The HealthBeacon Injection Care Management System shows Improved Adherence to Gastroenterological, Dermatological and Rheumatological Treatments

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INTRODUCTION

Treatment adherence falls sharply following initiation, and is reported to range from 46%1 to 66% 2 during implementation, with variability by age, gender and therapeutic area. By enhancing patient support and accommodating injection routines, the HealthBeacon Injection Care Management System (ICMS) aims to improve adherence. We investigated its efficacy and compared outcomes to reported adherence.

METHODS

HealthBeacon electronically monitored injections during 2015-2021 to calculate adherence (total drops made divided by the number of scheduled drops) within each sex, age group, and therapeutic area. This measure of adherence was used for statistical modelling and discussion. We additionally calculated the proportion of participants with adherence rates above 80% to facilitate comparison with other studies in these same therapeutic areas. This metric was used as a proxy for Medication Possession Ratio (MPR).

The analysis included 9,737 individuals (55% female, all 18-100 years of age), on an injectable treatment across three therapeutic areas including, gastroenterological, dermatological and rheumatological.

The breakdown of participant characteristics is described in Table 1.

Multivariate linear regression was used to investigate the effects of age, sex, and therapeutic area on adherence. Potential interactions between these three effects were considered by comparing the Akaike Information Criterion (AIC) of models with vs. without interactions, where the model resulting in the better AIC was used.

Partial effects of each term were extracted from the model, and post-hoc testing was completed using the estimated marginal means of effects to calculate pairwise independent samples t-tests between age groups, sexes, and therapeutic areas.

Normality of residuals was verified using QQ-plots, and multicollinearity was deemed negligible as the Variance Inflation Factor (VIF) of all predictor variables was approximately 1.0. All analyses were completed using R version 4.0.2.

Table 1:

		Therapeutic Area			
		Overall	Dermatological	Gastroenterological	Rheumatological
Sample	n	9737	1384	3877	4476
Sex	Female (n, %)	5350 (54.95%)	676 (48.84%)	1989 (51.3%)	2685 (59.99%)
Age	18-29 (n,%)	1494 (15.34%)	185 (13.37%)	938 (24.19%)	371 (13.82%)
	30-44 (n,%)	3029 (31.11%)	503 (36.34%)	1407 (36.29%)	1119 (25%)
	45-59 (n,%)	3202 (32.88%)	495 (35.77%)	1003 (25.87%)	1704 (38.07%)
	60-79 (n,%)	1925 (19.77%)	194 (14.02%)	508 (13.1%)	1223 (27.32%)
	80-100 (n,%)	87 (0.89%)	7 (0.51%)	21 (0.54%)	59 (1.32%)

RESULTS

These adherence rates compared favorably with those previously reported in each area (61% and 62%, respectively) 5-10, suggesting that HealthBeacon may prove advantageous in numerous therapeutic areas with **an average 25% increase in MPR seen.**

Lastly, while our findings mirrored previously reported age effects 10, we did not find any sex-related differences in adherence, which have been reported in gastroenterological[6] and rheumatological[1] treatments. These findings suggest the **universal benefits of HealthBeacon's ICMS** may be particularly beneficial in those groups with lower adherence, helping to close the gap and mitigate any gender differences.

Table 2

	Contrast	Estimate	St. Error	t	DF	*p*	
Area	Derm vs. Gastro	-0.008	0.012	-0.65	22	0.793	
	Derm vs. Rheum	0.009	0.012	0.73	22	0.746	
	Gastro vs. Rheum	0.017	0.012	1.39	22	0.365	
Age	18-30 vs. 30-45	0.002	0.016	0.11	22	1.000	
	18-30 vs. 45-60	-0.020	0.016	-1.26	22	0.715	
	18-30 vs. 60-80	-0.032	0.016	-2.00	22	0.298	
	18-30 vs. 80-100	-0.073	0.016	-4.64	22	0.001	*
	30-45 vs. 45-60	-0.022	0.016	-1.37	22	0.652	
	30-45 vs. 60-80	-0.033	0.016	-2.11	22	0.252	
	30-45 vs. 80-100	-0.075	0.016	-4.74	22	0.001	*
	45-60 vs. 60-80	-0.012	0.016	-0.74	22	0.945	
	45-60 vs. 80-100	-0.053	0.016	-3.37	22	0.021	*
	60-80 vs. 80-100	-0.042	0.016	-2.63	22	0.098	
Sex	Female - Male	-0.007	0.010	-0.66	22	0.512	

Adherence

HealthBeacon's adherence was strong overall, at 86.5% (MPR=0.865, SD=3.75%). Results were comparable across participants on gastroenterological (87.30%) dermatological (86.50%) and rheumatological treatments (85.60%). **Adherence was found to be extremely similar between males (86.80%) and females (86.13%).**

There was no significant difference found in HealthBeacon adherence between therapeutic areas overall ($F(2,22)=0.96$, $p=0.397$), or sex ($F(1,22)=0.44$, $p=0.512$). However, there was a significant effect of age ($F(4,22)=7.47$, $p<0.001$). Post-hoc testing revealed **adherence increased with age**, with the oldest age group (80-100 years) showing significantly higher adherence than each of 18-29, 30-44, and 45-59. All post-hoc testing results are shown in Table 2. The effect of age on adherence is shown in Figure 1.

Adherence comparisons

In addition to overall adherence, we calculated the proportion of individuals with MPR ≥ 0.80, as is commonly reported. Previous studies in adherence to rheumatological treatments have reported this metric to fall within a 95% confidence interval of 45%-62% over one year 1-4. In this regard, HealthBeacon showed a significant improvement in adherence to rheumatological treatment, with 66% of individuals with MPR ≥ 80. HealthBeacon's adherence rates were strong in both dermatological (MPR=0.865, MPR ≥ 0.80 in 64.4%) and gastroenterological (MPR=0.873, MPR ≥ 0.80 in 70.9%) treatments.

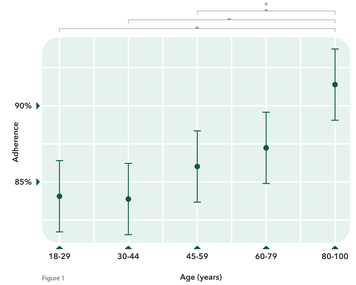

Figure 1

CONCLUSION

We investigated adherence in gastroenterological, dermatological and rheumatological treatments using HealthBeacon's ICMS, finding the system resulted in favorable reports of adherence when compared with previous literature, and significant improvements specifically in rheumatological treatments. Moreover, while older age groups showed significantly better adherence than younger ones, differences between sex or therapeutic areas were not identified and were potentially mitigated.

The HealthBeacon system represents a significant step in improved adherence for several therapeutic areas.

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