

HealthBeacon: Weekday vs Weekend Scheduling and Medication Adherence

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INTRODUCTION

HealthBeacon's Injection Care Management System (ICMS) electronically monitors adherence by recording used injections ('drops') deposited into the system's connected Smart Sharps Bin (Figure 1, 2).

Patients are often advised to administer their medication on a specific day of the week, however, compliance to schedules can be difficult to measure. As each Smart Sharps Bin is pre-programmed with patients' treatment schedules, the ICMS can monitor whether patients adhere to their schedule, and assess the impact of dose scheduling on medication compliance.



Figure 1: HealthBeacon Injection Care Management System (ICMS)



Figure 2: HealthBeacon Smart Sharps Bin

1. Personalised smart reminders alert patients when their medication is due
2. Patients' medication schedules automatically update when a drop is made
3. A real-time record of adherence is created for physicians to review remotely
4. HealthBeacon Support monitors adherence and provides intervention calls, as needed
5. Hazardous sharps waste is safely stored within the internal sharps bin
6. Discreet yet user-friendly design allows for ease of use and incorporation into the home environment

RESULTS

HealthBeacon's data reported strong Overall Adherence, at 86% for all drops recorded across weekdays and weekends.

Impact of Weekday vs Weekend Scheduling and Adherence Behaviour

- Significant differences were observed in weekday versus weekend adherence
- '24-Hour' and 'Same Day' adherence rates dropped 4% over the weekend, with lowest rates observed on Saturday ($p < 0.001$), a suboptimal day for dose scheduling (Figure 4)
- Participants were more likely to drop doses scheduled on weekdays than on weekends, with Odds Ratios consistently higher on weekdays (Table 2)

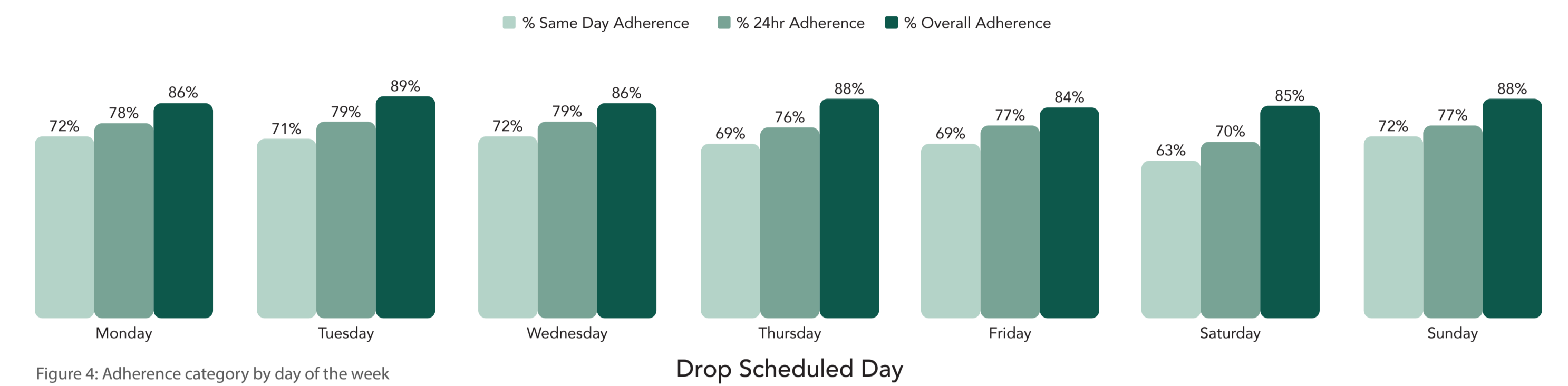


Figure 4: Adherence category by day of the week

Patient Variables and Weekday vs Weekend Scheduling:

- **Age:** Adherence increased with age and the effect of the weekend was also seen across age groups. However, adherence to doses scheduled on weekends was lower than on weekdays in all age groups except 18-29 year-olds ($p = 0.104$)
- **Gender:** Gender had no effect on 'Overall' and '24-Hour' adherence. However, both males and females reported lower adherence on weekends compared to weekdays ($p < 0.001$)
- **Frequency:** Patients on monthly injections demonstrated more precise adherence behaviour, with greater 'Same-Day' adherence rates on weekdays than those on other injection frequencies
- **Therapeutic Area:** Therapeutic area significantly affected Overall Adherence. Dermatology patients reported lowest adherence rates on weekends compared to other Therapeutic Areas.

We repeated the analysis by considering Friday as a weekend day to account for the fact the majority of drops are reported during the evening, and to account for varying social and cultural definitions of the weekend. Results were essentially identical when Friday was considered a weekend day. The table below summarises the results of all of the models:

Table 2: Odds ratio by adherence category

Table 2:	Overall Adherence Odds ratio(95% CI)	24hr Adherence Odds ratio(95% CI)	Same Day Adherence Odds ratio(95% CI)
Main Analysis: Weekday vs Weekend	1.18(1.05, 1.33), $p < 0.001$	1.39(1.27, 1.52), $p < 0.001$	1.4(1.29, 1.52), $p < 0.001$
Friday as Weekend	1.29(1.25, 1.33), $p < 0.001$	1.26(1.22, 1.30), $p < 0.001$	1.31(1.27, 1.35), $p < 0.001$
Saturday vs other days of the week	1.28(1.18, 1.4), $p < 0.001$	1.38 (1.29, 1.49), $p < 0.001$	1.34(1.25, 1.43), $p < 0.001$

AIMS AND METHODS

Aims

To compare adherence to medications scheduled on weekdays (Monday - Friday) versus weekends (Saturday, Sunday)

Methods

1. HealthBeacon electronically recorded 287,088 drops from 6,587 patients (58% female, aged 18-79) between January 2018- July 2022, across Gastroenterology, Dermatology, Rheumatology, and Neurology (Table 1).
2. Drops were labelled as either 'weekday' or 'weekend' depending on the day of the week they were scheduled.
3. Patient variables, including age group, gender and injection frequency were also included to assess their effect on the adherence.
4. Mixed effect logistic regression analysis was used to model the binary outcome variable (i.e. whether the drop was made or not) and assess the effect of independent variables (i.e. day of the week, age, gender, therapeutic area, injection frequency, etc).
5. Interaction between the day a dose was scheduled (i.e on a weekday or weekend) and each of the other patient variables was analysed to investigate the effect of weekend scheduling within subgroups.

Table 1: Patient Demographics

	Weekday Scheduled Injections	Weekend Scheduled Injections	Significance
#Total Scheduled Injections (Size)	259,270	27,818	
#Patients	6,179	1,657	
Gender			
Male	2,587 (42%)	687 (42%)	$X^2 = 0.08$
Female	3,592 (58%)	970 (58%)	$p = 0.765$
Therapeutic Area			
Dermatology	911 (15%)	293 (18%)	
Gastroenterology	2,063 (33%)	261 (16%)	$X^2 = 1143.98$
Rheumatology	2,543 (41%)	354 (21%)	$p < 0.001$
Neurology	665 (11%)	750 (45%)	
Age Group			
18-29	947 (15%)	224 (14%)	
30-44	1,956 (32%)	509 (31%)	$X^2 = 14.45$
45-59	2,075 (34%)	635 (38%)	$p = 0.002$
60-79	1,201 (19%)	289 (17%)	
Frequency			
Monthly	1,216 (20%)	925 (56%)	
Weekly	648(10%)	92 (6%)	
Bi-Weekly	3,818 (62%)	482 (29%)	$X^2 = 944.73$
Daily	8 (0.1%)	8 (0.4%)	$p < 0.001$
Other	109 (2%)	61 (4%)	
Thrice a Week	393 (6%)	92 (6%)	
% Overall Adherence	86%	86%	
% 24hrs Adherence	78%	74%	
% Same Day Adherence	71%	67%	

Definitions

Adherence categories were defined and calculated as follows (Figure 3):

- Overall: all drops recorded by the ICMS regardless of the day recorded
- 24-Hour: drops recorded +/- 24 hours from their scheduled time
- Same-Day: drops recorded on their scheduled day

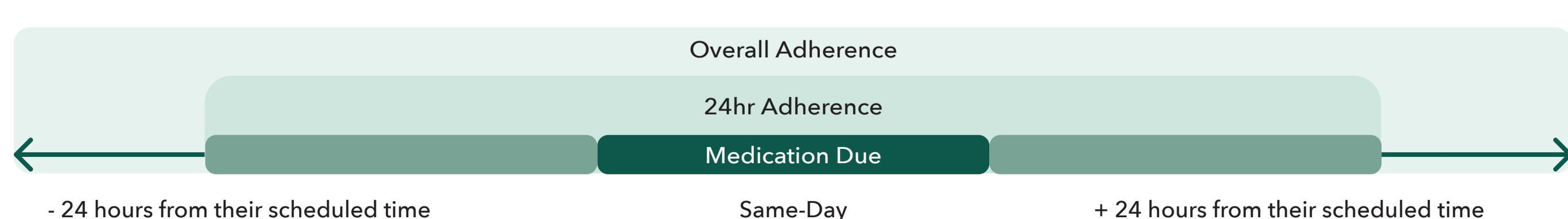


Figure 3: Definitions

CONCLUSION AND DISCUSSION

Assumptions/Limitations

- HealthBeacon assumes that a drop recorded by the Smart Sharps Bin is an indication a dose has been taken, and hence a close proxy for adherence
- Drops self-reported by patients to HealthBeacon's Care Team were excluded as the exact day the dose was taken was not always possible to determine

Conclusion

- Dose scheduling impacts patients' tendency to take medications on time; adherence falls on weekends, particularly Saturdays - *doses should be scheduled on weekdays when possible and clinically supported*
- Interactions between patient factors and adherence varies - *tailored dose scheduling should be followed and adjusted to patient demographics such as therapeutic area or age group*
- Capturing reasons for patterns in adherence is an important next step - *by better understanding patient behaviour, prescribing instructions can be optimised to fit schedules and enhance compliance*

HealthBeacon's data demonstrates the impact of dose scheduling on patient adherence.

By understanding patient adherence behaviour, treatment schedules can be personalised and outcomes optimised.