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Adaptive Interventions May Optimize Outcomes in Drug Courts: A Pilot Study

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Abstract

Adaptive interventions apply *a priori* decision rules for adjusting treatment services in response to participants' clinical presentation or performance in treatment. This pilot study (N = 30) experimentally examined an adaptive intervention in a misdemeanor drug court. The participants were primarily charged with possession of marijuana (73%) or possession of drug paraphernalia (23%). Results revealed that participants in the adaptive condition had relatively higher graduation rates and required significantly less time to graduate from the program and achieve a final resolution of the case. It took an average of nearly 4 fewer months for participants in the adaptive intervention to resolve their cases as compared to drug court as-usual. Participants in the adaptive condition also reported equivalent satisfaction with the program and therapeutic alliances with their counselors. These data suggest that adaptive interventions may enhance the efficiency and effectiveness of drug courts, and justify examining adaptive interventions in large-scale drug court studies.

Introduction

Adaptive Interventions

Adaptive interventions continuously adjust the amount or type of services that are administered to participants in response to their clinical presentation or on-going performance in treatment [1-3]. The decision rules or algorithms that are used to determine when and how adaptive responses should be implemented are specified *a priori*; that is, before treatment has been initiated. In this way, decisions are guided primarily by the research evidence rather than by individual professional judgment, which can be negatively influenced by such factors as time pressures, insufficient expertise about a presenting problem, or personal biases. Professionals always retain the authority to override or alter an indicated adaptive response; however, they are typically called upon to articulate their rationale for doing so in the client's record.

Adaptive interventions have been shown to be effective in treating a range of substance use disorders, including tobacco dependence [4], opiate dependence [5-8], cannabis abuse [9], problem drinking [10] and alcoholism [11]. The specific content and structure of the adaptive programs will vary depending upon the nature of the disorder being treated; however, the findings from these studies indicate that employing standardized criteria for determining how and when to respond to participants' progress, or lack thereof, in treatment can yield significant improvements beyond that obtained when professionals exercise their individualized judgment in specific cases.

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Drug Courts

Drug courts are judicially supervised programs that provide nonviolent, drug-abusing or addicted offenders with a mandatory regimen of substance abuse treatment and other indicated services in lieu of criminal prosecution or incarceration [12]. Among other conditions, participants are required to undergo random urine drug testing and attend regular status hearings in court during which the judge reviews their progress and may impose a range of consequences contingent upon their performance. These consequences may include punitive sanctions (e.g., writing assignments, community service or brief jail detention), rewards (e.g., verbal praise, reduced supervision requirements or token gifts) or modifications to the participant's treatment plan (e.g., transfer to a more intensive modality of care) [13-15].

The consequences are typically meted out by the judge in open court after the drug court team has met privately in a "staffing" to review the case and reach a determination about the appropriate course of action. The various team members—which often include representatives of the court, prosecution, defense bar, treatment providers, case managers and probation officers—contribute information from their perspectives about participants' progress in the program and may offer recommendations for suitable responses; however, the judge is legally and ethically required to make the final decision about what consequences to impose after giving due consideration to all of the relevant information [12,16].

Several meta-analyses have concluded that drug courts significantly reduce re-arrest and new conviction rates by an average of approximately 10 to 15 percentage points as compared to probation or adjudication as-usual [17-21]. A recent cost-related meta-analysis concluded that drug courts produce an average of $2.21 in direct benefits to the criminal justice system for every $1 that is invested [22]. Importantly, however, these figures reflected average outcomes across multiple studies. The effect sizes (ESs) ranged considerably across the studies. Some drug courts were associated with worse outcomes and poorer cost-benefit ratios than the comparison conditions, whereas others were associated with crime reductions exceeding 30 percent and financial benefits as high as 12 times the initial investments [20]. This variation in outcomes and economic benefits may be attributable, in part, to an inefficient allocation of services by some drug courts, a failure to target services to the most suitable offender populations, or the provision of non-evidence-based interventions. It is necessary to identify best practices in drug courts that can optimize outcomes for participants, and standardize the administration of those practices so that they may be more broadly implemented by a larger number of programs.

Standardization of best practices is becoming increasingly important as drug courts "go to scale" [23]. Currently, drug courts serve only about 5 percent of the estimated 1.5 million adults arrested each year in the U.S. who meet criteria for substance abuse or dependence [22]. If drug courts are to extend their reach to this larger population, it may no longer be feasible for team members to meet regularly in staffings to review all of their cases. It will be necessary, instead, to model how well-functioning drug courts typically respond to various presentations by participants, and routinize that process so that it can be reliably implemented with a large number of drug offenders [24]. Adaptive treatment interventions represent a promising approach to standardizing drug court procedures in this manner.

Noncompliance vs. Non-responsiveness

Selecting suitable adaptive interventions can be complicated when dealing with offender populations, who are jointly supervised by the criminal justice system and the substance abuse treatment system. Criminal justice professionals are primarily charged with protecting public safety and are empowered to respond to misconduct with enhanced supervision or punitive sanctions. Treatment professionals, in contrast, are primarily charged with improving the health

and functioning of their clients and may intensify a client's treatment plan in furtherance of these goals. This requires a distinction to be drawn between noncompliance with supervision requirements and non-responsiveness to the clinical interventions [14-16].

If, for example, a participant fails to show up for counseling sessions or to deliver urine specimens when directed to do so, he or she is arguably engaged in willful noncompliance, assuming that the absences were unexcused and avoidable. Under such circumstances, it might be appropriate to apply a punitive sanction or to increase the participant's supervision requirements. On the other hand, if the participant was attending all of his or her required sessions but was not responding to the clinical interventions, the fault might lie not with the participant but with the treatment plan. Rather than apply a punitive sanction, it would be preferable to alter the treatment plan. For example, the participant might require intensive clinical case management services to address a co-occurring psychiatric problem.

Distinguishing between noncompliance and non-responsiveness addresses an important problem that is commonly encountered in drug courts. Some judges or probation officers may increase treatment requirements as a consequence for misconduct in the program. For example, a participant who misses several counseling sessions or is re-arrested might be "sanctioned" with a more restrictive modality of treatment, such as residential treatment. This practice not only risks wasting scarce treatment slots, it may also give the inadvertent message to participants that treatment is aversive and thus something to be avoided [15]. It would be preferable for the judge to order a clinical re-evaluation of the participant, and to request recommendations from the treatment professionals about the best course to pursue.

Stepped Care vs. Branching Models

There are two general models of adaptive interventions. The *stepped care* model intensifies treatment only after less intensive interventions have proven to be insufficient. For example, some studies have reported superior outcomes by beginning clients in drug-free outpatient counseling, and then referring those who failed to respond to more intensive counseling or medication [6,10,25]. This model has the obvious benefit of conserving scarce treatment resources while placing the least burden on participants commensurate with their clinical needs.

However, evidence among offender populations suggests that each treatment failure may increase the likelihood of continued failure in future treatment episodes [26]. A history of prior drug abuse treatment has been associated in many research studies with negative outcomes in correctional rehabilitation [27]. Each disappointing episode might undermine offenders' confidence in treatment or generate counterproductive feelings of pessimism or despondency. Worse still, failure on an initial treatment regimen could lead a judge or other criminal justice professional to impose a punitive sanction on the participant, such as incarceration. Judges might, correctly or incorrectly, interpret a poor response to treatment as evidence of low motivation or incorrigibility. Because judges are responsible for protecting public safety, it may be unrealistic to expect them to abide multiple treatment failures before symptom remission can be achieved. It may be preferable to begin drug offenders on the proper treatment regimen from the outset rather than risk unanticipated negative repercussions from trial-and-error treatment planning. This strategy is referred to as a *branching* model because participants are sorted into the most appropriate interventions at each stage or decision-point in the adaptive algorithm.

Current Study

The current study pilot-tested a branching adaptive algorithm in a misdemeanor drug court. The algorithm distinguished between noncompliance with the supervisory conditions of the program (e.g., failing to attend counseling sessions) and non-responsiveness to the clinical

interventions (e.g., providing drug-positive urine specimens). Increased judicial supervision was specified as the consequence for noncompliance and enhanced clinical case management was specified as the consequence for non-responsiveness. This small pilot study (N = 30) was not intended to be statistically powered to detect small or moderate effects. The aims were limited to determining whether the adaptive algorithm was feasible to implement in a real-world drug court and whether it showed sufficient promise to justify the cost and effort of a fully powered experimental trial.

We were also concerned whether the adaptive algorithm might negatively affect participants' satisfaction with the drug court program or therapeutic alliance with their counselors. Applying a pre-specified algorithm might, for example, be perceived by participants as unduly mechanistic or inflexible, which could interfere with their engagement in treatment. We, therefore, closely monitored this possibility in the pilot study.

In previously published preliminary analyses, we reported that the adaptive algorithm was implemented with greater than 85% fidelity, was acceptable to both clients and staff, and showed substantial promise for improving outcomes [28]. The estimated effect sizes (ES's) ranged from 0.40 to 0.60 (in the moderate to large range) across various dependent measures, including drug-negative urine specimens and on-time graduation rates. We further found that the drug court team responded more reliably to instances of noncompliance and non-responsiveness when they were following the adaptive algorithm, and they implemented those responses in a substantially shorter period of time. This could be expected to lead to a more efficient allocation of resources and a more timely management of participants while they are in the program. The current article reports longer-term outcomes on the same cohort, including participants' ultimate graduation rates and their average time to completion of the program.

Methods

The study was conducted in a misdemeanor drug court located in the city of Wilmington, DE. Participants in this drug court must be at least 18 years of age, may not have a history of a violent offense, and are charged with possession or consumption of cannabis, possession of drug paraphernalia or hypodermic syringes, or first-time driving under the influence (DUI). Defendants are required to plead guilty to the charge(s) and the guilty plea is held in abeyance. Graduates have their charge(s) withdrawn and are eligible to have the record expunged if they remain arrest-free for an additional 6 months. If a defendant is terminated from the drug court for unsuccessful performance, the guilty plea is formally entered as a conviction. Convicted offenders lose their drivers license for 2 years and are typically sentenced to probation with conditions similar to those imposed in drug court (e.g., drug abuse counseling and urine monitoring).

The program is scheduled for a minimum of 20 weeks and has no maximum term of enrollment. Graduation requirements include attending at least 12 weekly group-counseling sessions, providing at least 14 consecutive weekly drug-negative urine specimens, remaining arrest-free, obeying program rules and procedures, and paying a $200 fee. The group sessions are psycho-educational in format and cover a standard sequence of topics, including the pharmacology of drug and alcohol use, progression from substance use to dependence, the impact of addiction on the family, treatment options, HIV/AIDS risk reduction, and relapse prevention strategies.

Participants are assigned to a clinical case manager who coordinates any indicated treatment referrals, and the case manager or another designated court liaison submits monthly progress reports to the judge and appears at all status hearings. Participants provide urine specimens on a random, weekly basis in direct observation of a same-gender treatment staff person. The urine screens are performed by an independent certified laboratory using the enzyme multiplied

immunoassay technique (EMIT) with gas chromatography/mass spectrometry (GCMS) confirmation of positive results on a six-panel screen for cannabis, alcohol, opiates, amphetamines, cocaine, and phencyclidine (PCP) plus any additional substances believed to be used by the individual.

Research Design

Consenting participants were randomly assigned at entry to drug court as-usual (n = 14) or to the adaptive intervention (n = 16) depicted in Figure 1. Participants in the adaptive condition were eligible for all of the services that are typically available in this drug court; however, consequences from the judge were scheduled to be administered according to the adaptive algorithm.

The adaptive procedures were initiated from the point of entry into the program. The first stage in the adaptive algorithm involved assigning participants to different schedules of status hearings based upon their assessed risk levels. This baseline-matching procedure was based on our earlier research demonstrating that "high-risk" participants who had either (1) Antisocial Personality Disorder (APD) or (2) a history of previous drug abuse treatment performed significantly better when they were required to appear before the judge on a bi-weekly basis; in contrast, participants without these characteristics performed equivalently regardless of how often they were required to see the judge [29-31]. The assessment of risk level was derived from two dichotomous measures employed on an either/or basis. If participants either met DSM-IV diagnostic criteria [32] for APD (yes or no) or had a history of at least one prior drug abuse treatment episode excluding self-help groups (yes or no), they were determined to be high risk and were assigned to bi-weekly hearings. If they had neither APD nor a prior drug treatment episode, they were determined to be low risk and were assigned to as-needed hearings.

Subsequently, participants were assessed at monthly intervals to determine how they were progressing in the program. Participants who had two or more unexcused absences from counseling sessions or two or more unexcused failures to provide a valid urine specimen were determined to be noncompliant with the conditions of the program. For those individuals, the schedule of court hearings was increased. If they were previously on an as-needed schedule, they were re-assigned to bi-weekly hearings. If they were already on a bi-weekly schedule, they were placed on a jeopardy contract. A jeopardy contract involves "zero tolerance" for further violations of the rules of the program. Any further violation leads to a termination hearing, also known as a show-cause hearing. At the termination hearing, the individual is terminated from the program and sentenced on the original charge(s) unless he or she can provide a good-cause reason to be given another chance. The decision whether to grant an additional chance is within the discretion of the judge and is granted in approximately 40% of cases.

Participants who provided two or more drug-positive urine specimens were determined to be non-responsive to the clinical interventions. Those individuals were referred to an intensive clinical case-management program administered by the local TASC (Treatment Accountability for Safer Communities) Office. Participants in the TASC program are required to meet twice weekly with an intensive clinical case manager who provides individual substance abuse counseling with an emphasis on motivational enhancement, relapse prevention and cognitive restructuring techniques. This curriculum differs from the standard treatment regimen in the drug court program because it is delivered individually as opposed to predominantly in groups, and is clinical rather than psycho-educational in focus.

Participants who were assigned to drug court as-usual were also assessed on a monthly basis in the same manner as in the adaptive condition. However, the drug court team responded to their presentation in the usual way with no influence or communication from research staff.

Data Sources

Participants received a $40 money order for completing a baseline assessment battery. This battery included an Antisocial Personality Disorder Diagnostic Interview (APD-DI). The APD-DI is a 29-item structured interview that assesses DSM-IV diagnostic criteria [32] for APD. A dichotomized (yes or no) diagnosis of APD was used to match the participants at baseline to schedules of status hearings. In inter-rater reliability scoring trials, there was between 90% and 100% exact agreement for dichotomous diagnoses of APD among our research assistants. A single dichotomized (yes or no) item inquiring whether participants experienced any prior drug abuse treatment episode (excluding self-help groups) was also used to match them at baseline to the schedules of status hearings. Test-retest reliability for this item was consistently above 95% in our prior studies.

At the end of their fourth month in the program, participants were asked to complete the Helping Alliance Questionnaire-II (HAq-II) [33] and the Mental Health Statistics Improvement Program (MHSIP) Consumer Satisfaction Survey [34]. The HAq-II is a 19-item, Likert-scale questionnaire that measures the strength of the therapeutic alliance between a patient and a therapist or counselor. A sample item is “I feel I can depend upon the counselor” and each item is rated from 1 (“strongly disagree”) to 6 (“strongly agree”). The MHSIP Consumer Survey is a 21-item, Likert-scale questionnaire. A sample item is “I like the services that I received here” and is rated from 1 (“strongly agree”) to 5 (“strongly disagree”). A 3-item subscale of the MHSIP measuring “General Satisfaction” with the program was used in the analyses.

Results

Participants

Participants were predominantly male (77%) and most self-identified as Caucasian (50%) or African American (43%). Their mean age was 27.60 years (SD =11.65), they had an average of 11.77 years of education (SD = 1.96), 66% were employed full or part time, and 90% were unmarried. They were charged with possession of marijuana (73%), possession of drug paraphernalia (23%), consumption of marijuana (3%), underage consumption of alcohol (7%) or DUI (3%) (participants could have more than one charge). Within the previous thirty days, they reported abusing marijuana (47%), alcohol (43%), opiates (13%) or cocaine/stimulants (6%) and 37% reported abusing multiple substances.

Ten percent of the sample had at least one prior drug abuse treatment episode, 17% met criteria for APD, and an additional 13% had both prior drug treatment and APD. Thus, 40% were determined to be high-risk according to the either/or decision rule. Setting a liberal p-value of $< .15$ due to the small cell sizes, there were no significant differences between the two study conditions on any of the above characteristics, including risk level.

Outcomes

As was previously reported, the consent rate for the study was 65% and the adaptations were implemented as intended 88% of the time [28]. Preliminary analyses revealed that participants in the adaptive condition were more likely to have on-time graduations within 20 weeks of their entry into the drug court (50% vs. 21%, ES = 0.60), were issued a bench warrant less often (13% vs. 29%, ES = 0.40) and provided more drug-negative urine specimens than participants in drug court as-usual (mean ± SD = 8.94 ± 5.47 vs. 6.86 ± 6.11, ES = 0.40) [28]. The drug court team also responded more reliably to instances of noncompliance and non-

responsiveness when they were following the adaptive algorithm (88% vs. 31%) and they implemented those responses in a substantially shorter interval of time (16.25 ± 24.66 vs. 89.67 ± 79.61 days).

Current analyses revealed that participants in the adaptive condition had relatively higher graduation rates overall (88% vs. 79%), although the magnitude of this difference was small. These percentages reflect participants' ultimate graduation rates, as opposed to on-time graduations within 20 weeks of entry, which were previously published. Among the graduates, it took significantly less time to successfully complete the program when they were assigned to the adaptive condition as compared to drug court as-usual, $t(23) = 2.33$, $p = .03$. It took an average of nearly 4 months less for participants to graduate in the adaptive condition (see Table 1). The estimated ES for time to graduation was 0.92, which is in the large range according to Cohen's (1988) criteria [35]. Log-transformed scores were used in this analysis because the data were not normally distributed and the standard deviations were discrepant for the two groups; however, the actual raw scores are reported in Table 1 for ease of interpretation.

Among all of the participants, including both graduates and terminated cases, the length of time to case resolution was significantly shorter for those in the adaptive condition as compared to drug court as-usual, $t(28) = 2.65$, $p = .01$. It took an average of more than 4 months less for the cases to be resolved in the adaptive condition (see Table 1). The estimated ES was 0.96, which is in the large range. Again, log-transformed scores were used in the analysis but raw scores are reported in Table 1 for ease of interpretation.

There were no significant differences on the MHSIP General Satisfaction Scale or the HAq-II. The estimated ES's were 0.12 and 0.05, respectively, which are small and therefore unlikely to be clinically meaningful or influential.

Discussion

The results of this pilot study suggest that adaptive interventions may substantially enhance the efficiency and effectiveness of drug court programs. When the drug court team members followed the adaptive algorithm, they administered consequences to participants in a more reliable manner and in a shorter period of time [28]. Perhaps as a result of this, participants were more likely to complete the program successfully and did so an average of approximately 4 months sooner.

The average annual cost of a drug court is estimated to be approximately $4,000.00 per participant, plus treatment costs which may average an additional $7,000.00 per participant for outpatient counseling ($11,000.00 total) [22]. Reducing the time to case resolution by an average of approximately 4 months (1/3 of a year) could, therefore, be expected to save approximately $3,700.00 per participant. This might conserve scarce resources and permit drug court programs to treat a larger number of needy offenders who might otherwise be facing jail or prison sentences for their crimes.

Even if the adaptive program did not improve outcomes, but merely elicited comparable results in a timelier manner, this could still justify applying adaptive algorithms as drug courts go to scale. As was noted earlier, drug courts are only serving about 5 percent of offenders with serious substance abuse problems [22]. If drug courts are to extend their reach to the larger population of drug-abusing or addicted offenders, it may no longer be feasible to discuss all of the cases in team staffings. Standardizing responses using adaptive algorithms may be the only feasible way to apply the drug court model to the entire at-risk offender population.

It is also noteworthy that the adaptive algorithm did not appear to negatively influence participants' satisfaction with the program or therapeutic alliance with their counselors. There

is no basis from these preliminary findings for assuming that adaptive programs are likely to be viewed as rigid or mechanistic by clients. In fact, adaptive algorithms might be viewed favorably by participants because they may lead to a fairer administration of consequences. Participants might, for example, be less likely to feel they are being unfairly singled out for punishment if the procedures have been clearly spelled out in advance and are applied equally to all clients. Research reveals that offenders tend to perform better in treatment when they perceive a direct and fair connection between their own conduct and the imposition of sanctions and rewards [36-37]. Additional research is needed to determine whether adaptive algorithms may contribute to more favorable perceptions of fairness by drug court participants.

Limitations

The limitations of this study are largely self-evident. The small sample size raises serious questions about whether the results are likely to be stable in a larger cohort and whether these 30 participants were reasonably representative of the population of participants in drug court programs. The participants in the current study were primarily charged with relatively minor misdemeanor crimes involving the possession of marijuana (73%) or drug paraphernalia (23%) and most self-reported currently abusing marijuana (47%) or alcohol (43%). It is unclear whether the results would generalize to offenders who are addicted to or abusing more serious illicit drugs, such as methamphetamine. Moreover, there is no way to know whether the results would generalize to other offender populations, such as juvenile offenders or mentally ill offenders, or to other geographic locations, such as rural communities.

Clearly, more research is needed before this adaptive approach could be characterized as a best practice or evidence-based practice for drug court programs. However, the promising findings emerging from this pilot trial are more than sufficient to justify examining the effects of the adaptive intervention in adequately powered drug court studies.

Conclusion

The results of this pilot experiment in a misdemeanor drug court revealed that adaptive interventions were associated with higher graduation rates and required significantly less time for participants to graduate from the program or achieve a final resolution of the case. Participants in the adaptive condition also reported equivalent satisfaction with the program and therapeutic alliances with their counselors. These data suggest that adaptive interventions may enhance the efficiency and effectiveness of drug court programs, and justify examining adaptive interventions in large-scale drug court studies.

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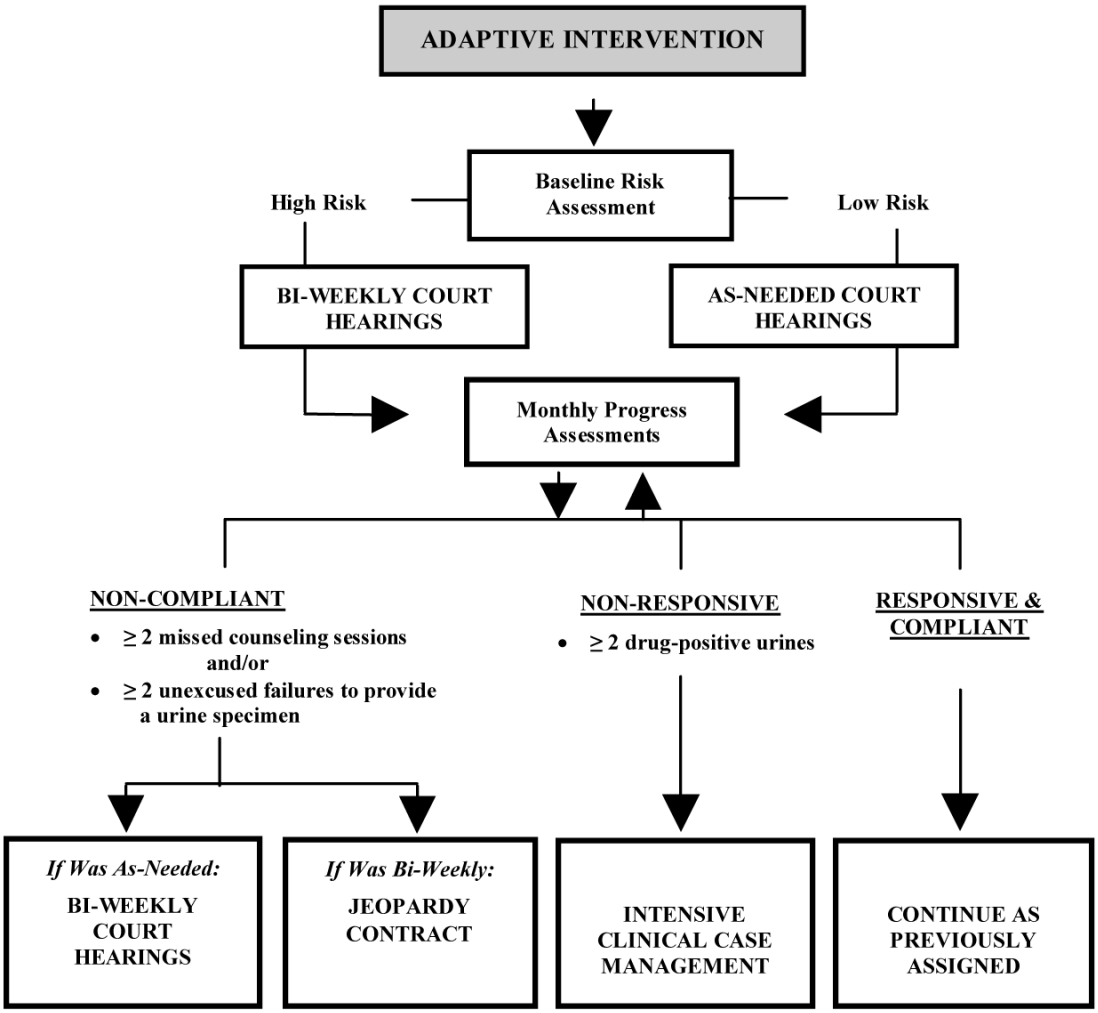

Figure 1.
Adaptive algorithm.

Table 1

Outcomes by Condition: n (%) or mean (SD)

	Adaptive	As Usual	p-value	Estimated effect size (range)
Graduated	14 (88%)	11 (79%)	.43	0.12 (small)
Days to Graduation [a]	161.79 (73.75)	277.91 (168.93)	.03	0.92 (large)
Days to Case Resolution [b]	171.50 (74.74)	307.64 (194.18)	.01	0.96 (large)
MHSIP General Satisfaction Score	4.29 (2.09)	4.50 (1.35)	.75	0.12 (small)
HAq-II Total Score	100.71 (12.00)	100.23 (8.83)	.91	0.05 (small)

Notes

The *p*-values are derived from the t-statistic for continuous variables and Fisher's Exact test for binary variables. The effect sizes are presented as *d* for continuous variables and as *w* for proportional data. MHSIP = Mental Health Statistics Improvement Program Consumer Satisfaction Survey. MHSIP General Satisfaction Subscale: range = 3 to 15 with lower scores indicating greater satisfaction. HAq-II = Helping Alliance Questionnaire-II: range = 19 to 114 with higher scores indicating a better therapeutic alliance.

[a] Includes only graduates (n = 25).

[b] Includes all participants (n = 30).