 90-day CDI rate was 0.08% pre-intervention, and 0.12% post-intervention

Conclusions

The audit-feedback and academic detailing intervention to improve antibiotic management for uncomplicated ARI was effective at reducing antibiotic prescribing. The intervention was sustainable for three seasons in select clinics and was generalizable to other VA ED and PC settings. Clinical outcomes for patients with uncomplicated ARIs were not notably different pre and post intervention, but antibiotic adverse events and allergies were less common post-intervention.

References: 1. JAMA Network Open. 2018 1 (2) e 180243; 2. JAMA. 2016;315(6):562-570; 3. Ann Intern Med, 2015. 163(2): p. 73-80;34. Clin Infect Dis. 2012 Nov 15;55(10):e86-102); 5. Clin Infect Dis, 2012. 55 (10): e72-e112

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