National Institute for COORDINATED HEALTHCARE

GLOBAL TO LOCAL MOBILE HEALTH PROGRAM ANALYSIS OF CHANGE IN CARE COSTS AND ROI

Juan F. Gutierrez Sanin MD MPH

Global to Local's Mobile Health Program recruited a sample of 49 participants from a list of diabetic patients provided by the community health center HealthPoint, hoping to replicate the success shown by earlier remote case management projects enabled by mobile technology.

Through a partnership with AT&T, the Mobile Health Program provided each participant with a mobile phone equipped with a tested diabetes management application. Participants, then, sent a weekly report consisting of five or more blood sugar readings to a Global to Local case manager who tracked their progress and in turn provided a remote support system for disease management.

There is substantial evidence that application-equipped smart phones can be instrumental in helping patients struggling with diabetes. Many of the Global to Local participants were using smart phones for the first time in their lives.

The majority of the participants were low-income, uninsured, and ethnic/racial minorities. Several studies have shown these subpopulations are receptive to various case management approaches, including those involving remote technology.

The structure of the Mobile Health Program consists of a combination of weekly entries, educational cooking classes, and supportive case management. The program's pilot year recently ended. It had a remarkably low dropout rate with 36 of the 39 participants completing the program and having their annual HbA1c tested.

36% of the participants showed an HbA1c decrease of 1.26% from their baseline. These results are significant because it translates into a reduction in the risk of eye, kidney and nerve disease by approximately 40% and diabetes related death by 21%.

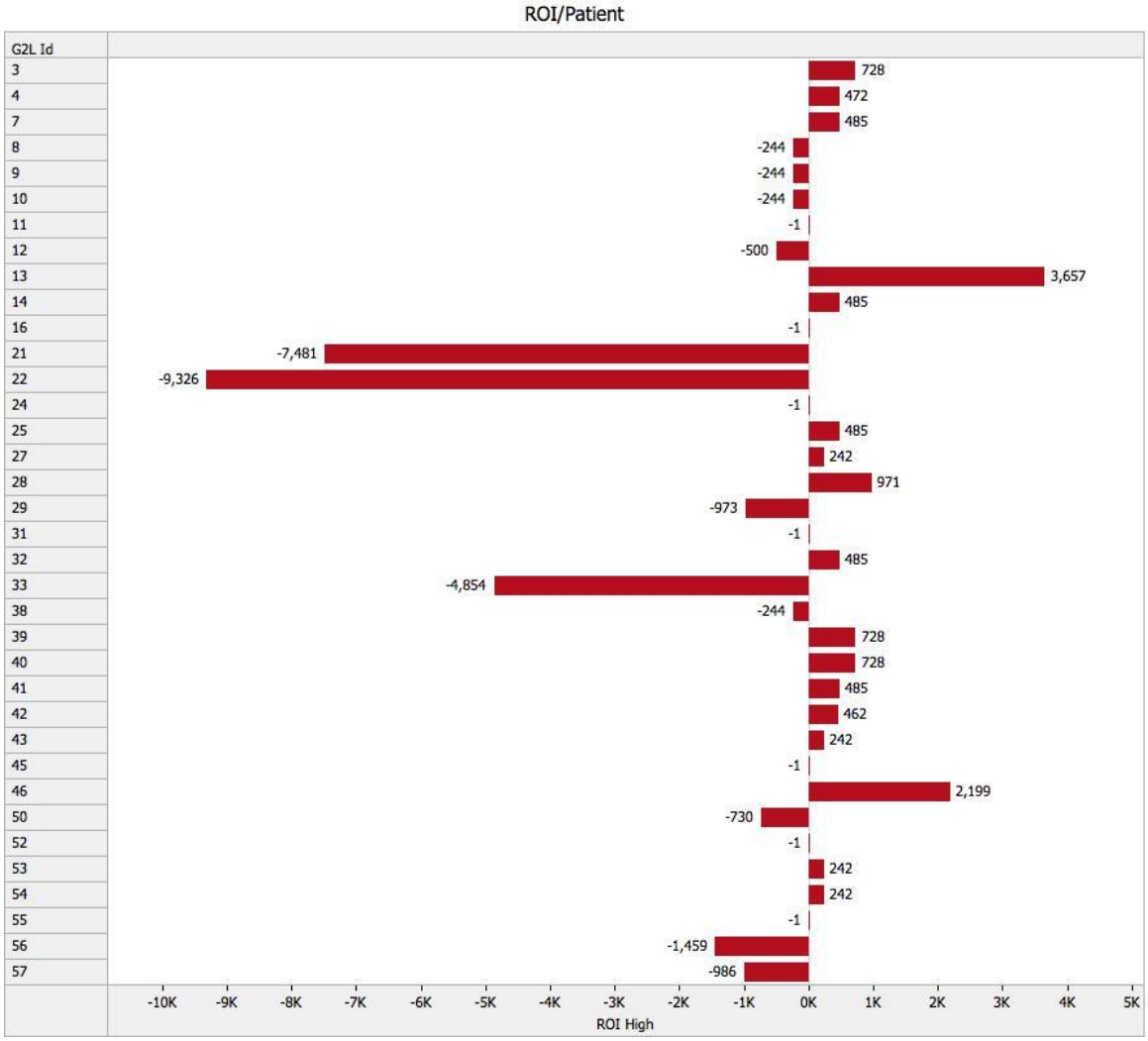
Global to Local generously agreed to share their data with the NICHC so that we could provide a comprehensive understanding of the financial implications of developing and implementing this program, including potential cost savings that can be achieved by decreasing participants' need for utilization of emergency and acute care services in the long term.

In order to produce this report we requested a specific data set from Global to Local, which was provided as an Excel^{R} workbook. We organized and cleaned up the data from any blank fields, converted the individual spreadsheets into comma-separated value files and uploaded the atomic data into a Tableau^{R} database, from which we proceeded to analyze Global to Local's results.

OUR FINDINGS

The aggregate return on investment (**ROI**) of the pilot project was negative: -6.1%.

However, there was a widely varied response from the participants, where the vast majority of them actually showed a significant decrease on their total care costs after the intervention, as reflected on this graphic

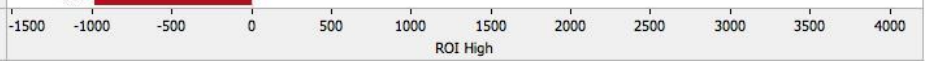


As it can be seen here, out of the 36 participants there are 4 exhibiting negative returns on investment of $1,000 or larger: These are the participants identified by the G2L Id numbers 21, 22, 33, and 56. We believe these participants to be outliers for a number of possible reasons that we'll discuss below. At Global to Local's request, we created two separate datasheets. The first excludes the outliers, to reflect what the ROI would have been if these 4 cases weren't included. The second looks only at cases with positive return on investment, in order to estimate the average savings per patient.

The results are shown below. The first alternative scenario has a **positive** ROI of 5.2%

Alternative Scenario

G2L Id	Race/Ethnicity	ROI High
3	African American	728
4	African American	472
7	Iraqi	485
8	Ethiopian	-244
9	White	-244
10	African American	-244
11	White	-1
12	African American	-500
13	African American	3,657
14	White	485
16	African American	-1
24	Hispanic/Latino	-1
25	Indian	485
27	African American	242
28	White	971
31	White	-1
32	African American	485
38	White	-244
39	White	728
40	White	728
41	Indian	485
42	White	462
43	African American	242
45	African American	-1
46	White	2,199
50	African American	-730
52	African American	-1
53	African American	242
54	African American	242
55	African American	-1
57	African American	-986

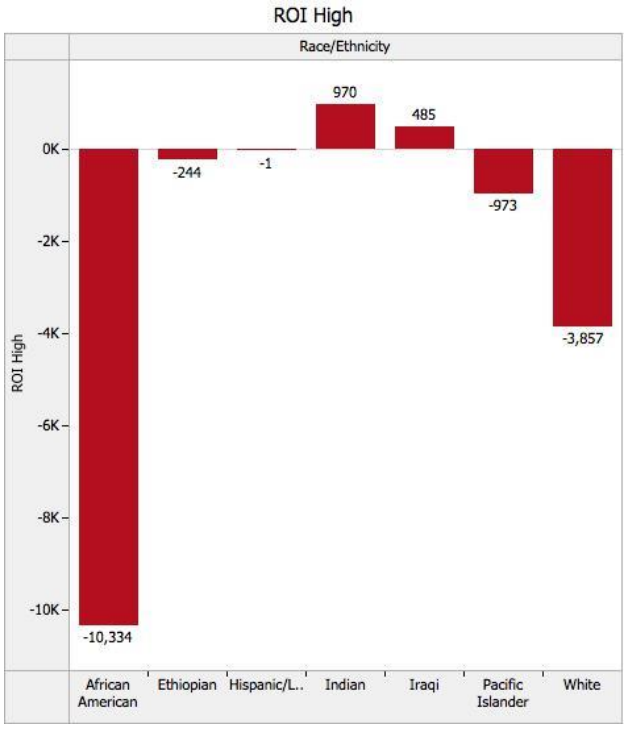


For the second alternative scenario we excluded G2L ID numbers 8, 9, 10, 12, 29, 38, and 50, leaving a total of 33 participants. This scenario rendered a **positive** 10% ROI, with an average savings per case of $556.46 per patient.

ROI/H1CChange

G2L Id	Race/Ethnicity	ROI High	Change in HbA1c
3	African American	728	-0.100
4	African American	472	0.700
7	Iraqi	485	-2.400
11	White	-1	0.500
13	African American	3,657	1.900
14	White	485	-0.900
16	African American	-1	0.200
24	Hispanic/Latino	-1	4.600
25	Indian	485	0.100
27	African American	242	3.100
28	White	971	-4.200
31	White	-1	-0.400
32	African American	485	0.200
39	White	728	0.500
40	White	728	0.100
41	Indian	485	0.300
42	White	462	1.400
43	African American	242	-0.100
45	African American	-1	-0.800
46	White	2,199	-1.200
52	African American	-1	0.400
53	African American	242	3.100
54	African American	242	4.600
55	African American	-1	0.600

We noticed some variations in responsiveness to the intervention across different demographics that we considered worth noting:



As it can be seen in this graphic, African American, White and Pacific Islander patients seem to have increased costs of care after the intervention. Hispanic and Ethiopian patients are neutral, while Indian and Iraqi patients show a significant reduction in their total care costs. It is important to note that all of the outliers are either African American or White.

There doesn't seem to be a very strong direct correlation between the changes in values of hemoglobin A1C and ROI as seen below:

ROI/HBA1CChange

G2L Id	Race/Ethnicity	ROI High	Change in HbA1c
3	African American	728	-0.100
4	African American	472	0.700
7	Iraqi	485	-2.400
8	Ethiopian	-244	0.700
9	White	-244	-0.200
10	African American	-244	0.400
11	White	-1	0.500
12	African American	-500	-1.500
13	African American	3,657	1.900
14	White	485	-0.900
16	African American	-1	0.200
21	White	-7,481	-0.300
22	African American	-9,326	0.400
24	Hispanic/Latino	-1	4.600
25	Indian	485	0.100
27	African American	242	3.100
28	White	971	-4.200
29	Pacific Islander	-973	1.000
31	White	-1	-0.400
32	African American	485	0.200
33	African American	-4,854	-2.300
38	White	-244	0.400
39	White	728	0.500
40	White	728	0.100
41	Indian	485	0.300
42	White	462	1.400
43	African American	242	-0.100
45	African American	-1	-0.800
46	White	2,199	-1.200
50	African American	-730	0.100
52	African American	-1	0.400
53	African American	242	3.100
54	African American	242	4.600
55	African American	-1	0.600
56	White	-1,459	-2.000
57	African American	-986	0.200

These findings lead us to believe that a more nuanced evaluation including clinical and non-clinical factors other than HbA1C, that can better predict utilization and cost, are needed to complement this already promising program.

DISCUSSION

Global to Local's Mobile Health Program is a viable alternative for providing chronic disease management to patients with Type II diabetes, through the use of mobile technology.

We are not aware of the screening process that was used to select participants in the program, or whether or not a risk management tool such as a LACE score was used during the selection process[2].

We know from a recent report[1] that interventions based on care coordination may take up to 3 years to show any significant savings.

Another risk assessment model, which can be of value and is disease specific is based on Carondelet's Diabetes Score Card[R].

Developed in Pima Co, Arizona, the Diabetes Scorecard stratifies diabetic patients using a scale from A – C, where A and B stages have 2 subdivisions (A1, A2, B1, B2). It relies on the following clinical elements:

- HbA1c
- Blood Pressure
- LDL
- GFR
- Neuropathy score
- Retinopathy score

Patients are allocated to a category at the beginning of the program and monitored for behavioral and metabolic outcomes, as well as for personal management goals. Carondelet Medical Group has found out that the scorecard is a good long-term predictor of care costs and readmissions.

Some of the patients in the analyzed data set may benefit from a more involved intervention, including home visits, as not all patients are equally responsive to remote monitoring.

We believe in this case Iraqi and Indian patients' dietary habits may tend to already include significantly more low-glycemic products than that of low-income White or African Americans.

The uneven responses across these different racial/ethnic groups suggests that a more directed utilization of community health workers as cultural brokers can potentially help further engage and activate the less responsive patients[4].

References

1. Rosenthal, M. B., Alidina, S., Friedberg, M. W., Singer, S. J., Eastman, D., Li, Z., & Schneider, E. C. (2015). A Difference-in-Difference Analysis of Changes in Quality, Utilization and Cost Following the Colorado Multi-Payer Patient-Centered Medical Home Pilot. *Journal of general internal medicine*, 1-8.

2. Spiva, L., Hand, M., VanBrackle, L., & McVay, F. (2014). Validation of a Predictive Model to Identify Patients at High Risk for Hospital Readmission. *Journal for Healthcare Quality*.

3. The Carondelet Diabetes Scorecard Program presented at the American Diabetes Association 6th Disparities Partnership Forum,
2013

4. Islam, N., Nadkarni, S. K., Zahn, D., Skillman, M., Kwon, S. C., & Trinh-Shevrin, C. (2015). Integrating community health workers within Patient Protection and Affordable Care Act implementation. *Journal of Public Health Management and Practice*, *21*(1), 42-50.