Remote patient monitoring in the real world:
Immediate and long-term improvements in glycemic control

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BACKGROUND AND AIMS

Mobile-enabled remote patient monitoring (RPM) has the potential to increase access to care and improve health outcomes while also reducing hospitalizations and other healthcare-related costs. While RPM has the potential to augment diabetes management, the extent to which RPM programs can improve glycemic outcomes, especially as implemented in real-world clinics, is not well understood. The purpose of this study is to evaluate the efficacy of RPM pilot programs implemented in diabetes clinics.

METHOD

Glooko Remote Monitoring helps clinicians provide personalized care to patients on one simple platform. Glooko makes it easier for patients to view, understand, and share their diabetes data with clinicians between clinic visits. Clinicians view patients' in-clinic and at-home diabetes data in one platform to provide more personalized consultations based on a richer data set rather than just from periodic visits.

We evaluated real-world self-monitored blood glucose (SMBG) data among people with diabetes(PWD) who are enrolled in RPM pilot programs across healthcare systems in the United States. While the RPM pilot programs varied in scope and duration across sites, all PWDs were provided with the Glooko mobile app and were encouraged to sync blood glucose (BG), medication, and lifestyle information remotely using the app. The RPM care teams monitored these data remotely and provided coaching as needed. The RPM programs were initially designed to be short-term pilot programs (3-6 months), but some sites, spurred by the positive experience and success of the program, continued remote monitoring for longer durations (thus providing SMBG outcomes data for 12+ months). In the current analyses, we assessed cross-sectional SMBG data RPM program participants at various time points of the RPM program (up to 12 months). Cross-sectional sample size differences were attributed to rolling enrollment and variations in the duration of RPM program administration across participating sites.

RESULTS

Compared to pre-RPM SMBG data collected at enrollment, mean BG decreased steadily over the first three months and remained consistent after six and twelve months of RPM **(Table 1; Figure 1)**. Similar improvements were observed in the proportion of in-range (between 70-180 mg/dL) and hyperglycemic SMBG readings (>250 mg/dL) across the same time periods **(see Table 1; Figures 2 and 3)**. No differences were observed in the proportion of hypoglycemic readings (<70 mg/dL), proportion of PWDs with 1+ hypoglycemic SMBG reading, SMBG check rates, or coefficient of variation (CV) at any time period compared to pre-RPM **(Table 1)**.

CONCLUSION

In the current study, we observe immediate and sustained improvements across multiple glycemic outcomes following various durations of RPM. These findings are derived from SMBG data and should replicated using CGM data, which is being increasingly adopted by persons with diabetes. These findings, when considered in the context of evolving reimbursement models and enthusiasm from health care systems, suggest that RPM may provide sustained benefits. As RPM is adopted more widely, real world evidence can help establish its relative value. The ability of health care systems to effectively implement and scale RPM programs should also be better evaluated.

Table 1: Cross-sectional sample information and cross-sectional descriptives. All descriptives (except counts) are presented as median (interquartile range). Within each time period, only participants with at least 2 days of recorded SMBG readings are included in the analyses.

*indicates significant difference compared to pre-RPM (two-tailed KS test; P<0.05).

	pre-RPM	3 months	6 months	12 months
Cross-sectional sample size	250	278	164	97
SMBG check rate(checks/day)	1.4(1.1-2.1)	1.6 (1.1-2.0)	1.5 (1.1-2.0)	1.5 (1.1-2.0)
Average BG (mg/dL)	195.7 (157.6-236.6)	160.5* (137.4-189.4)	158.9* (139.0-190.0)	165.0* (142.3-181.6)
% of participants with 1+ hypoglycemic SMBG reading (<70 mg/dL)	16.4%	15.8%	15.2%	15.5%
% in-range SMBG readings (70-180 mg/dL)	41.6% (18.8%-73.4%)	71.0%* (47.4%-92.0%)	71.3%* (49.4%-89.5%)	71.4%* (51.1%-89.3%)
% hyperglycemic SMBG readings (>250 mg/dL)	15.2% (0%-38.7%)	2.9%* (0%-14.6%)	2.5%* (0%-13.9%)	3.2%* (0%-11.1%)
Coefficient of Variation	.26 (.18-.34)	.25 (.16-.34)	.24 (.17-.31)	.26 (.19-.33)

Figure 1: Average BG decreased during RPM. Median and IQR of mean SMBG readings decreased steadily over time during the RPM pilot program (18.0% improvement after 3 months; 18.8% after 6 months; 15.7% after 12 months).

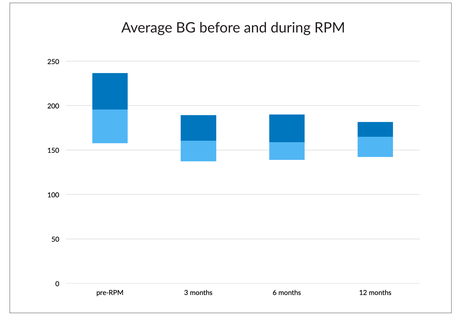

Figure 2: Proportion of in-range BG readings increased during RPM. Median and IQR of the proportion of in-range SMBG readings increased steadily over time during the RPM pilot program (29.4% pt improvement after 3 months; 29.7% pt improvement after 6 months; 29.8% pt improvement after 12 months).

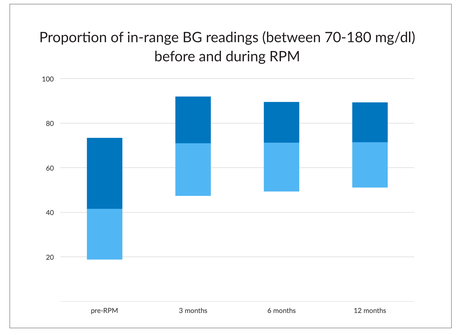

Figure 5: Proportion of hyperglycemic BG readings decreased during RPM. Median and IQR of the proportion of hyperglycemic SMBG readings decreased steadily over time during the RPM pilot program (12.3% pt improvement after 3 months; 12.7% pt improvement after 6 months; 12.0% pt improvement after 12 months).