Enhancing Diabetes and Hypertension Self-Management: A Randomized Trial of a Mobile Phone Strategy

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ABSTRACT

mHealth has improved diabetes (DM) care in select populations. We assessed the impact of a mHealth DM plus hypertension (HTN) program on Medicaid patients. 40 patients with DM and HTN were randomized to a mHealth intervention (n=18) or usual care (n=22). All subjects had A1c >7.0% and BP >130/80 on meds. All subjects had BP and glucose meters. The mHealth group had a smart phone with the WellDoc™ Diabetes Manager application providing real time feedback on glucose and blood pressure (BP) entries. Case managers viewed glucose and BP via a web portal. A monthly report was entered into EMR. Primary outcome was change in the Patient Activation Measure (PAM) at 6 months. Secondary outcomes included A1c, BP, HEDIS measures, hospitalizations, and ER visits. At 6 months there were no significant differences between the mHealth and control group PAM scores, A1c, BP, HEDIS measures, hospitalizations, or ER visits. Our mHealth program did not improve self-management or clinical DM or HTN measures over 6 months. Subjects chose high PAM scores at baseline leaving little room for improvement. There was minimal engagement by case managers and primary care providers. Importantly, the mHealth system did not assist social needs critical to Medicaid patients. Both actual (eg. community health workers) and virtual (mHealth) assistance is needed to improve chronic disease management in this population.

	PAM score		A1c (%)		Systolic BP (mmHg)		Diastolic BP (mmHg)	
	Baseline (SE)	6 months (SE)	Baseline (SE)	6 months (SE)	Baseline (SE)	6months (SE)	Baseline (SE)	6 months (SE)
mHealth group (#18)	39.9 (1.1)	41.0 (1.3)	8.3 (0.4)	8.4 (0.5)	139 (3.7)	136 (5.0)	84 (1.7)	82 (2.5)
Control group (#22)	40.2 (1.1)	41.5 (0.9)	9.2 (0.5)	9.2 (0.6)	145 (2.6)	141 (2.9)	88 (2.3)	84 (2.1)

Background/Hypothesis

Background: Mobile Health (mHealth) has the potential to improve self management of type 2 diabetes (DM2). Recent studies utilizing mHealth to enhance DM2 care have had variable results, with only limited evaluation in an inner city high risk population. Additionally, nearly 50% of patients with DM2 have hypertension (HTN), thus there is a need to test the impact of mHealth for both DM and HTN.

Hypothesis: Introduction of a mHealth diabetes and hypertension strategy in an inner city community clinic can:
1) improve patient self management of DM2 (PAM score)
2) Reduce hospitalizations and emergency room visits
3) Improve HgA1c, blood pressure, and HEDIS measures

METHODS

1. Recruit 40 patients 18-80 years old followed in a DC urban community clinic who have DM2 (HgA1c >7.0%) and HTN (on >1 HTN med and BP>130/80mmHg)
2. Randomize participants to either the mHealth WellDoc Diabetes Manager© adapted with a HTN module monitored by a clinic-based case manager with monthly (or greater) reports to the primary care provider or to usual care with follow up for 6 months
3. Provide all subjects with a glucometer, test strips, home blood pressure monitor and all mHealth subjects a free smartphone and data plan for 6 months
4. Provide usual care subjects $20/month participation reward
5. Request all subjects to monitor glucose and BP at least 2x/week

DEMOGRAPHICS

	Cell Phone (n=18)	Control (n=22)
Females % (n)	55.6 (10)	60.0 (15)
Black % (n)	83.3 (15)	86.4 (19)
Previous cell phone owner % (n)	83.3 (15)	86.4 (19)
Access to internet % (n)	50.0 (9)	31.8 (7)
Employed % (n)	22.2 (4)	4.5 (1)
High School Education % (n)	88.9 (16)	54.5 (12)
College Education % (n)	16.7 (3)	4.5 (1)
	Mean (SE)	Mean (SE)
Age	56.2 (1.6)	55.9 (1.9)

PAM STAGE BY GROUP

% (n)	Cell Phone (n=18)		Control (n=21)	
	Baseline	6 Months	Baseline	6 Months
Stage 1	33.3 (6)	22.2 (4)	23.8 (5)	9.5 (2)
Stage 2	16.7 (3)	16.7 (3)	14.3 (3)	14.3 (3)
Stage 3	33.3 (6)	27.8 (5)	42.9 (9)	42.9 (9)
Stage 4	16.7 (3)	33.3 (6)	19.1 (4)	33.3 (7)

Intervention group: 27.8% (5) decreased stage; 16.7% (3) stayed the same; and 55.6% (10) increased stage.
Control group: 14.2% (3) decreased stage; 42.8% (9) stayed the same; and 42.9% (9) increased stage.

HOSPITALIZATIONS/ED VISITS/PCP VISITS

% (n)	Cell Phone		Control	
	Baseline (n=21)	6 Months (n=17)	Baseline (n=23)	6 Months (n=23)
No hospitalizations	85.7 (21)	100.0 (17)	69.9 (16)	69.6 (16)
No ER visits	66.7 (14)	88.2 (15)	47.8 (11)	68.2 (15)
Median # PCP visits (min-max)	4 (2-16)	2 (1-18)	5 (1-13)	4 (1-8)

HEDIS CRITERIA

	Cell Phone		Control	
	Baseline (n=21)	6 Months (n=19)	Baseline (n=23)	6 Months (n=23)
HgA1C done	85.7 (18)	94.7 (18)	100.0 (23)	95.7 (22)
LDL Done	81.0 (17)	84.2 (16)	87.0 (20)	91.3 (21)
Retina exam done	66.7 (14)	76.5 (13)	56.5 (13)	45.0 (9)
Nephropathy screening done	71.4 (15)	84.2 (16)	% (n)	78.3 (18)
BP as 2 measures	4.8 (1)	15.8 (3)	4.4 (1)	13.0 (3)
BP<140/90	71.4 (15)	89.5 (17)	52.2 (12)	73.9 (17)
LDL<100	57.1 (12)	68.4 (13)	43.5 (10)	56.5 (13)
Excellent/Good HgA1C	42.9 (9)	47.3 (9)	26.1 (6)	30.4 (7)

SATISFACTION SURVEY

	Cell Phone (n=17)	Control (n=22)
	% agree/strongly agree(n)	% agree/strongly agree (n)
Study made it easier to track BP and glucose	94.1 (16)	86.4 (19)
Study made it easier to take care of myself	88.2 (15)	90.9 (20)
Blood pressure better controlled than 6 months ago	88.2 (15)	90.9 (20)
Diabetes better controlled than 6 months ago	88.2 (15)	68.2 (15)
Cell phone was easy to use.	76.5 (13)	NA
Diabetes Manager was easy to use.	100.0 (17)	NA
Money I received was fair.	NA	86.4 (19)
Interested in cell phone to control diabetes and blood pressure.	NA	45.5 (10)
Would pay to use Diabetes Manager	88.2 (15)	45.5 (10)

LIMITATIONS

Baseline PAM scores high
Not selected for high baseline A1c
Case managers and PCP minimally engaged

CONCLUSIONS

Our mHealth program did not improve self-management or clinical DM or HTN measures over 6 months.
mHealth management of DM and HTN in a inner city community clinic is difficult to integrate into vulnerable inner city patients and their medical team. Importantly, mHealth did not address social needs critical to Medicaid patients. Both actual and virtual (mHealth) assistance is needed to improve chronic disease management in this population.