Improved Antibiotic Prescribing Practices for Respiratory Infections Through Use of Computerized Order Sets and Educational Sessions in Pediatric Clinics

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Background:

- Literature regarding comprehensive outpatient antimicrobial stewardship programs, especially in the pediatric arena, is sparse.

- However, computerized clinical decision support systems (CDSSs) have promising effectiveness in improving outpatient antibiotic (Ab) prescribing.

Methods:

- We targeted outpatient treatment of otitis media (OM), community-acquired pneumonia (CAP), and streptococcal pharyngitis.

Intervention:
• EPIC order sets (treatment pathways) coupled with educational sessions.
• 4 pediatric clinics at Parkland Health and Hospital System randomized into intervention and control arms.
• Pre- and post-intervention periods included.
• Education provided to the 2 intervention clinics between the study periods.
• EPIC order sets became available to the intervention clinics at the beginning of the post-intervention period.
-Primary endpoint: rate of first-line Ab prescribing.
- Secondary endpoints: Ab duration (for OM and CAP), and Ab prescription modification within 14 days.

Results:

	Pre-implementation period		Post-implementation period		Mantel-Haenszel common odds ratio	Breslow-Day test	Clinic * Variable		Clinic * Variable
	Intervention clinics (N=569)	Control clinics (N=862)	Intervention clinics (N=433)	Control clinics (N=826)			Pre-Implementation	Post-Implementation	Combined periods
					P	P	P	P	P
Male sex N (%)	310 (54.5)	434 (50.3)	223 (51.5)	442 (53.5)	0.499	0.125	0.126	0.497	0.515
Ab allergy N (%)	18 (3.2)	34 (3.9)	17 (3.9)	42 (5.1)	0.231	0.920	0.440	0.355	0.203
Hispanic ethnicity N (%)*	334 (61.6)	740 (87.1)	261 (62.4)	733 (89.4)	<0.001	0.349	<0.001	<0.001	<0.001
Parkland Financial Assistance N (%)*	316 (55.5)	503 (58.4)	242 (55.9)	482 (58.4)	0.179	0.930	0.292	0.401	0.177
Physician prescriber N (%)	496 (87.2)	784 (91)	388 (89.6)	705 (85.4)	0.914	0.002	0.023	0.034	0.992
First-line Ab prescribing N (%)	426 (74.9)	670 (77.7)	360 (83.1)	642 (77.7)	0.589	0.011	0.211	0.024	0.664
Ab modifications N (%)	6 (1.1)	10 (1.2)	5 (1.2)	13 (1.6)	0.578	0.769	0.852	0.552	0.552

Table 1. Analysis of categorical variables.

	Pre-implementation period		Post-implementation period		ANOVA				Bonferroni post-hoc test
								Intervention clinics versus control clinics	
	Intervention clinics (N=569)	Control clinics (N=862)	Intervention clinics (N=433)	Control clinics (N=826)	Clinic * Period	Clinic	Period	Pre-implementation	Post-implementation
					P	P	P	P	P
Age (years) - mean ±SD	4.43 ±4.03	5.02 ±4.28	4.32 ±3.70	4.94 ±3.70	0.849	<0.001	0.760	0.014	0.070
Weight (kg) - mean ±SD	20.90 ±17.46	24.38 ±20.20	20.13 ±16.96	23.14 ±19.17	0.758	<0.001	0.188	0.004	0.049
Overall Ab duration (days) - mean ±SD*	9.69 ±0.96	9.63 ±1.07	9.28 ±1.56	9.79 ±0.75	<0.001	<0.001	0.007	>0.999	<0.001
Ab duration for OM (days) - mean ±SD	9.67 ±0.99	9.66 ±1.05	9.24 ±1.60	9.79 ±0.74	<0.001	<0.001	0.004	>0.999	<0.001
Ab duration for CAP (days) - mean ±SD	9.81 ±0.69	9.24 ±1.42	9.55 ±1.06	9.68 ±0.93	0.032	0.183	0.578	0.050	>0.999

Table 2. Analysis of continuous variables.

	Pre-implementation period		Post-implementation period	
	Intervention clinics (569)	Control clinics (N=862)	Intervention clinics (N=433)	Control clinics (N=826)
OM, N (%)	424 (74.5)	614 (71.2)	320 (73.9)	590 (71.4)
Strep pharyngitis, N (%)	72 (12.7)	111 (12.9)	75 (17.3)	136 (16.5)
CAP, N (%)	69 (12.1)	125 (14.5)	35 (8.1)	89 (10.8)
Mixed, N (%)	4 (0.7)	12 (1.4)	3 (0.7)	11 (1.3)

Table 3. Distribution of Ab prescriptions.

- Pre-intervention: No difference between study arms in terms of first-line Ab prescribing (74.9% vs. 77.7%, P=0.211) and Ab duration (9.69 ±0.96 days vs. 9.63 ±1.07 days, P>0.999).
- Post-intervention: Intervention clinics had higher rate of first-line Ab prescribing (83.1% vs. 77.7%, P=0.024) and shorter Ab duration (9.28 ±1.56 days vs. 9.79 ±0.75 days, P< 0.001).
- Rate of modified Abs was small in all clinics and not different at pre- and post-intervention.

Conclusion:

- A computerized CDSS involving treatment pathways in the form of EPIC order sets coupled with educational sessions was associated with higher rate of first-line Ab prescribing and shorter Ab duration for the outpatient treatment of bacterial acute respiratory infections.
- More studies are needed in order to assess the utility of multimodal approaches in pediatric outpatient antimicrobial stewardship.