Adherence to Short-Term Antibiotic Therapy in Children – a Blinded, Prospective, Electronically-Monitored Study

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BACKGROUND

- Medical non-adherence has been shown to be associated with a host of adverse outcomes including treatment failure, deteriorating health, repeated hospital admissions, use of additional drugs, an increase in the total cost of management, and in the case of antibiotics the added potential to increase development of drug resistant microorganisms
- Electronic medication monitoring devices have been in use in the past two decades and have been shown to yield the most reliable adherence estimates, but have only been used to measure chronic medication adherence in the pediatric population.

Figure 1: The Medication Event Monitoring System

OBJECTIVES

- Our primary aim was to provide reliable overall adherence estimates in this population.
- To evaluate whether patient or treatment charachteristics are associated with adherence.
- To evaluate wether caregivers can predict their patient's adherence.

DEFINITIONS

- Overall adherence was the percentage of doses taken relative to the overall number of doses prescribed.
- Timing adherence was the proportion of prescribed doses taken within ±20% of the prescribed interval.
- For both outcomes we defined good adherence as >75% of doses.

METHODS

A prospective, blinded, electronically monitored, observational study between January 2018 and October 2021.

- Patients aged 2 months to 5 years diagnosed with an acute bacterial infection requiring short-term (5-10 days) oral antibiotic monotherapy, were provided with an electronically monitored medication bottle, recording every manipulation of the cap.
- A guardian of the patient was asked to participate in the evaluation of a new type of child-proof medication cap.
- On the day of the last planned dose an investigator contacted the guardians and arranged an in-person visit, the true purpose of the research was explained, and permission to use the data recorded in the cap and in the previous short interview was sought.
- If the guardians agreed, they were re-consented and questionnaires were completed.

Table 2: Prescribed treatment regimens

Medication	Interval	Duration (days)	Number of Prescriptions
Amoxicillin	BID	7	2
	TID	5	16
		7	36
		10	12
Cephalexin	TID	5	7
		7	19
		10	8

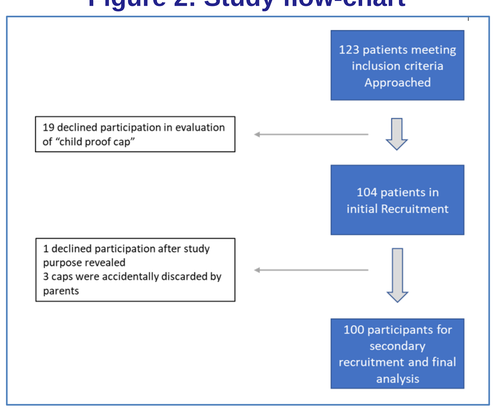
RESULTS

- 100 infants (49 boys, mean [range] age 1.87 years [0.2-5.1]) were included in the final analysis.
- Only 11 participants received all the recommended doses.
- Overall adherence was 62%, while timing adherence was 21%.
- After applying a logistic regression model, the only factor significantly associated with non-adherence was being a single parent [OR=5.7 95%CI (1.07-30.3)].
- Prescribers overestimated adherence, defining 49/62 (77.7%) participants as likely adherent.
- Patients predicted to be adherent were not more likely to be adherent than those predicted to be non-adherent (31/47 actual adherence among those predicted to be adherent vs. 6/16, p=0.77).

CONCLUSIONS

- Adherence of children to short-term antimicrobial treatment for an acute infection is suboptimal.
- Providers were unable to predict adherence of their patients.
- This data is important when considering recommended treatment durations and developing interventional programs to increase adherence.

Figure 2: Study flow-chart



Patient Characteristic	All Participants (N=100)	Adherent (N=62)	Non-Adherent (N=38)	P-value
Age (y) mean (SD; range)	1.87 (1.34; 0.02-5.1)	1.69 (1.37; 0.02-4.64)	2.16 (1.25; 0.25-5.23)	**0.032**
Female	51 (51%)	31 (51.8%)	20 (51/3%)	0.964
Ethnicity				0.783
Jewish	92 (92.0%)	58 (93.5%	35 (92.1%)	
Muslim	8 (8.0%)	4 (6.5%)	3 (7.9%)	
Diagnosis				NA
AOM	21 (21.0%)	12 (19.4%)	9 (23.7%)	
bacteremia	14 (14.0%)	10 (16.1%)	4 (10.5%)	
Cellulitis	18 (18.0%)	7 (11.3%)	11 (28.9%)	
Pharyngitis	5 (5.0%)	3 (4.8%)	2 (5.3%)	
Pneumonia	13 (13.0%)	9 (14.5%)	4 (10.5%)	
UTI	16 (16.0%)	14 (22.6%)	2 (5.3%)	
Other	13 (13.0%)	7 (11.3%)	6 (15.8%)	
Antibiotic Prescribed				0.287
Amoxicillin	66 (66.0%)	41 (66.1%)	25 (65.8%)	
Cephalexin	34 (34.0%)	21 (33.9%)	13 (34.2%)	
Frequency of Administration (per day)				0.770
BID	64 (64.0%)	39 (62.9%)	25 (65.8%)	
TID	36 (36.0%)	23 (37.1%)	13 (34.2%)	
Enrolled Parent				0.168
Father	17 (17.0%)	11 (17.7%)	3 (7.9%)	
Mother	83 (83.0%)	51 (82.3%)	35 (92.1%)	
Age (y) Mean (SD; range)	33.44 (5.17; 22.00-49.00)	33.76 (5.02; 22 - 42)	32.95 (5.42; 24 - 49)	0.326
Marital status				**0.060**
Single parent	10 (10.0%)	3 (4.8%)	7 (18.4%)	
Married	90 (90.0%)	59 (95.2%)	31 (81.6%)	
Number of children Mean (SD; range)	2.55 (1.44; 1.00 - 8.00)	2.34 (1.19; 1 - 6)	2.89 (1.74; 1-8)	0.146
Education				0.478
Academic	45 (44 %)	30 (48.3%)	15 (39.5%)	
High School	37 (37%)	21 (33.8%)	16 (42.1%)	
Post-graduate	18 (18%)	13 (20.9%)	5 (13.2%)	
Steady work				0.471
No	30 (30.0%)	17 (27.4%)	13 (34.2%)	
Yes	70 (70.0%)	45 (72.6%)	25 (65.8%)	
Partner Steady work				0.211
No	10 (9%)	4 (6.6%)	5 (14.3%)	
Yes	90 (90%)	57 (93.4%)	30 (85.7%)	
Work Schedule				**0.036**
Day Job	60 (60%)	33 (53.2%)	27 (71.0%)	
Shift Work	15 (15%)	13 (21.0%)	2 (5.2%)	
Unemployed	25 (25%)	16 (25.8%)	9 (25.0%)	
Partner Work Schedule				**0.045**
Day Job	62 (62%)	44 (71.0%)	18 (48.6%)	
Shift Work	25 (25%)	13 (21.0%)	12 (32.4%)	
Unemployed	13 (13%)	5 (8.1%)	7 (18.9%)	
Family Income				0.082
Above average	27 (27%)	17 (28.8%)	6 (17.6%)	
Average	27 (27%)	18 (30.5%)	6 (17.6%)	
Below average	46 (46%)	24 (40.7%)	22 (64.7%)	

Table 1: Demographic characteristics of patients and caregivers, total and by overall adherence outcomes