Improving Inner-city Substance Use Outcomes with Technology
Implementing DynamiCare Health's Motivational Incentives & Cognitive Behavioral Therapy App

Authors: Shawn Ryan MD MBA[1], Samin Rezania PhD[2]
Setting: BrightView Health, 446 Morgan St, Cincinnati, OH 45206
Population: Predominantly Medicaid with Opioid Use Disorder, prescribed opioid agonist medication
Design: Statistical matching between app + standard care
            vs. standard care group at similar nearby site

BrightView, the largest addiction treatment system in Ohio, launched a digital health smartphone wellness app from DynamiCare Health (www.DynamiCareHealth.com) as part of the Ohio Opioid Technology Challenge (OOTC). Governor John Kasich created the OOTC after Ohio generated the second-highest rate of opioid-related overdose deaths in the U.S.

METHODS:
At BrightView's Morgan St. Clinic, 108 participants with Substance Use Disorder (SUD) were recruited following IRB-approved consent, as the intervention group. The DynamiCare app provided (1) appoint-ment reminding and GPS tracking of successful attendance, (2) 36 in-app self-service Cognitive Behavioral Therapy (CBT) brief modules, (3) video-selfie monitoring for alcohol abstinence, and (4) logging of in-person urinalysis results conducted at the clinic. DynamiCare's app also automatically delivered (5) prompt financial incentives for each of these healthy behaviors. The study was run for 4 months for each patient. Financial rewards of up to $100 per month were transferred in real-time *via* a smart debit card that blocks risky expenditures (e.g., bars, liquor stores, cash withdrawals, etc.).

Control participants consisted of 95 patients at BrightView's Colerain site, with similar services and population, 2 miles away, also in metro Cincinnati. An algorithm statistically matched control and intervention groups, based on day of enrollment, urine drug testing prior to starting DynamiCare, and type of treatment program.

The intervention group was primarily white (85%), 54% male, with an average age of 39 years; 85% were Medicaid insureds. For most (90%), Opioid Use Disorder was the primary diagnosis and of these, most (94%) were prescribed buprenorphine. Participants were recruited from Brightview's intensive outpatient programs (27%), outpatient programs (68%), and continuing care programs (4%).

We compared urine test results between the control and intervention groups at 30, 60 and 90 days from starting the DynamiCare program (for control, we used time periods based on corresponding days-in-treatment). Urine tests were either consistent with medical expectations (i.e., positive for prescribed medications, e.g., buprenorphine, and negative for illicit substances) or inconsistent (positive for illicit substances and/or negative for prescribed medications).

RESULTS:

Drug Testing: The raw data show that DynamiCare participants were at least twice as likely to provide consistent urine tests at three time-points (Figure 1). Using a more rigorous logistic regression analysis to control for baseline urine test differences, the odds for a DynamiCare patient to submit a consistent urine test at 90 days were <u>approximately four times the odds</u> for a control patient (Table 1).
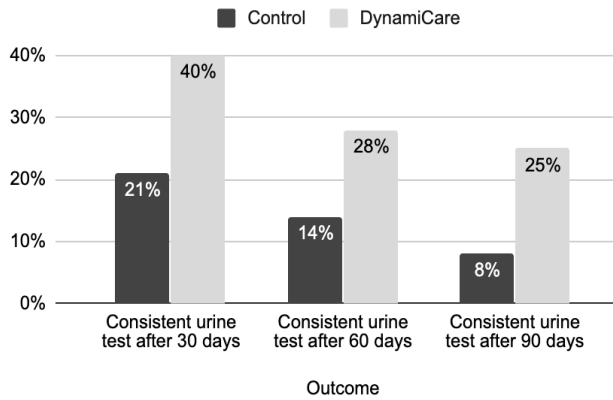

Figure 1: Percentage of consistent urine tests after 30, 60 and 90 days for the control group *vs.* the DynamiCare intervention group.

Consistent Urine Test	Odds Ratio
after 30 days	2.75*
after 60 days	2.46*
after 90 days	3.92*

Table 1: Logistic analysis, showing odds ratio of intervention group producing consistent urine tests after 30, 60 and 90 days. *= $p<0.05$.

Attendance: The urine outcome result is supported by the finding that intervention patients attended significantly more of their treatment sessions than control patients at every interval (Figure 2). An OLS regression analysis controlling for baseline urine tests estimated that the DynamiCare intervention increased treatment attendance by 8.6 - 16.1 percentage points, with the difference at each timepoint reaching significance (Table 2).
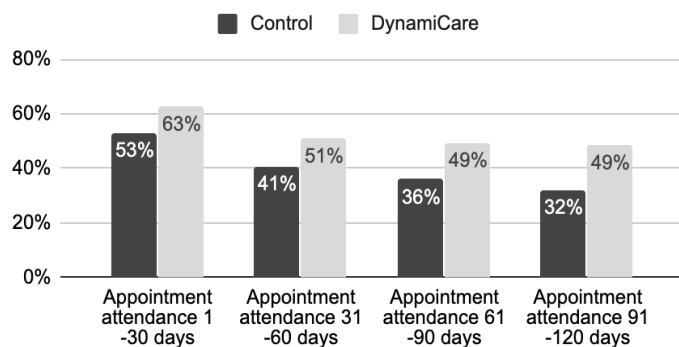

Figure 2: Percentage of appointments attended at 30, 60, and 90 days for the control group *vs.* DynamiCare intervention group.

Treatment Attendance	% Increase
from day 1-30	8.6*
from day 31-60	9.7*
from day 61-90	12.4*
from day 91-120	16.1*

Table 2: Treatment attendance percentage point increase from the control group to the intervention group. *= $p<0.05$.

2

Cognitive Behavioral Therapy (CBT) Effort: CBT effort was confirmed by post-module comprehension questions and detection of the duration spent with each module in the app (measured in minutes). With $1 incentives to read and complete comprehension questions for each 3-5 minute in-app CBT module, DynamiCare participants completed an average of 66% of available modules (historically and at the control site, CBT participation tended to be negligible).

CONCLUSIONS:
This study used statistical matching to investigate the efficacy of an integrated smartphone-smartcard app in a predominantly Medicaid, Opioid Use Disorder, opioid agonist-treated, inner-city population. The DynamiCare app was associated with significantly better urine substance test outcomes. These results were also associated with better attendance and substantial confirmed CBT effort. The odds of DynamiCare participants submitting a urine sample indicating abstinence and adherence to prescribed medication were 2.4 to 4 times greater than controls. This finding was sustained through day 90.

These results are consistent with the peer-reviewed literature on motivational rewards (also known as contingency management) combined with CBT. This innovative technology is a delivery-system enhancement over prior research, however, because it provides remote appointment reminders, remote random substance testing, and on-demand CBT with real-time incentives. The technology automates progressive reinforcement schedules, between clinic visits, even during evenings, weekends and holidays -- when patients may be at elevated risk but without access to providers.

Based on these outcomes, the DynamiCare platform was awarded $1M in the Ohio Opioid Technology Challenge and is now being offered on a clinical basis in a subsequent BrightView program expansion. These developments suggest that this technology can overcome staff burdens that have previously obstructed implementation of motivational incentives. Such apps offer potential for efficient, scalable, affordable and therefore sustainable access for public treatment systems.

---

[1]President and Chief Medical Officer, Brightview LLC
[2]Director of Clinical Research, Brightview LLC