FADAA
FLORIDA ALCOHOL & DRUG ABUSE ASSOCIATION

Contingency Management:
The Greatest Unused Treatment in Opioid Use Disorder

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Disclosure Information

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Purpose of the Webinar

- One of the most potent evidence-based practices (EBPs) in substance use disorders (SUD) is Contingency Management (CM)
- The vast majority of U.S. providers, however, do not use it.
- We will review
  - the theory of CM and its origins in operant conditioning
  - its evidence base of random controlled trials
  - current understandings of best practices
  - including what is not fully known
  - the logistic, financial, ethical and training obstacles that have impeded adoption of CM
  - how new technologies might be used to solve these challenges to facilitate adoption of CM into routine clinical care

Objectives

As a result of this workshop, participants will be able to:

- Comprehend the theoretical and research basis for adding Contingency Management (CM) to counseling and Medication Assisted Treatment (MAT) in caring for patients with opioid use disorder (OUD) and other addictions
- Understand the best practices for using CM
- Assess the challenges and potential solutions in adopting CM, with practical considerations for implementing it in routine clinical care

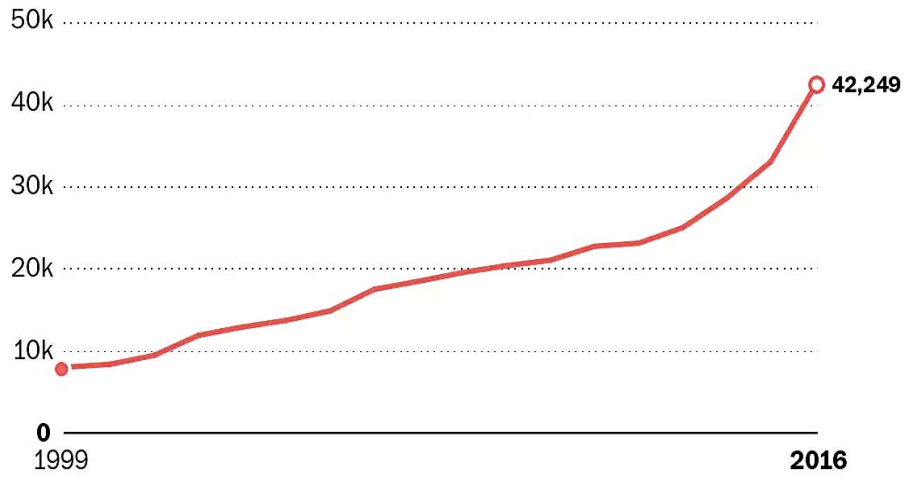
The U.S. Opioid Epidemic

- 1999 – 2014, Rx opioid sales & deaths ↑4X; Yet, no change in pain[1]
- 600,000 deaths 2000-2016; 42,000 in 2016; 40% - Rx opioids[1]
- Opioid OD deaths up in men/women, all races, & all adult ages[1]
- Estimated 2016 deaths: >60,000, driven by a 5X increase esp. from Fentanyl (3,105 in 2013 to ~20,000 in 2016) [2]
- FL: significant ↑in deaths 2015-2016; 115%↑ in Fentanyl deaths[1]
- 2016: 20 million (8% of Americans ≥12) needed SUD treatment[3]
- Only ~10% of these received any specialized care[3]

[1]https://www.cdc.gov/drugoverdose/data/statedeaths.html EG11
[2]https://www.cdc.gov/mmwr/volumes/66/wr/mm6643e1.htm EG10
[3]https://www.samhsa.gov/data/sites/default/files/NSDUH-DR-FFR2-2016/NSDUH-DR-FFR2-2016.htm EG12

Opioid deaths surge in 2016

Number of opioid overdose deaths, 1999 to 2016



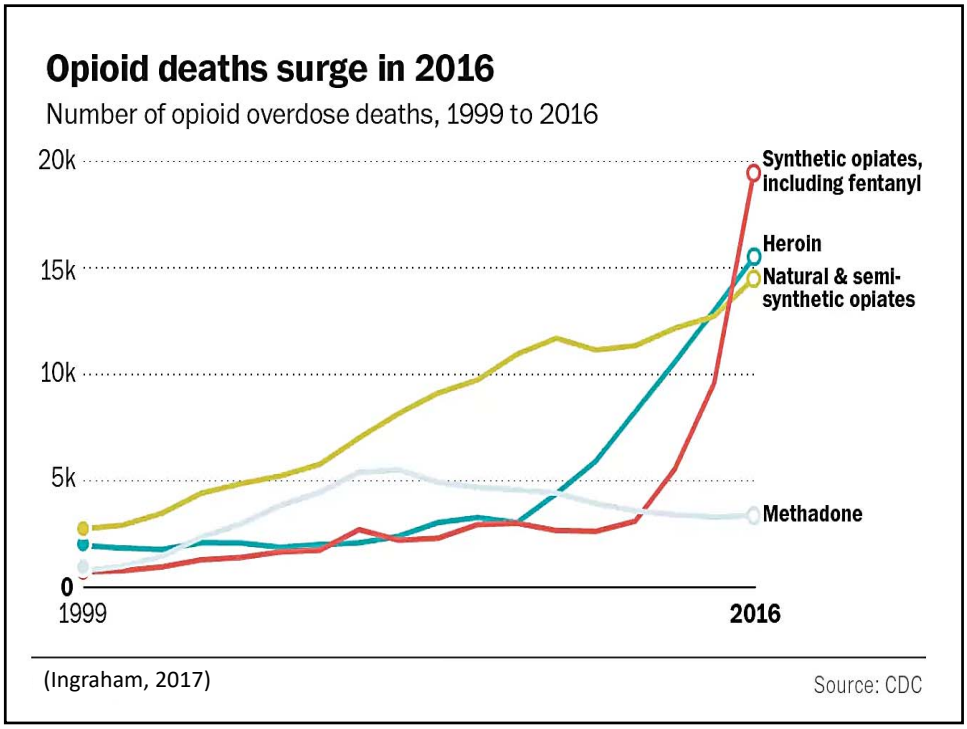
(Ingraham, 2017) Source: CDC

Slide 5

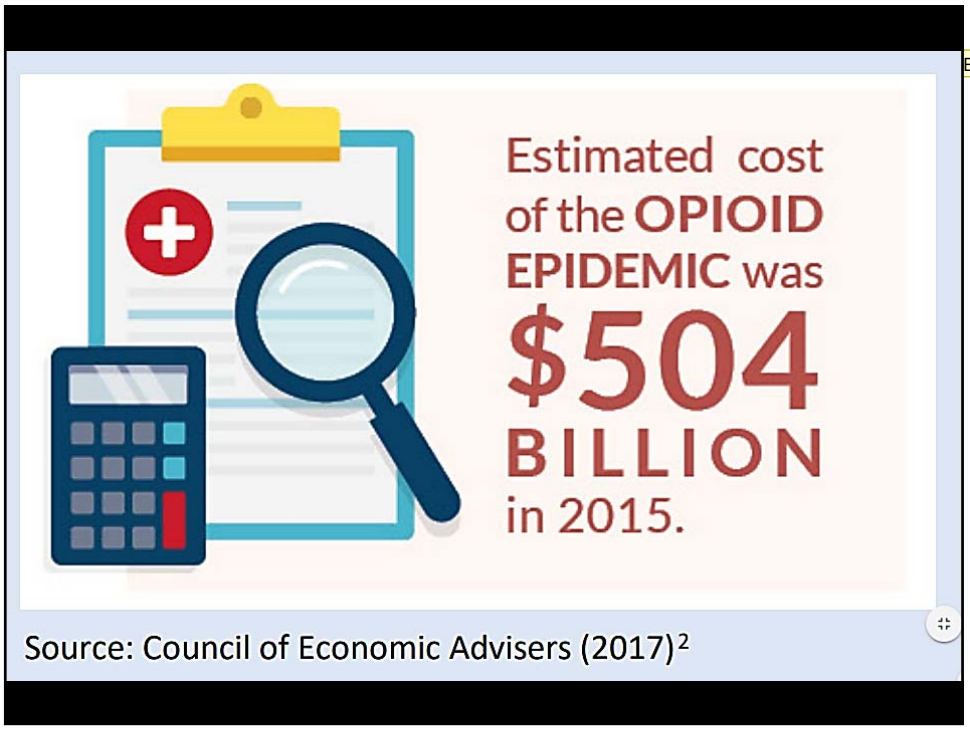
EG10 O'Donnell 2017
Eric Gastfriend, 3/7/2018

EG11 CDC 2018
Eric Gastfriend, 3/7/2018

EG12 Park-Lee 2017
Eric Gastfriend, 3/7/2018



(Ingraham, 2017)



Slide 8

EG7 US News & World Report 2017

Eric Gastfriend, 3/7/2018

Opioid Epidemic as an Economic Crisis

(US News & World Report, 2017)

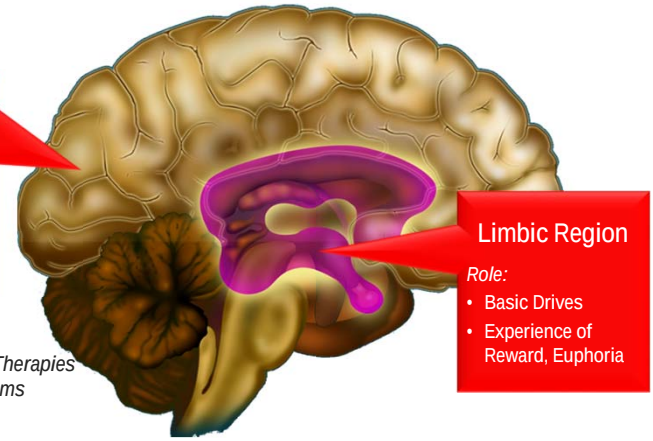
- OD: now the principal cause of death of Americans <50.
- ~27% of total societal costs of Rx opioid abuse: are from reduced earnings due to premature death,
- Reduced employment & compensation account for a further 20% ($7.9 billion in 2010)
- Employer surveys: Labor shortages because workers fail drug tests (Federal Reserve Banks of St. Louis & Philadelphia, 2017)
- Epidemic exacerbates economic inequities: In 1998-2008, states & counties with the highest poverty rates experienced the largest increases in opioid related ODs (CDC, 2011; Guy et al., 2017)
- Heroin abuse: Most prevalent among those with household income < $20,000

Opioid Epidemic as an Economic Crisis

(US News & World Report, 2017)

- Higher death rates in those without college & employed: drug & alcohol death rates rose 10X faster in middle aged whites without college than with college degree (Case & Deaton, 2015)
- Rates of illegal drug use are >2X as high among the unemployed (Badel & Greaney, 2013).
- Thus, the opioid epidemic is both a public health & economic crisis
- Confronting the epidemic is also essential to addressing both a cause and consequence of inequality in the US

Pathophysiology



Cortex

Role:
- Decision making
- Thinking
- Reasoning
- Learning

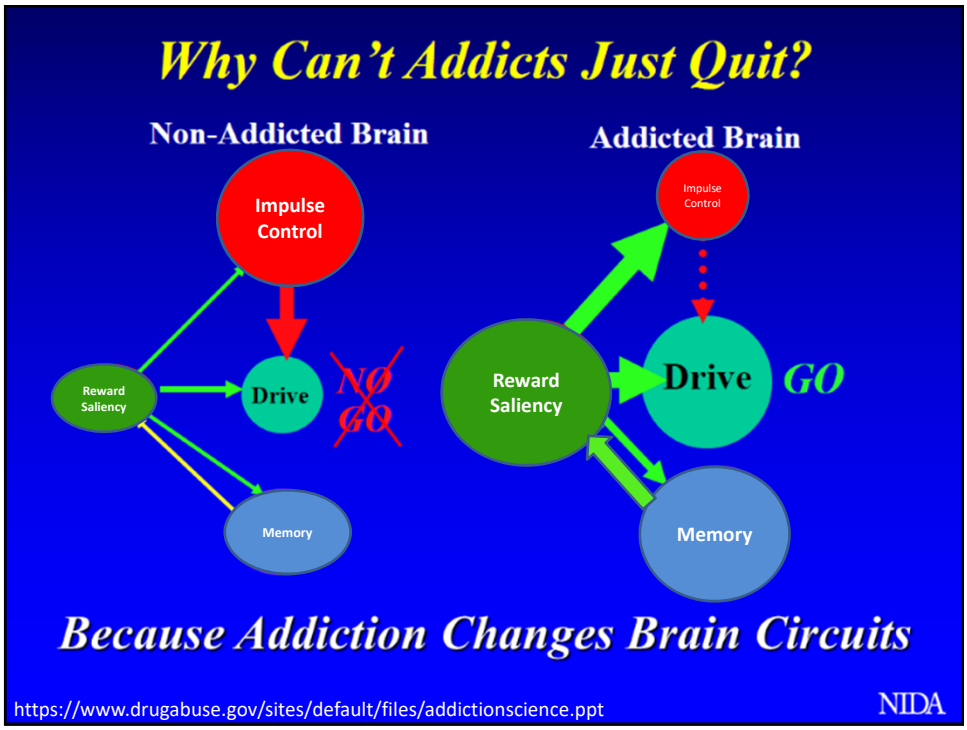
Interventions
- *Psychosocial Therapies*
- *12 Step Programs*
- *Monitoring*

Limbic Region

Role:
- Basic Drives
- Experience of Reward, Euphoria

Interventions
- *Agonist Medications*
- *Antagonist Medications*

NIDA Drugs, Brains, and Behavior – The Science of Addiction Website. Available at: http://www.nida.nih.gov/scienceofaddiction/brain.html. Accessed June 1,2011.
Fowler JS et al. Sci Pract Perspect. 2007;3:4-16.



Contingency Management (CM): Background

- CM is most-widely used in the field of substance abuse
- Often implemented as part of clinical behavior analysis
- A form of operant conditioning
- Uses stimulus control, + and - reinforcement to change behavior
- Patients' behaviors are rewarded (or, less often, punished) for adherence to or failure to adhere to program rules or treatment plan.
- Derives from the science of applied behavior analysis (ABA)
- By most evaluations, its procedures produces one of the largest effect sizes out of all mental health & educational interventions

(Forness, et al., 1997) EG8

Contingency Management (CM): Approaches

Rewards: can be $, vouchers, opportunity to win prizes, or privileges

Token Economy:

- Successful with a diverse array of populations: Addiction, children w/special needs, stuttering, delinquency, etc.
- Goal: To gradually phase out CM & transition to natural reinforcers
- Voucher-based CM:
- Gives vouchers for retail items contingent upon abstinence from drugs or compliance with other behavior-change targets
- Introduced in the early 1990s for cocaine dependence
- Most effective method for cocaine abstinence in controlled trials

Slide 13

EG8 Couldn't find this one.
Eric Gastfriend, 3/7/2018

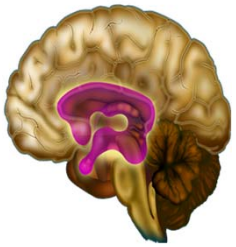
Contingency Management (CM): Approaches

Privileges: Medication Take-homes

- Frequent in Methadone maintenance treatment (MMT)
- Patients are permitted to "earn" take-home doses of methadone in exchange for increasing, decreasing, or ceasing behaviors
- Take home-doses or bottles are highly desirable rewards because patients come to the clinic less often for medication
- For example, a patient receive 1 take-home dose per week after submitting negative urine drug screens for 3 months
- Lapse/relapse: → loss of take home privilege, brief/long-term

Contingency Management (CM): The Theory

- Addiction is a complex illness, a large part of which is sustained through reinforced learning
- Learning is mediated by the dorsal striatum and becomes hard wired through procedural learning
- With procedural learning we cannot unlearn habits; – we must learn new and competing habits
- The Limbic system connects to (and drives) the Prefrontal Cortex
- CM uses incentivized reinforcement learning to restart the brain's Drive/Reward system and entrain new behaviors that drive the process of recovery



Question:

Are you familiar with Contingency Management?

1. I am unfamiliar with Contingency Management (CM)
2. I've heard of it
3. I'm aware of its principles
4. CM is being used in a program in which I am or have worked, but I didn't use it
5. I've used CM

Question:

Why can't we / Why don't we use Contingency Management?

1. I don't know about it or how to use it
2. It's unethical to pay addicts to do what they should do
3. It violates regulations to pay patients money – and they might buy drugs with the money
4. It's difficult to do the accounting for rewards money
5. It's hard to do rigorous urine testing, i.e., "observed stream" and true random testing

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1968, 1, 263-266 NUMBER 3 (FALL 1968)

A TECHNIQUE FOR CONTROLLING BEHAVIOR IN NATURAL LIFE SETTINGS[1]

THOMAS J. TIGHE AND ROGERS ELLIOTT[2]

DARTMOUTH COLLEGE

A behavior control technique is presented, consisting primarily of having a patient give up some portion of his reinforcers (usually money) with the understanding that he must behave in therapeutically prescribed ways in his natural environment to re-earn the reinforcers. The critical features and requirements of the technique are discussed, various applications are suggested, and implications for research are drawn.

A behavior modification program is likely to be successful to the degree to which it provides control over the relevant response-reinforcement contingencies. That human behavior may be readily modified under conditions which permit precise control of reinforcement variables, as in the laboratory, the clinic, or the institution, has been abundantly demonstrated. Yet, in the usual form of out-patient behavior therapy the therapist has little if any control over the major reinforcements and effects can be expected to dissipate to that extent when the patient returns to his natural environment. An urgent problem for the behavior modifier, then, is the development of techniques to extend his control over the patient's behavior in everyday situations and allow him to shape appropriate behavior in the presence of the ultimate controlling stimuli. This paper outlines such a technique and considers the major issues in its application and development.

volved in applying the technique. First, the response-reinforcement relation should be set up so that it is irrevocable and the patient should be convinced that the manipulated behavioral consequences are inevitable. For ex-

A second condition of effectiveness is that the program should be sufficiently extensive to make probable the persistence of the improved behavior after the threat of reinforcer loss has terminated. At present, the therapist must largely be guided by his knowledge of the behavior involved in meeting this condition. One procedure that may be useful in this regard is to urge the subject to extend treatment if he does not feel confident of his ability to continue the improved behavior when treatment ends. This procedure was tried with some of our smoking subjects and several of them extended the behavior-reinforcement contract for various periods up to 1 yr of total treatment length.

Third, the therapist must be assured that the desired behavior is actually occurring during the course of the treatment. The ease with problems. For example, in applying the technique to smoking behavior, this condition was manipulated as a shaping procedure. We sought to make sustained abstinence more probable by first requiring and immediately reinforcing a period of abstinence which was probably within the capacity of each beginning participant, *i.e.*, an initial two-day period of abstinence followed by return of $10. The later payoffs were then staggered over successively longer periods of abstinence in an effort to approximate gradually the ultimate demands of long-term quitting. Finally,

dered as a condition of treatment. On an intuitive basis, the prospective loss of a previously owned reinforcer seems to be an unusually compelling form of behavior control, and this notion was expressed by a number of the subjects in the smoking study. It would be in-

ment. A not inconsequential aspect of this issue is that the use of the subject's own reinforcer, should this prove to be a generally effective form of control, avoids the practical limitations involved in direct payment by the therapist for altered behavior, as in manipulation of therapist's fees.

CM: The Evidence in SUD

- >100 RCT's (Prendergast 2006 + Davis 2016)
- 7 meta-analyses
  - ✓ Ainscough 2017 : "Contingency management appears to be efficacious for treating most drug use during treatment for opiate addiction."
  - ✓ Prendergast 2006: "among the more effective approaches to promoting abstinence"
  - ✓ Benishek 2014: "among the most empirically supported strategies for increasing drug abstinence."
  - ✓ Davis 2016: "high efficacy, moderate to large effect sizes during treatment that weaken but remain evident following termination, across SUDs, populations, and settings"
  - ✓ Griffith 2000, Lussier 2006, Dutra 2008

Behavioral Incentives Recommended by:

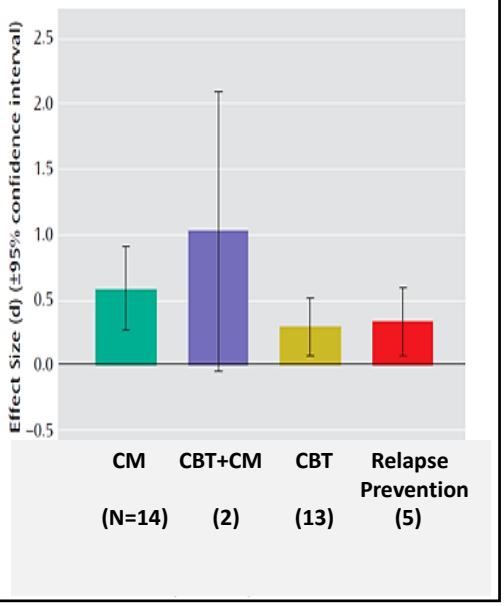
NIH National Institutes of Health | SURGEON GENERAL | ASAM | NHS

CM: The Evidence in SUD

Meta-analysis

- Ainscough 2017: "Contingency management appears to be efficacious for treating most drug use during treatment for opiate addiction."
- Dutra 2008: "The strongest effect was found for CM."

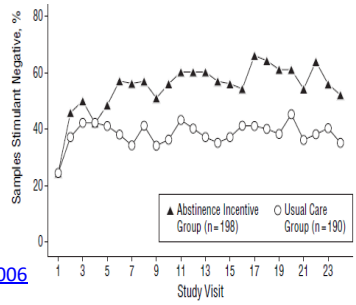
FIGURE 2. Mean Effect Sizes Across Treatment Types



CM: The Evidence in Stimulant Use Disorder

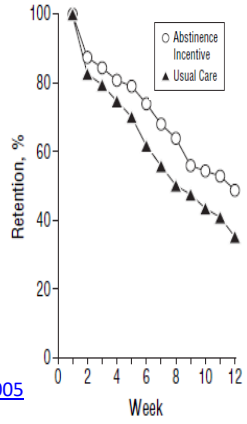
NIDA Clinical Trials Network

- N=800 cocaine/meth-users (14 Methadone clinics)
- Prize-based CM, 12 weeks
- $40/mo/pt
  - Pts reaching 4-wks cont. abstinence: 24% vs. 9%
  - Mean wks. cont. abstinence: 2.8 vs. 1.2



Peirce, et al. 2006

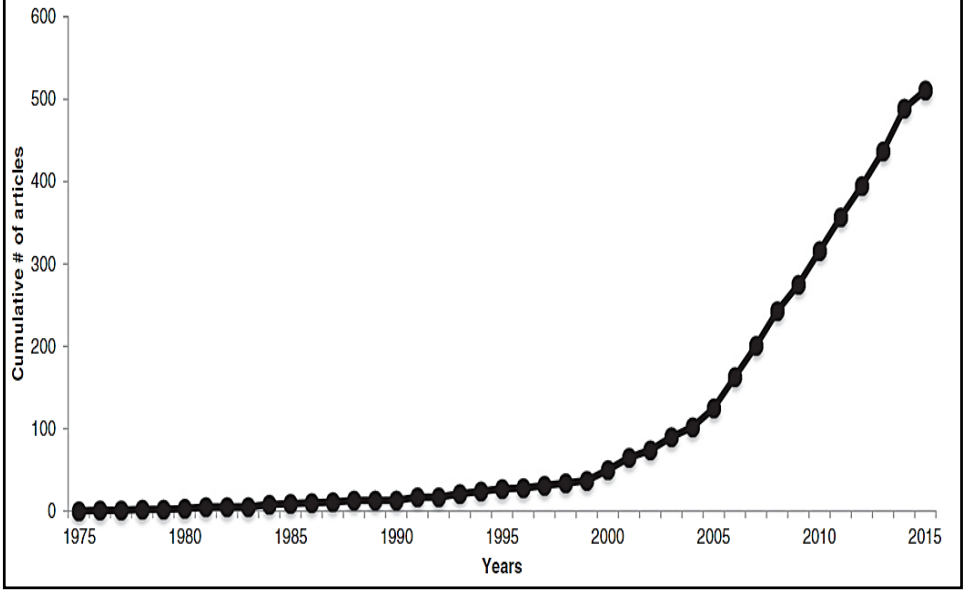
- Psychosocial clinics: $70/mo/pt
  - Retention (% of pts): 49% (CM) vs. 35% (Control)
  - Mean wks. cont. abstinence: 4.4 vs 2.6



Petry, et al. 2005

CM: Growth in Published Papers, 1975 – 2015

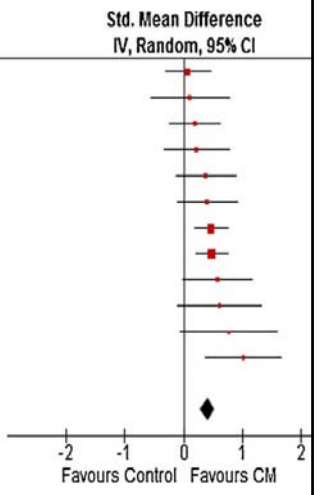
(Davis et al., 2016)



CM: For Opioid Use Disorder with MAT

Study or Subgroup	Std. Mean Difference	SE	Weight	Std. Mean Difference IV, Random, 95% CI
025 Ling et al. (2)	0.08	0.2	10.8%	0.08 [-0.31, 0.47]
134 Schottenfeld (3)	0.11	0.34	3.7%	0.11 [-0.56, 0.78]
181 Umbricht et al. (1)	0.2	0.22	8.9%	0.20 [-0.23, 0.63]
189 Katz et al. (3)	0.22	0.28	5.5%	0.22 [-0.33, 0.77]
133 Preston et al.(2)	0.38	0.26	6.4%	0.38 [-0.13, 0.89]
156 Petry et al. (1)	0.4	0.26	6.4%	0.40 [-0.11, 0.91]
174 Petry et al. (5)	0.47	0.14	22.0%	0.47 [0.20, 0.74]
147 Epstein et al. (3)	0.48	0.14	22.0%	0.48 [0.21, 0.75]
062 Kidorf et al. (1)	0.58	0.3	4.8%	0.58 [-0.01, 1.17]
074 Kidorf et al.(5)	0.61	0.36	3.3%	0.61 [-0.10, 1.32]
045 Vandrey et al. (1)	0.77	0.42	2.4%	0.77 [-0.05, 1.59]
061 Dunn et al. (4)	1.02	0.33	4.0%	1.02 [0.37, 1.67]
Total (95% CI)			**100.0%**	**0.41 [0.28, 0.54]**

Heterogeneity: Tau² = 0.00; Chi² = 10.10, df = 11 (P = 0.52); I² = 0%
Test for overall effect: Z = 6.22 (P < 0.00001)



(1) = Cocaine, (2) =opiates, (3) =opiates and cocaine, (4) = Tobacco, (5) = Poly-substance

(Ainscough, et al. 2017)

CM: Effective for MAT

CM is highly effective – it can motivate the patient to:
(Stitzer & Vandrey 2008)

- Reduce illicit drug use, including opioids and stimulants
- Increase medication adherence

4 randomized trials found no extra benefit
to adding counseling to well-conducted medical management visits delivered by the buprenorphine prescriber.

BUT, there is evidence of benefit of CM + pharmacotherapy
(CSAT Tip 63, 2018)

CM: Effective for MAT

- 43 papers published just on Opioid Use Disorder (OUD) Studies
- 22 of these were OUD Random Controlled Trials (RCTs)
- All but 1 involved MAT (Methadone maintenance treatment or Office-based opioid treatment)
- RESULT: During MAT, CM is efficacious for ↑Length of Stay & ↓Drugs with:
  - ✓ Cocaine
  - ✓ Opioids + Cocaine
  - ✓ Tobacco
  - ✓ Polysubstance
  - ✓ (BUT not for use of opioids alone)

(Ainscough et al., 2017)

5 minute break

CM: Effective for Withdrawal Management

Medically supervised withdrawal is necessary for starting extended release naltrexone (XR-NTX), which can require 7 days after short-acting opioids
and 10 – 14 days after long acting opioids.

Patients who complete withdrawal are at increased risk of opioid OD

CM can reduce (Amato et al., Cochrane Reviews 2011):

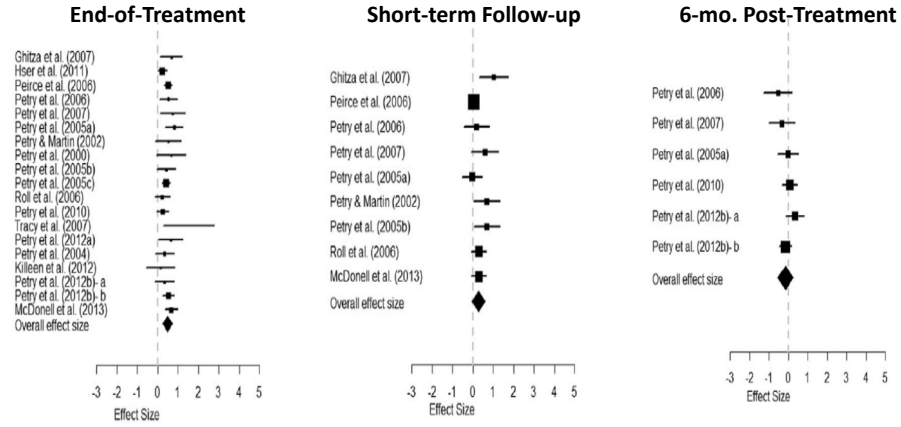
- Dropout from medically supervised withdrawal
- Opioid use during withdrawal
- Opioid use following completion of withdrawal

CM: Also shows proven efficacy for…

- Adults, adolescents & family SUD treatment, & non-opioid SUD
- Patients with Co-Occurring Psychiatric Illness (Bellack et al 2006)
  Negative drug tests: 59% (CM) vs. 25% (Control)
- Homeless population (Millby et al 2000)
  Abstinence @ 6 months: 41% vs. 15%
- Criminal justice-involved patients (Carroll et al 2006)
  Days of abstinence: 27 vs. 19
- Pregnant women (Jones et al 2001)
  Opioid-negative samples: 90% vs. 82%
- Adolescents (Krishnan-Sarin et al 2006)
  Smoking abstinence @ 1 month: 53% vs. 0%

CM: The Limitations

1. Cost: ~$100/month per patient in prizes (Petry 2013)
2. Study Durations: Most are 3-month trials
3. CM Effects regress after 6 months (Benishek 2014)



CM: The Limitations

4. CM is Labor Intensive – It Requires…

- Drug testing
- Attendance tracking
- Tracking of reinforcement schedules
- Distributing prizes

  Estimated $100 in staff time per patient for 12-week CM (Petry 2013)

5. Overcoming cultural resistance:

- inertia
- "paying drug addicts", "for what they should do anyway"

CM: The Myths

1. "Patients relapse when you take rewards away"
   - CM patients do slightly better than controls immediately after treatment; and no better & no worse than controls at 6 months post-treatment. (Benishek 2014, Davis 2016)
2. "Prize-based rewards encourage gambling"
   - 62 cocaine users who gamble assigned to prize-based CM actually gambled less after CM treatment (Petry & Alessi 2010)
3. "Patients will spend the money on drugs/alcohol"
   - 222 cocaine patients randomized to cash CM, voucher CM, or control: Cash was just as effective as vouchers and "did not increase rates of drug use, cravings, or high-risk behaviors" (Festinger 2014)

CM: Best Practices

When in the course of illness and recovery is CM effective?

Surprisingly, CM can be effective during:

- Active use, where it decreases use
- Reinforce abstinence in early recovery
- Sustain recovery through the first years of the recovery process

Consider CM for management of early recovery (1st year)

To decrease the ambivalence all recovering individuals experience

CM: Best Practices

1. Based upon operant conditioning
2. Breaks down the recovery process into a series of goals that are:
   - Concrete
   - Attainable
   - Realizable
3. Sidesteps hopelessness of many individuals with addictive disease
4. Subtly and unconsciously establishes priorities for recovery by:
   - Rewarding critical recovery behaviors
   - Prioritizing critical behaviors through reward intensity

CM: Best Practices – Setting Patient Goals

Goals should be:

1. Frequent (>1 time per week)
2. Attainable
3. Objective
   - Attending a therapy session
   - Attending a support group meeting
   - Completing a drug screen
   - Having a negative drug screen
4. The system must be designed to prevent gaming of the system

CM: Best Practices – Setting Rewards

Rewards should be:

1. **Immediate** - immediate rewards are twice as effective as delayed rewards (Lussier 2006)
2. **Tangible** and matched to participant needs.
3. **Intermittent** reinforcement rewards (e.g., pulling a ticket from a punch bowl that may contain a prize, of varying values is just as effective as constant reinforcement but through lower level prizes.
4. **Valuable** - low value rewards are half as effective as high-value rewards (Lussier 2006).

CM: Best Practices – The Reward Schedule

The Reward Schedule should be:

1. Escalating, especially for critical behaviors.
   For example, escalating for each subsequent positive drug screen (the most fundamental goal of addiction care).
2. Resetting, when an expected behavior does not occur
   A positive drug screen resets the next negative urine screen to a lower reward.
3. Intermittent

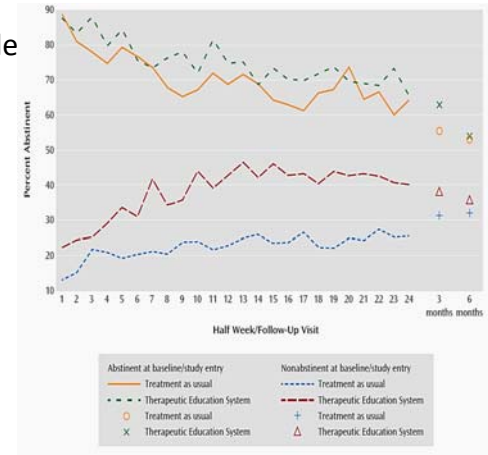
CM: A Technology Example

1. A smartphone app in the patient's hands
2. Can be added to routine treatment at multiple levels of care
3. Current care models continue; no change — except adds CM
4. Provides appointment reminders, & tracks attendance/duration
5. Automates drug testing process & has the client do the labor
6. Tracks reinforcement schedules, disbursement of funds/prizes
7. Measures client compliance & performance/outcomes
8. Alerts for missed visits (SUD, self-help, primary care, dental)

CM: Computerized CM + CBT

NIDA Clinical Trials Network

- 507 substance-using patients across 10 outpatient clinics
- Prize-based CM, 12 weeks, $92/mo.
- Alcohol, cocaine, opiates, marijuana, and many combinations
- Computer (TES) delivers CBT, calculates CM reward schedule
- TES group 28% less likely to drop out
- Bigger effects for those nonabstinent at baseline



Campbell, et al. 2014

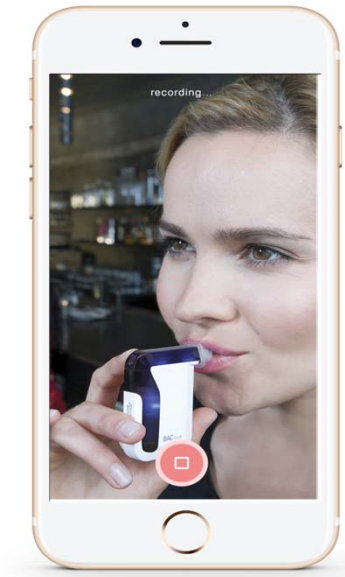
CM: Technology for MAT

1. Multiple drug testing options
   - Video selfie verification
2. Medication adherence options
   - Medication reminders
   - Dose amounts, time of day
   - Video selfie verification
3. Pill counts
   - Video selfie verification

CM: Technology for MAT

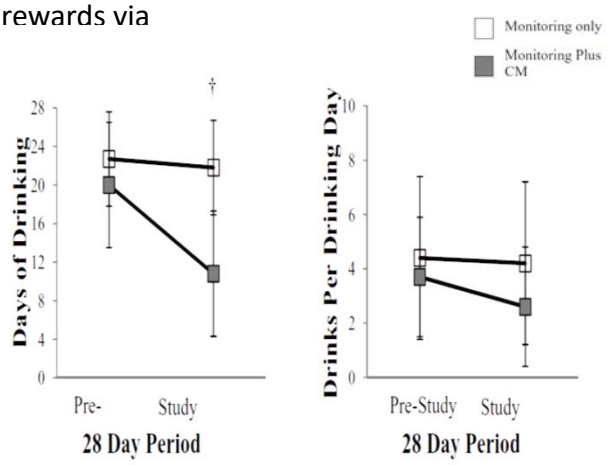
Selfie Videos for drug testing for:

- Drugs (saliva test kits)
- Alcohol (breathalyzer)
- Tobacco (smoke-alyzer)



CM: Selfie Videos & Breathalyzers

- 30 frequent drinkers, not in treatment
- Escalating voucher CM, 28 days, ~$219 avg.
- Flip phone & breathalyzer
- Send videos & earn rewards via using texting.
- Tests requested 7am-11pm, 1-3 times/day
- 86% mod./very satisfied with selfie testing



Alessi and Petry 2013

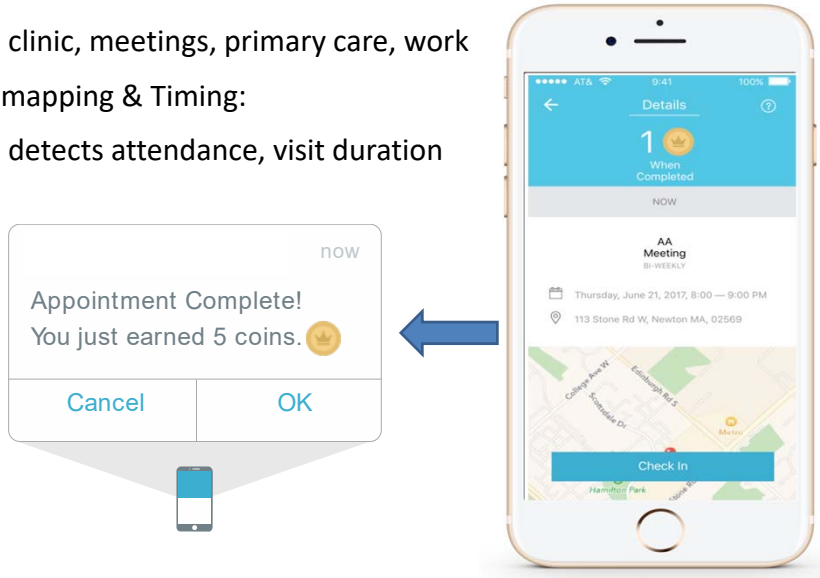
CM: Technology for Appointments

Appointment Reminders:

- clinic, meetings, primary care, work

Geomapping & Timing:

- detects attendance, visit duration



CM: Technology for Rewards Delivery

Multiple Options for Issuing Rewards:

- Direct Payment in Dollars
- Direct Payment in Vouchers
- Gamification Layer with streaks & coins
- Fishbowl Clicker
- Spinner Wheel

(Utilizing behavioral economics)

CM: Technology for Rewards Fundraising

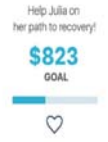
87% of parents of opioid-addicted children would be willing to pay $200/week for an incentive-based program

(Baltimore Research; unpublished 2017)

Crowdfunding rewards: Multiple options

- Wages, welfare payments, disability checks
- Significant other, family, friends
- Payer
- Employer

HOW IT WORKS: ABSTINENCE



Fund incentives from patient, family, employer, or payer

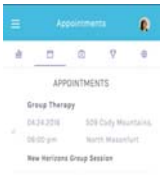
User receives smartphone app & drug testing device

User gets "random" alerts for drug testing

User performs drug test with selfie, App verifies it

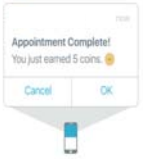
Money is deposited onto a debit card

HOW IT WORKS: ATTENDANCE



Automatically gather dates, times, locations of appointments

User receives reminder alerts for upcoming appointments

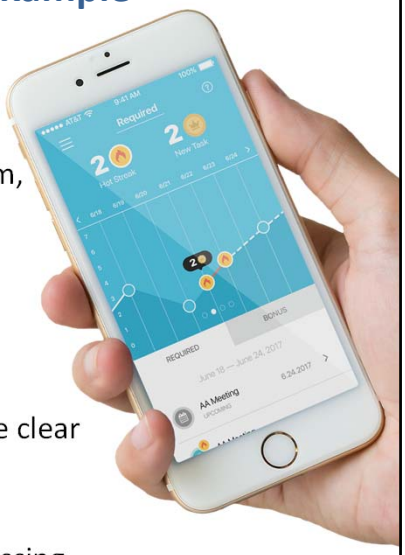


User is "checked-in" to appointment using GPS – right time, place & duration

Money is deposited onto a debit card

CM: A Patient-centered Care Example

- Patients like reminder alerts for meetings & med doses
- Burden of effort on patient, not clinic
- Drug Testing – Urine: not truly random, not witnessed, patient feels "dirty" vs. Saliva Testing
  - True random or "smart" random, & witnessed – yet less intrusive
- Rewards
  - Amounts received & remaining are clear
  - Immediately available to patient
  - Graphically displayed over time so patient sees how s/he is progressing



How can we give patients incentive rewards & generate raw data for behavior analytics?

Desirable features of a smart debit card for early recovery:

- Eliminate access to cash, excess spending
- Block spending at bars, liquor stores, casinos,
- Provide fine-grain spending controls
- Real-time, high- value, -volume behavioral data

ANALYTICS

Population Health tool
for families, insurers & providers
to predict relapse
& trigger intervention

Using a recovery debit card

Machine learning
based on behavioral data stream

Powers "smart" drug testing
instead of random tests

Prevent relapse before it happens

Drop-Out Prediction
Proof of Concept Test
True Positive Rate

CM + Technology Benefits

Treatment Programs

- Predict, catch & reduce relapses
- Increase retention
- Quality improvement

Families

- Leverage the power of incentives
- Support instead of enabling/policing
- Monitor behavior

Payers/States

- Cost-effective treatment
- Reduce hospitalizations
- Innovative models outcome-based payments, etc.

Conclusions

- Contingency Management (CM) is one of the most potent evidence-based practices (EBPs) for substance use disorders (SUD)
- The vast majority of U.S. providers, however, do not use it because of logistic, financial, ethical and training obstacles
- But, new technologies can help solve these challenges to facilitate adoption of CM into routine clinical care
- Also, more research & experience is needed about:
  - How to individualize CM for patients' unique & changing needs
  - How to transition patients from CM rewards to natural rewards

For more information:

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