Official Title: A Quasi-experimental Longitudinal Study of Adolescents' Well-being in Community-based Treatment Versus in a Psychiatric Residential Treatment Facility (PRTF)

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RESEARCH PROTOCOL

i. TITLE PAGE

Title:	A Quasi-experimental Longitudinal Study of Adolescents' Well-being in Community-based Treatment versus in a Psychiatric Residential Treatment Facility (PRTF)
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Sponsor:	The Duke Endowment
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*Outcome Referrals, Inc. (ORI) is the research site for this study. ORI is a HIPAA Business Associate and 3rd party data collection provider. ORI will receive referrals for the study from the Children's Hope Alliance (CHA) and Psychiatric Residential Treatment Facilities (PRTFs). ORI will consent and administer the assessments.

ii. PURPOSE OF THE STUDY AND BACKGROUND

- **Purpose of the Study**

In partnership with The Duke Endowment and Children's Hope Alliance, Outcome Referrals, Inc. is conducting a quasi-experimental longitudinal study to compare the outcomes of youth in Psychiatric Residential Treatment Facility (PRTF) compared to youth in the at-home Child-Focused Assertive Community Treatment Team [Child ACTT] program. We hypothesize that Child ACTT will be associated with better outcomes and lower cost than PRTF among adolescents admitted to Child ACTT or PRTF.

- **Background**

Psychiatric Residential Treatment Facility (PRTF) care is expensive, removes adolescents from their communities, and is not necessarily effective. Managed care organizations (MCO) are exploring other methods of providing intensive care at home. Several states (e.g., Maine, Minnesota, Florida) have initiated and maintained Youth –Assertiveness Community Treatment (ACT) programs that are adapted from the evidence-based adult ACTT model. Children's Hope Alliance has been offering the Child-Focused Assertive Community Treatment Team [Child ACTT] Program as a service for potential clients since December 2019.

This study will examine the primary hypothesis that, relative to the Control group (PRTF Treatment as Usual), participants in the Experimental group (Child ACTT) will evidence significantly better general psychological well-being over time. Cost outcomes per condition will also be evaluated.

iii. CRITERIA FOR SUBJECT SELECTION

We will recruit participants from PRTF and Child ACTT. For example, at Partners MCO in 2020, 131 unique members were served in PRTFs. Their summary demographic characteristics for gender, race, and age were as follows: 43.5% female and 55.7% male; 18% Black, 78% White, 3% Other and an average age of 14.5 years. This is the range of potential primary diagnoses expected based on previous data regarding adolescents admitted into PRTF and ACTT treatment programs at CHA in the last fiscal year (10/1/19 - 9/30/20):

Adjustment Disorder
Attention Deficit Hyperactivity Disorder
Autistic Disorder
Bipolar Disorder
Borderline personality disorder
Cannabis dependence, uncomplicated
Conduct Disorder
Disruptive Mood Dysregulation Disorder (DMDD)
Dysthymic disorder
Generalized Anxiety Disorder
Major Depressive Disorder
Oppositional Defiant Disorder
Post-traumatic stress disorder, unspecified (PTSD)

Other stimulant dependence, uncomplicated
Reaction to severe stress, unspecified
Reactive attachment disorder of childhood
Schizoaffective disorder, depressive type
Schizophrenia, unspecified
Unspecified mood [affective] disorder
Unspecified trauma and stressor related disorder based

In addition, we plan to include wards of the state as participants in this study because 34% of CHA's PRTF clients were in DSS Custody at admission in the last fiscal year (10/1/19 - 9/30/20). Inclusion criteria: 1) Between the ages 12 and 18. 2) Has primary mental health diagnosis. 3) Admitted for treatment in a participating program (i.e., Psychiatric Residential Treatment Facility (PRTF) or Child ACTT). 4) A trained ORI staff member determines that the youth is able to understand and sign an assent for participation. 5) Documentation of the youth's assent to participate in the study. 6) A legal guardian provides consent for the youth to participate in the study.

Exclusion criteria: 1) The client is not admitted to treatment in a participating program. 2) The client has dropped out of this study during a previous treatment episode. 3) Client does not initiate treatment.

NOTE: We cannot confirm that pregnant participants will not be enrolled in this study because there is no screening for pregnancy into these treatment programs and a few pregnant clients have received treatment in the ACTT program. There are nurses on the treatment teams in both programs to provide care to pregnant participants, as needed. If medication is prescribed to pregnant subjects it is at the discretion of the psychiatric/mental health prescriber. The decision to treat any pregnant subjects with medications is made outside this research protocol and is consistent with standard of care.

1. The MCO will send a letter to PRTF treatment providers to inform them about this study.
2. The CHA and PRTFs will inform the legal guardians of children who meet the inclusion criteria #s 1-4 above about a potential study opportunity (see revised recruitment script):
3. If the legal guardian verbally consents to being contacted by ORI about the study, CHA or PRTF will forward the contact information for the legal guardian of the eligible participant to Liza Baxter, MSW, at ORI via an encrypted email.
4. ORI will contact the legal guardian to describe the study and review the eligibility criteria with potential participants (within 5 days of treatment authorization). See attached description of consent procedures and screening form.
   Individuals who meet the eligibility criteria and are interested in participating in the study will be sent electronic copies of the assent and consent forms to review and sign. ORI will inform the original referral source (CHA or specific PRTF) if family is not able to be contacted or does not consent for study.

iv. METHODS AND PROCEDURES

The purpose of this study is to compare Child ACTT which is based on the Youth-ACT program with PRTF. The CHA Child ACTT program was initiated in December 2019. This study

will examine the primary hypothesis that, relative to PRTF, participants in the Experimental group (Child ACTT) will evidence significantly better general well-being over time. Cost outcomes per condition will also be evaluated.

A randomized controlled trial was selected as the study design for this project because it is the gold standard for testing for causality; however, given recruitment issues, we have decided to transition to a quasi-experimental study instead. Although the investigators cannot conclude that one treatment is more efficacious than another, this quasi-experimental longitudinal study will provide important comparative information about these two treatment options for high need youth and families. The study completion enrollment goal per group is 105 participants per group.

After study assent and consent forms are received by ORI, ORI will inform the referral source (CHA or PRTF) that the family consented to participate in the study: CHA or the PRTF will provide ORI with the contact information for the case manager and the facility for each participant. ORI will send an email to the case manager to inform them of that client's participation and request a time to train them on study assessment procedures.

ORI will administer a) the electronic assents and consents through an e-signature platform, and b) study assessments to both participants and their legal guardians during and post-treatment through ORI's secure platform, WellnessCheck.net. (See section below on Data Storage and Confidentiality Practices for details.)

Measures

The Treatment Outcome Package (TOP; e.g., Kraus et al., 2005) is a comprehensive well-being assessment that is used in behavioral health and child welfare settings. It includes three forms: the Consumer Registration form, the Case-mix form, and the Clinical Scale. The TOP Consumer Registration form (TOP-CR) consists of eleven items regarding demographic characteristics (e.g., race, education). The TOP Case-Mix form (TOP-CM) includes 54 items about stressful life events, physical health, and medication use in the past 12 months and the past 30 days. The Adolescent TOP Clinical Scale (TOP-CS) is a 58-item scale for adolescents who are between the ages of 11 – 21. The TOP assesses the client's past 2-week experience on 12 domains including Depression, Attention Problems, Conduct Disorders, and Suicidality, and provides a total well-being score. Participants indicate "All" to "None of the Time" for each item on a 6-point Likert scale. Several studies have indicated the reliability and validity of the TOP (e.g., Baxter et al., 2016; Boswell et al., 2009; Kraus et al., 2010; Kraus et al., 2005). The TOP Total Score has concurrent validity with the total difficulties Score of the Strength and Difficulties Questionnaire and the total problems score of the Child Behavior Checklist. In addition, the four Likert-scale items of the Overall Provider Quality subscale of the TOP Satisfaction Scale and a single qualitative item (i.e., What are two reasons for your rating of the overall quality of the treatment received?) will be administered at every follow-up assessment to assess satisfaction with treatment: raw data from this assessment will not be available to the participant's clinical team. See attached questionnaires.

TOP will be completed as a self-report tool by the participants in this study. Other individuals who know the adolescent well (e.g., the client's legal guardian, staff involved in the client's treatment) will be invited to complete a TOP about the participants' behavior from their perspectives (maximum of 2 follow-up requests per timepoint). Participants will be sent a TOP assessment every month for up to 6 months during treatment then at 3 months post-discharge.

Participants and one legal guardian per participant will be offered the option of receipt of gift card payments electronically or via mail for completion of assessments during the study. See details below.

While the child is enrolled in the study, the child's legal guardian will receive a) a gift card between $20 and $50 each time they complete a set of questionnaires about the child corresponding to the research study timeline during treatment and b) a $75 gift card for completion of the questionnaires about this child 3 months after the child is discharged from the study-specific treatment episode. See prorated incentive schedule below. That means that if this child is in the treatment program for all six months and the legal guardian completes the final questionnaire three months later, the legal guardian would receive a total of $325.

While the child is enrolled in the study, the child will receive a) a gift card between $10 and $25 each time they complete a set of questionnaires corresponding to the research study timeline during treatment and b) a $50 gift card for completion of the questionnaires 3 months after they leave the program. See prorated incentive schedule below. That means that if this child is in the program for all six months and completes the final questionnaire three months later, this child would receive a total of $175.

	baseline - at treatment start	after 1 month in treatment	after 2 months	after 3 months	after 4 months	after 5 months	after 6 months	3 months post-discharge from treatment	TOTAL
adolescent	$20	$10	$15	$15	$20	$20	$25	$50	$175
legal guardian	$40	$20	$30	$30	$40	$40	$50	$75	$325
FAMILY									$500

Payment will be provided to participants and legal guardians by Children's Hope Alliance (CHA) within 3 weeks of ORI's receipt of the completed assessments. Names, addresses, and compensation amounts with date of assessment completion per participant will be managed in an encrypted Excel file that is auto-sent securely to CHA via CHA's password-protected FTPS site on a daily basis. NOTE: Other TOP raters will not receive compensation for completing these clinical surveys which will be used during the client's treatment.

We will also request participants' permission for the MCO to confidentially share their diagnosis and billing information with the researchers to assess cost of treatment associated with each condition.

Experimental Condition: Child ACTT with WellnessCheck Support (n=105)

Excerpt from the Partners Child ACTT service definition in NC (Revised 5-23-19):

Program Requirements: Child ACTT is a team-based multi-disciplinary approach to serve children in their homes, kinships placements, DSS foster homes, or may begin during transition from a more restrictive residential setting, but typically would not exceed 30 days,

although may be extended as needed if discharge plans are adjusted. It is the expectation that the majority of services are provided in the home or other community settings, typically 80-90% of the contacts will be in these settings. While the composition of the team is established, the team members providing the direct interventions to the child and family may be varied based on the needs of the individual. The team will have daily meetings to prioritize activities, share information, and discuss individual members. The team will be available to respond 24/7 for crisis de-escalation and assessment, inclusive of availability by phone within 15 minutes and face to face within no more than 2 hours. This will include face-to-face assessment by a clinician, or nurse if this is determined to be needed for the individual. The psychiatric provider will be available minimally by phone 24/7 for consultation and treatment recommendations. The team will assess the overall needs of the family to ensure that all necessary treatment and supports are in place for entire family system. Targeted length of service is 6 months. In 2020, 25 clients were served in this program. The average length of stay has been 4.8 months (due to unexpected premature discharges). Of the 14 clients discharged from the program thus far, 7 (50%) were successfully discharged to a lower level of care. There are 24 clients currently enrolled in ACTT as of March 10, 2021.

Control Condition: PRTF Treatment as Usual (n=105)

Psychiatric Residential Treatment Facilities, commonly referred to as PRTFs, are non-hospital facilities intended to provide inpatient services to Medicaid-eligible individuals who are under the age of 21. A PRTF's mission is to either improve residents' condition or prevent further regression to ultimately remove the need for such services. PRTFs provide a range of comprehensive services intended to treat residents' psychiatric conditions under the supervision and direction of a psychiatrist. The core components in a PRTF program include at least weekly medication management, 24 hours nursing services, high staff-to-client ratio with awake staff during night hours, individual, group, and family therapy, intensive psychoeducation, behavioral model of care designed to teach new functional skills, and comprehensive assessments as needed.

NOTE: Medication management is an intervention in both treatment models. Programs employ licensed psychiatric/mental health prescribers. Medications prescribed will be up to the discretion of the psychiatric/mental health prescribers and consistent with standard of care at the facility. The decision to treat with medications is made outside this research and use of any specific medications is not required by this research protocol.

- **Data Analysis and data monitoring**

Primary Analyses

The primary efficacy/outcome measure will be the TOP-CS total score from the participants' self-report. To take full advantage of its longitudinal assessment, hierarchical linear modeling (HLM) will be used to examine rates and patterns of change, as well as levels of treatment outcome at specific time points (e.g., beginning, middle, and end of treatment). A 3-level HLM model will be used to estimate within-patient differences (level 1), between-patient differences (level 2), and between program differences (level 3). At level 1, a change trajectory will be fit to each individual's TOP scores across treatment. We will fit a series of models to

determine whether a linear, quadratic, or cubic model best fits the data. If there is significant variability in individual trajectories and outcome levels, a level 2 model will be estimated with patient-specific covariates. Our primary interest is examining change trajectories and outcome levels as a function of treatment condition, which will be analyzed at level 2. Estimates of effect size (**r**2 & pseudo-**r**2) will be calculated by standardizing the coefficients from the HLM model. Multilevel modeling is currently the most suitable method for analyzing longitudinal data, as it accounts for the dependent data in repeated measures designs, provides more accurate estimates of standard errors, and addresses missing data in outcome variables.

We computed the effect size with available data then updated the power analysis: To test for a medium effect size (0.39) with an alpha of 0.05 and 80% power for comparing means, we require a sample size of >= 105 participants per treatment condition in this study (i.e., a minimum total sample of 210). These power and sample size considerations were updated based on recent calculations for the Cohen's D for ACTT and PRTF clients at CHA, We will conducti analysis of variance with time (within-group) and treatment condition (between-groups) as independent variables and TOP-CS total score as dependent variable. The sample size of participants per treatment condition was estimated by a balanced one-way analysis of variance power calculation.

Exploratory Analyses

We will conduct exploratory analyses to assess secondary outcomes such as average TOP-CS total score across raters, domain-specific TOP scores (per rater and averaged across rater), treatment satisfaction, and total financial behavioral and medical costs. TOP scores are continuous variables that will be measured at a minimum of monthly during treatment, and we will assess these with 3-level growth models as described for the TOP total score.

Dropout status (i.e., discontinued the treatment condition) will be a binary yes/no variable, which we will assess with a 2-level logistic model with participants nested within treatment programs. Consequently, we will assess domain-specific treatment effects with exploratory linear regression analyses with the primary TOP domain post-treatment score as the outcome and the corresponding pre-treatment score as a covariate. For all regression models, we will include other appropriate covariates as indicated by preliminary analyses. Estimates of effect size (**r**2 & pseudo-**r**2) will be calculated for all models.

Exploratory secondary analyses will include the assessment of potential moderators, the modeling of variability in patient outcomes, and the exploration of site effects. First, we will include 4 moderator variables in the multilevel framework outlined previously to determine whether race, the most elevated TOP domain, distress severity, or distress complexity (all modeled at level 2) moderate the relationship between treatment and outcome change rates or scores at specific time points. Finally, because patients and providers are nested within sites, we will explore the amount of variability in outcomes that occurs at the site level by calculating the site ICC from a 4-level unconditional model. If it appears that there are site differences in outcomes (i.e., site ICC is > .10), we will replicate the primary analysis in a 4-level model, but we will not have sufficient statistical power to include site-level covariates.

In longitudinal studies, there may be missing values due to missed occasions and/or attrition. We will employ state-of-the-art techniques for missing data. When missingness is deemed to be completely at random (MCAR) or at random (MAR), we will employ inference by multiple imputation. Using routines developed by Schafer and Yucel, we will incorporate the longitudinal design in the imputation phase. We will conduct sensitivity analyses to gauge the

impact of departures from MCAR/MAR, and employ pattern-mixture models, which lead to valid inferences under missing not at random, and compare inferential quantities with those that assume MCAR/MAR.

- **Data Storage and Confidentiality:**

Below is a description of the key IT Security measures which the joint ORI IT team applies on an ongoing basis to protect the security of WellnessCheck.net and other ORI assets. NOTE: TOP data are available through our secured network to the client's clinical team for treatment.

1. Network:
    - Network Infrastructure Architecture
    - Web Server deployed in DMZ
    - Hardware Firewall operating between Web Server and back end Application, Database and Report Servers
    - Secure Multiprotocol Switches operating between systems behind Hardware Network Firewalls
    - Network appliances regularly updated reasonably near latest revisions, including security patches
    - Enterprise-wide Hardware Network Firewalls continually operate 24x7 with: Active and Passive Intrusion Detection/Intrusion Prevention (IDS/IPS)
    - Monitoring of network traffic signatures
    - Automated priority alert notification on event detection to internal IT Security personnel
    - Web Filtering, Anti-Spam, Anti-Virus/Anti-Malware, Anti-Phishing Protection
    - Daily/hourly/per minute updates to Active and Passive IDS/IPS, Anti-Spam, Anti-Virus/AntiMalware, Anti-Phishing Signature databases
    - Unified Threat Management (UTM) appliances deployed and configured for primary network gateway protection
    - Data encrypted at rest and in transit
2. System:
    - Operating systems and relevant packages regularly updated reasonably near latest revisions, including security patches
    - Double encryption of backups
3. Application:
    - SSL/TLS/HTTPS protocol utilization for URLs, data encrypted in transit
    - Userid/Password Authenticated Application Sessions
    - PII exclusion from logging
    - Primary application components (Web, Application and Report Servers) regularly updated reasonably near latest revisions, including security patches
4. Database:
    - Access credentials persisted with hashing, not clear text
    - Client/Patient information made anonymous (Behavioral Health/WellnessCheck 1.0)
    - Database table spaces containing PII are double-encrypted at rest
    - Primary Database Server components regularly updated reasonably near latest revisions, including security patches
    - All database backups are encrypted with two different encryption keys and are stored at a Tier 1 datacenter within the Continental United States
5. Source Revision Control:

- All source repositories resident and maintained in-house behind a Hardware Firewall
- No outsourcing of Software Engineering processes

6. Cloud Services:
   - No Cloud Services used for production runtime environment
   - No Cloud Services utilized for data storage
7. Compliance Testing:
   - PCI scan results detected no observed vulnerabilities (Q2/2020)

- **Transition from research participation:** Participants who terminate their participation in the research will be eligible to continue to receive care.

v. RISK/BENEFIT ASSESSMENT

- **Risk category:** There is minimal risk associated with participating in this study as clients will be managed closely during care in currently MCO-approved treatment modalities.

- **Potential risk:** A potential risk is to participant confidentiality.

- **Protection against risks:** ORI has strict protocols in place to secure clinical and research data. See Data and Storage Confidentiality section above.

- **Potential benefits to the subjects:** Clinical data collected from the TOP baseline and 30-day outcome assessments will be available to and actionable by the treatment team (regardless of study condition) to improve care.

- **Alternatives to participation:** Client continues process with admission to PRTF or ACTT.