Remote Physiologic Monitoring (RPM) as a Sustained Longitudinal Intervention: Evidence from Interruption-Reinitiation Cohorts, Hypertension Trajectories, and Control Conversion Analysis

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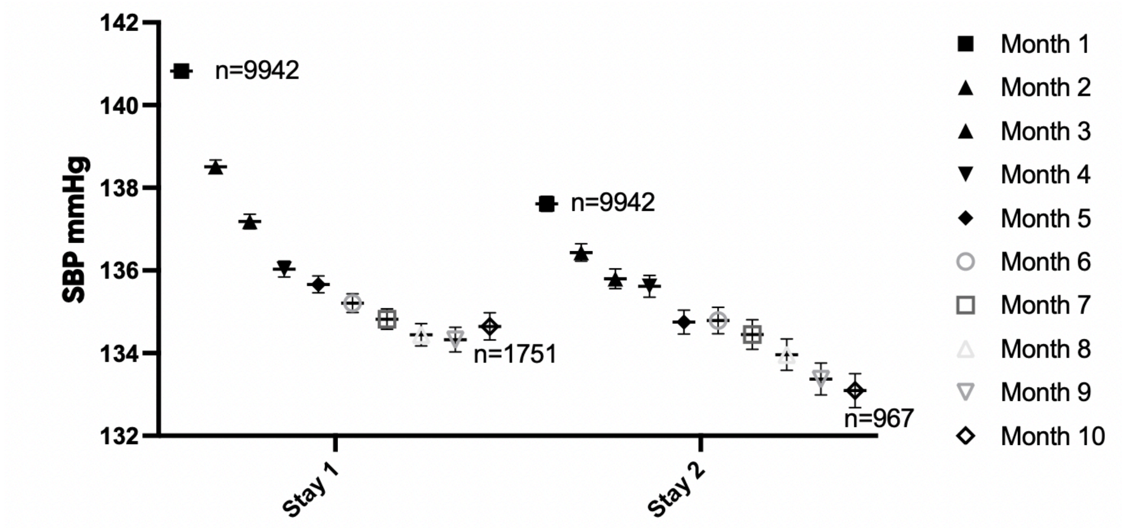
Remote Physiologic Monitoring (RPM) has emerged as a scalable digital health solution for chronic disease management. While numerous studies have documented its short-term benefits, limited data exists on its durability as a longitudinal intervention. Here, we present novel data evaluating (1) changes in systolic blood pressure (SBP) across two distinct periods of RPM participation, separated by a leave of absence (LOA), (2) the extended blood pressure trajectories among patients continuously enrolled in RPM up to 20 months, and (3) the proportion of hypertensive patients achieving control stratified by RPM program duration.

Collectively, these findings underscore the need for viewing RPM not as an episodic care tool but as a chronic care infrastructure requiring long-term continuity.

Figure 1: RPM Interruption-Reinitiation Design ("Stay 1" and "Stay 2")



Patients with hypertension as an average of the first 7 days of data transmission (SBP ≥130 mmHg or DBP ≥80 mmHg) who completed an initial period of RPM engagement ("Stay 1") and subsequently re-engaged after a 60+ day gap ("Stay 2") were analyzed. Mean SBP trajectories were plotted over 10 months for each participation window.

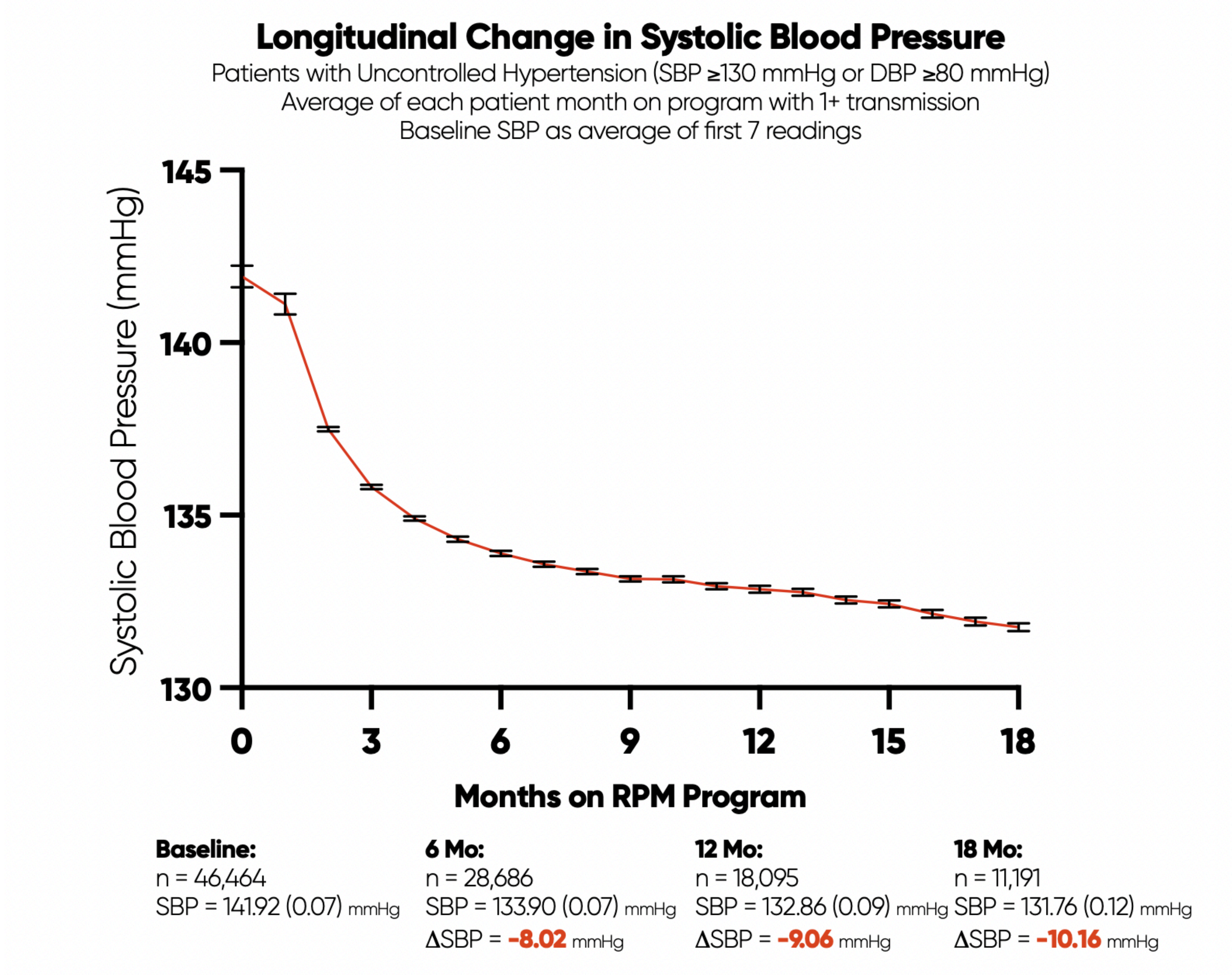
- Stay 1: **n=9,942** → progressive SBP reductions through Month 10; n drops to **1751** by month 10.

- Stay 2: n=**9,942** restarting RPM; n drops to **967** by Month 10 due to attrition

Key Insight: On re-initiation of RPM, SBP levels rebounded upward at Month 1 of Stay 2, nearly recapitulating the original baseline, suggesting loss of prior improvement during the LOA. However, subsequent months on RPM recapitulated the decline in SBP, mirroring Stay 1's slope.

Interpretation:
This pattern implies that discontinuation of RPM is associated with regression in BP control, and re-initiation restores therapeutic momentum. This regression-resumption profile strengthens the argument that RPM is mechanistically effective and that sustained use is necessary to preserve benefits. The consistent directional improvement after re-initiation eliminates regression to the mean or selection bias as sole explanations.

Figure 2: Longitudinal SBP Control in Continuously Enrolled Patients

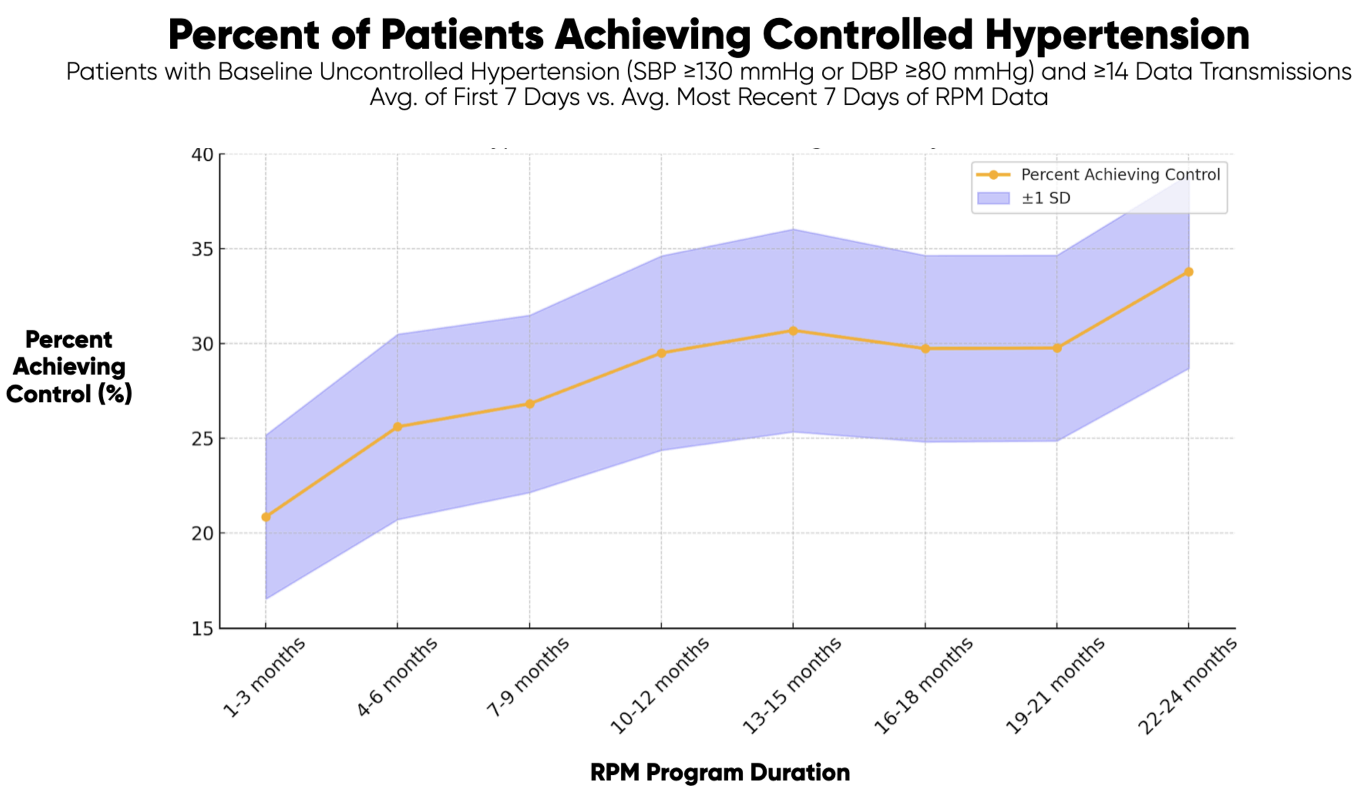


A separate cohort of patients with uncontrolled hypertension (n=**46,464** at baseline) was followed monthly up to 18 months of uninterrupted RPM engagement. Baseline SBP was computed as the average of the patient's first 7 readings and monthly mean SBP was assessed for all months during which a patient recorded >1 data transmission.

- Baseline SBP: **141.92 mmHg** (SE = 0.31)
- 6 Months: SBP = **133.90 mmHg** → Δ = **-8.02 mmHg**
- 12 Months: SBP = **132.86 mmHg** → Δ = **-9.06 mmHg**
- 18 Months: SBP = **131.76 mmHg** → Δ = **-10.16 mmHg**

Statistical Significance:
All reductions are statistically significant (**$p < 0.001$**) with tight confidence intervals due to large sample size ($n > 11,000$ at 18 months). The trajectory suggests a decelerating but persistent decline in SBP, compatible with longitudinal adherence effects and possible behavioral change consolidation.

Figure 3: RPM Duration and Achievement of Blood Pressure Control (SBP < 130 & DBP < 90)



To further assess RPM as a longitudinal intervention, we analyzed data on hypertensive patients and calculated the percent achieving blood pressure control (SBP < 130 mmHg and DBP< 80 mmHg) at varying program durations. Patients were grouped into 3-month intervals. Control conversion rates and standard deviations were calculated, along with p-values from Chi-Square tests.

Table 1: Proportion of Hypertensive Patients Achieving Blood Pressure Control by Duration of Remote Physiologic Monitoring (RPM)

Duration Interval	N	% Control	P Value for Control Conversion	P vs 1–3 months
1–3 months	3541	22.3	<.001	—
4–6 months	2673	24.9	<.001	0.018
7–9 months	1652	27.3	<.001	<.001
10–12 months	1231	28.8	<.001	<.001
13–15 months	896	30.4	<.001	<.001
16–18 months	707	31.1	<.001	<.001
19–21 months	503	32.2	<.001	<.001
22–24 months	333	33.6	<.001	<.001

This table summarizes the percentage of patients with uncontrolled hypertension (baseline Stage 1–3) who achieved blood pressure control (SBP < 130 and DBP < 80) across increasing durations of RPM participation. The leftmost column groups participants by 3-month intervals of program engagement. As duration increases, the proportion of patients achieving control rises steadily—from **22.3%** at 1–3 months to **33.6%** at 22–24 months. All durations showed statistically significant improvements in control conversion (**P < .001**). Additionally, each group was compared to the 1–3 month cohort, revealing significantly higher control rates for all longer durations (**P < .001**), reinforcing the dose-response relationship between RPM duration and clinical improvement.

Key Insight:
There is a clear, statistically significant increase in the proportion of patients achieving blood pressure control with longer duration of RPM use. These findings provide direct, empirical support that RPM delivers cumulative health gains over time.

Scientific and Clinical Implications

RPM as a Chronic Care Continuum:
The regression after LOA followed by renewed BP improvement upon re-engagement demonstrates that RPM exerts a durable therapeutic effect contingent upon ongoing use.

Treatment Decay Without Monitoring:
The "Month 1" SBP rebound post-LOA and the dose-responsive trend in conversion to control indicate that RPM is not merely a catalyst for initial change but a necessary component for maintenance of control.

Policy Implication:
CMS and private payers should consider modifying RPM reimbursement frameworks to incentivize long-term engagement rather than episodic usage. A longitudinal reimbursement model would align incentives with clinical outcomes and ensure RPM is only terminated upon physician-determined medical necessity.

Future Research:

- *Investigate psychological and behavioral contributors to RPM adherence.*
- *Evaluate RPM continuity in multimorbid populations.*
- *Quantify threshold durations (e.g., 90-day gaps) that lead to clinical relapse.*

Conclusion
These complementary analyses offer compelling evidence that RPM should not be considered a short-term intervention. Instead, its benefits are cumulative, dose-responsive, and reversible upon discontinuation. To optimize outcomes and reduce chronic disease burden, RPM must be operationalized as a sustained, longitudinal component of chronic care management.