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Predicting outcomes of children in residential treatment: A comparison of a decision support algorithm and a multidisciplinary team decision model

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ABSTRACT

Residential treatment is the most intensive and costly component of all child welfare systems per episode of care. At the same time, decisions to place in residential treatment centers are prioritized by the practice of least restrictive setting and best interest for children. There are, however, no standard evidence-based criteria for placing children in residential treatment. Clinical judgment, staffing dynamics, and other system factors are part of the decision-making process. Thus, some residential placements may be unnecessary and may be even harmful. The present study compares two models of decision-making, a multidisciplinary team approach and an objective decision support algorithm, and assesses outcomes when the two models either concur or not. Concordant decisions predicted greater clinical improvement than discordant decisions, but no differences were found in length of stay in placement. Policy implications for the decision-making process in child welfare are discussed.

1. Introduction

The use of residential treatment for children with severe emotional or behavioral problems in state custody is undergoing a transition. Three major contributors to this change are the cost of treatment, the principle of "least restrictive setting," and the absence of standard placement criteria. Inappropriate placements often lead to poor outcomes such as longer stay in care, unaddressed clinical concerns, and unplanned discharge (Foltz, 2004; Sunseri, 2005). To guide this change, there is a need to re-assess the clinical and systemic consequences of residential care and the processes leading to placement in residential care. Evidence-based decision making will both contribute to this reassessment and to long-term improvements in child welfare.

1.1. Cost of treatment

Residential treatment is a considerable financial burden on the child welfare system. Burns, Hoagwood, and Maultsby (1998) estimated that while 8% of the child welfare population received residential treatment, 25% of total mental health expenses were attributable to residential care. Associated annual costs for a single episode of residential treatment can range from $50,000 to $350,000 (Lyons, Libman-Mintzer, Kisiel, & Shallcross, 1998). In 1995, $350 million out of $450 million, over 3/4 of the Illinois state budget on mental health services, were invested in residential treatment and psychiatric hospitalization (Lyons & McCulloch, 2006; Lyons et al., 1998). Recent estimates indicate that residential treatment is still considered the most expensive form of treatment on a per episode basis, with per diem costs ranging from $100 to $600 (Helgerson, Martinovich, Durkin, & Lyons, 2007; Lyons, 2004).

1.2. Least restrictive setting

The impetus of the principle of least restrictive setting is to ensure children are nurtured in a naturalistic and exploratory environment

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(Friedman & Street, 1985). Legislation such as the Federal Education for All Handicapped Children Act of 1975 and the Adoption Assistance and Child Welfare Act of 1980 mandate the principle of least restrictive setting (Courtney, 1998; Friedman & Street, 1985). Given ongoing concerns that children are placed in more restrictive settings than necessary, appropriate community-based treatment is better for children who do not require the intensity of residential (Lyons et al., 1998). There is a clinical and systemic responsibility to stabilize children in community settings whenever possible.

The increased use of residential treatment appeared to have stabilized after a 300% increase from 29,000 children to 117,720 children from 1982 to 1997 (Connor, Miller, Cunningham, & Melloni, 2002). According to the Adoption and Foster Care Analysis and Reporting System, recent child welfare statistics from 2005 to 2010 showed that institutional placements made up of 9–10% of all substitute care placements and the number of children placed in institutions decreased from 51,210 to 36,607 in that period (U.S. Department of Health and Human Services, 2006, 2008, 2009a, 2009b, 2010, 2011). Relative to the 407,355 children in foster care in 2010 with known placements (U.S. Department of Health and Human Services, 2011), this translates to 8.99% residential placements or approximately 90 children in residential treatment centers per 1000 children in foster care.

Although the decreasing numbers of the child welfare population and residential placements are encouraging, there are persistent obstacles in implementing the principle of the "least restrictive setting" when it comes to residential treatment. Sunseri (2005) noted the misinterpretation and misuse of the principle. Rather than providing what is needed at the outset, children often get placed in residential treatment as a last resort because other placements have failed (Epstein, 2004; Foltz, 2004; McCurdy & McIntyre, 2004; Pfeiffer & Strzelecki, 1990).

1.3. Absence of standard placement criteria

The increase in inappropriate placement decisions due to the lack of standard placement criteria contributed to the earlier increase in residential placement (Ashford & LeCroy, 1988; Jaffe, 1979; Meddin, 1984; Schwab, Bruce, & Mcroy, 1984; Sowers, 1998; Wells, 1991). The National Association of Psychiatric Treatment Centers for Children is the only professional organization to publish explicit criteria exclusively for residential placement (Leon et al., 2000; Wells, 1991). These criteria include mental disorders of "moderate to severe in nature" such as functional impairment, acute disturbance in affect, behavior, and cognition, and danger to self or others. Common practice emphasizes the child's level of aggression, impulse control, risk behaviors, degree of reality testing, and presence or absence of a supportive home environment (Courtney, 1998; Foltz, 2004; Frensch & Cameron, 2002; Friedman & Street, 1985; Ong, 1999).

Although there is agreement that the best practice is to allow the child's needs to determine the levels of care most beneficial to the child (Sunseri, 2005), a plethora of non-clinical factors are considered, such as availability of residential placements (Aarons et al., 2010), availability of alternative community settings (Epstein, 2004), or preferences of the child and/or caregivers (DeMuro & Rideout, 2002; Hyde & Kammerer, 2009). Nevertheless, there is a consensus across state systems that standardizing placement criteria as a means to achieve placement stability and optimal child welfare outcomes is a priority (Blakey et al., 2012).

1.4. Placement decision-making

The practice of evidence-based placement decisions is rare, especially those resulting in residential treatment (Frensch & Cameron, 2002). Given the absence of standard placement criteria for residential treatment, placement decision-making is equally difficult to standardize. In a study of 18 clinicians' recommendations for appropriate levels of care for 47 children using clinical profiles, Bickman, Karver, and Schut (1997) found that the clinicians' inter-rater reliability was near zero. In other words, clinical judgment alone without consulting placement guidelines did not ensure the most appropriate level of care. Although residential treatment is designed to treat the most behaviorally and emotionally disturbed child population by managing risk and stabilizing symptoms, this clinical focus can be at times overshadowed by placements that are crisis-oriented or used for short-term or shelter care (McMillen, Lee, & Jonson-Reid, 2008). Finally, and perhaps most importantly, the outcomes of residential treatment over time have been sorely understudied (Connor et al., 2002; Foltz, 2004; Helgerson et al., 2007). Empirical evidence is essential to the effort to understand and reform child welfare. That the use of residential care in child welfare is in transition can be a blessing. If the appropriate empirical evidence can be brought to bear, the changes in the system can be directed to improve the welfare of the child. To address what is best for children who require residential treatment, the present study contributes to this goal by comparing two placement decision-making models and their associated longitudinal outcomes following placement.

2. Methods

2.1. Setting

Participants in this study are children who were placed in residential treatment centers and were in the custody of the Illinois Department of Children and Family Services (IDCFS), the Illinois child welfare agency. IDCFS oversees the child welfare population in Illinois, implements quality improvement initiatives, including evidence-based treatments, outcomes monitoring, child protective investigation, and child service delivery including medical and behavioral health, education, and transition to adulthood services (Weiner, Schneider, & Lyons, 2009). IDCFS has implemented two models of decision-making pertaining to level of care: a multidisciplinary team approach and a decision support algorithm.

2.1.1. Multidisciplinary team model: Child and Youth Investment Teams (CAYIT)

Placement Review Teams was originally the formal placement mechanism in Illinois child welfare. These teams were chaired by clinical managers in collaboration with psychologists and caseworkers, though typically without the child or family. As multidisciplinary team decision-making and child-empowerment began to take shape in state systems (DeMuro & Rideout, 2002; Leeson, 2007), the IDCFS implemented the Child and Youth Investment Teams (CAYIT) in July 2005 to capitalize on the key advantages of team decision-making, such as pooling multidisciplinary expertise together and including children in the process that will determine their future. To bolster the appropriateness of placement decisions made, a small group of IDCFS administrators make up the Centralized Matching Team (CMT) to identify potential placements and facilitate the intake process.

While caseworkers and their supervisors mainly oversee the general operation of placement changes, the CAYIT manage the level of care decision-making process statewide. Different regions in the state are served by different teams, with interchangeable team members depending on staffing availability. Each team consists of an intake coordinator, a reviewer, a facilitator, and an implementation coordinator. Through file reviews, investigations, and interviews, CAYIT staffing actively involves the child (if older than 12), caregivers, health care workers, educators, psychologists, and other pertinent individuals to arrive at a consensual, informed placement recommendation. CAYIT staffing is typically triggered by out-of-home placements that are at-risk of disruption, recent multiple changes of placement, and an identified need for a youth to "step-up" to a higher level of care such as residential setting (Illinois Department of Children and Family

Services, 2010). Once the CAYIT process is initiated, the team has 45 days to prepare for the staffing. During the staffing participants review the case, conduct a clinical assessment using the Child and Adolescents Needs and Strengths (CANS) measure, come to consensus on a service plan and recommended level of care. If the child is moved to a new placement, the implementation coordinator works with the CMT to identify a specific placement provider.

2.1.2. Decision support algorithm: the Child and Adolescent Needs and Strengths (CANS) Algorithm

The current approach of decision support algorithms focus on the child's needs based on placement criteria. Placement criteria are usually mapped onto a clinical assessment such that each level of care requires a different clinical threshold (e.g., residential treatment would require more severe ratings or combinations of ratings than foster home placements) (Lyons & Abraham, 2001). Overall, valid decision support algorithms should aid decision-making (Durbin, Cochrane, Goering, & Macfarlane, 2001; Lyons & Abraham, 2001; Schwab et al., 1984; Srebnik, Uehara, & Smukler, 1998) and be empirically associated with differential outcomes whether their recommendations are followed (Lyons, 2004; Lyons & Abraham, 2001). Some examples of decision support algorithm have been validated or are in use in child welfare mental health systems in Ontario, Canada (Durbin et al., 2001), and in Washington State (Srebnik et al., 1998).

As a decision support tool, the CANS Algorithm has field validity as it has been implemented by the Philadelphia Department of Human Services and Alaska Youth Initiative (Lyons, 2004). In Illinois, information gathered in the CANS assessment determines the recommended level of care (Lyons, 2004; Weiner et al., 2009). Focus groups comprised of IDCFS policymakers, mental health services researchers, community providers, and clinicians developed the specific level-of-care criteria (e.g., CANS items and rating thresholds). The CANS Algorithm recommend one of six levels of care of increasing restrictiveness: independent living option (ILO), transitional living program (TLP), foster care (FC), specialized foster care (SFC), group home (GH), and residential treatment center (RTC), whose criteria are reported in Table 1. Level of care recommendations produced by the CANS Algorithm are made available whenever possible to help inform the CAYIT on the final recommendations. However, the CAYIT are not required to follow the algorithm's recommended level of care.

2.2. Measures

2.2.1. Child and Adolescent Needs and Strengths (CANS)

The CANS measures a child's clinical functioning (Lyons, 2004; Weiner et al., 2009). The IDCFS CANS used in the CAYIT staffing consists of 104 items. Each item has four anchored ratings, from "0" to "3", to indicate the range of severity: "0" (no evidence and no need for action), "1" (need for watchful waiting), "2" (need for action), and "3" (need for immediate action). The more severe ratings of a "2" and "3" indicate actionable items that require associated service planning. CANS items are grouped into eight clinical domains: "Trauma Experiences," "Traumatic Stress Symptoms," "Strengths," "Life Domain Functioning," "Acculturation," "Behavioral/Emotional Needs," and "Risk Behaviors." Note that only "Strengths" items have reverse meanings such that "0" indicates a centerpiece strength and "3" indicates that a strength is not yet identified. For consistency of interpretation, "Strengths" item scores were coded in reverse (i.e., "0" to "3", "1" to "2", "2" to "1", and "3" to "0") so that higher scores indicate a greater level of concern.

The CANS is a standardized assessment tool widely implemented across IDCFS programs to track outcomes such as the implementation of evidence-based treatments for trauma (Weiner et al., 2009) and in child welfare systems in Florida, Indiana, New Jersey, Massachusetts, Tennessee, Utah, and Wisconsin (Lyons, 2009). Pilot studies and applied practices have generally demonstrated field reliability through CANS certifications and training, audit reliability (domain- and item-levels), and concurrent validity with the Child and Adolescent Functional Assessment Scale (Anderson, Lyons, Giles, Price, & Estle, 2003; Lyons, 2004; Lyons, 2009; Lyons, Rawal, Yeh, Leon, & Tracy, 2002).

The CANS is designed to be a reliable and valid clinical assessment to measure clinical change and symptom stabilization over time (Lyons, 2009). In particular, the time frame of this study spanned from the CAYIT staffing to repeated assessments during a child's stay at RTC. For each assessment, CANS domain scores on five core clinical domains –

Table 1
Illinois DCFS Child and Adolescent Needs and Strengths (CANS) Algorithm: eligibility criteria for residential treatment.

Eligibility criteria	CANS domain	CANS item
1. At least two or more '3' among the following items	Traumatic Stress Symptoms	14 Adjustment to trauma
	Behavioral/Emotional Needs	46 Psychosis
		47 Attention/Impulse
		48 Depression
		49 Anxiety
		50 Oppositional
		51 Conduct
		52 Substance abuse
		53 Attachment
		54 Eating disturbance
		55 Affect dysregulation
		56 Behavioral regression
		57 Somatization
		58 Anger control
2. At least three or more '2' among the following items	Traumatic Stress Symptoms	14 Adjustment to trauma
	Behavioral/Emotional Needs	46 Psychosis
		47 Attention/Impulse
		48 Depression
		49 Anxiety
		50 Oppositional
		51 Conduct
		52 Substance abuse
		53 Attachment
		54 Eating disturbance
		55 Affect dysregulation
		56 Behavioral regression
		57 Somatization
		58 Anger control
3. A '2' or '3' on development	Life Domain Functioning	32 Developmental
4. At least one or more '3' among the following items	Risk Behaviors	59 Suicide risk
		60 Self mutilation
		61 Other self harm
		62 Danger to others
		63 Sexual aggression
		65 Delinquency
		67 Fire setting
5. At least three or more '2' among the following items	Risk Behaviors	59 Suicide risk
		60 Self mutilation
		61 Other self harm
		62 Danger to others
		63 Sexual aggression
		64 Runaway
		65 Delinquency
		66 Judgment
		67 Fire setting
		68 Social behavior
		69 Sexually reactive behavior
6. At least one or more '2' or '3' among the following items	Life Domain Functioning	32 Developmental
		36 Medical
		37 Physical
	Risk Behaviors	63 Sexual aggression
		65 Delinquency

Decision rules:
Referral to residential treatment is indicated by a CANS that satisfies one of the following criteria matching rules:
Rule 1. (Criteria 1 or 2 or 3) and (Criteria 4 or 5) are met;
Rule 2. Consider a specialty residential treatment if Rule 1 is met and Criterion 6 is met

"Traumatic Stress Symptoms," "Strengths," "Life Domain Functioning," "Behavioral/Emotional Needs," and "Risk Behaviors" – were calculated by summing their item scores, and were standardized relative to the means and standard deviations at baseline (i.e., clinical assessment at CAYIT staffing) to remove artifacts of scaling and to account for variability of scores across the five domains. Thus, the higher is the standardized CANS domain score, the higher is the level of clinical severity in the domain. To assess clinical change over time, CANS administered at the CAYIT staffing (T_0), 30 days after admission (T_1), and three to six months after admission (T_2) were examined. These intervals were chosen in accordance with assessment schedules implemented by IDCFS in RTC.

2.2.2. Length of stay in RTC

In out-of-home placements, placement stability (e.g., length of stay, frequency of placement changes, nature of follow-up placements etc.) is associated with psychosocial well-being and mental health (James, Landsverk, Slymen, & Leslie, 2004) and residential care (Sunseri, 2005). We used length of stay at RTC following the CAYIT decision-making process to assess the immediate impact of the CAYIT process on the first subsequent placement.

2.3. Participants

Participants were 544 children under the custodial care of IDCFS who were placed in RTC following the CAYIT staffing. Given the CANS Algorithm could recommend any of the six levels of care, we operationalized the *concordant* group as consisting of children with a recommended level of care of RTC by the CAYIT and the CANS Algorithm; the *discordant* group as consisting of children with a CANS Algorithm recommended level of care other than RTC.

2.4. Data analysis

Clinical outcomes were tested with a mixed, three-factor within-subject ANOVA using a $2\times(3\times5)$ or Group$\times$(Time$\times$Domain) model. This model compared changes on the five CANS domains between groups over time such that Group (i.e., *concordant* vs. discordant) was the between-subjects factor, and Time (i.e., T_0, T_1, and T_2) and Domain (i.e., the five CANS domains) were the repeated or within-subjects factors. The use of CANS domains as a repeated factor allowed for differences in patterns of change across domains, as there was empirical support for greater improvement in risk reduction than other symptoms over the course of residential treatment (Lyons, Terry, Martinovich, Peterson, & Bouska, 2001). The Domain factor was further broken down into five sets of contrasts, comparing each of the five domains against the pooled means of the remaining domains.

The Cox proportional hazards model was used to assess length of stay at RTC until the placement ended while accounting for right-censored placements (Singer & Willett, 1991) and controlling for demographic factors (i.e., age, gender, and ethnicity), baseline CANS, and placement history factors (i.e., history of at least one prior runaway, one prior RTC placement, or one prior hospitalization).

Mixed design ANOVA was conducted using SPSS 16.0 and survival analyses using STATA 10.1.

3. Results

3.1. Group characteristics

Table 2 shows that the *concordant* group (n = 449) was significantly larger than the *discordant* group (n = 95). The two groups were similar demographically, on time between the CAYIT and residential placement, on time in RTC, and prior RTC. More of the youth in the *concordant* group had a prior hospitalization (60% versus 50% for the *discordant* group).

3.2. Outcomes

3.2.1. CANS

Table 3 shows the mean standardized CANS scores at T_0, T_1, and T_2. Of the whole sample, 177 children from the *concordant* group and 41 children from the *discordant* group had all three CANS assessments to construct the clinical trajectories from baseline. Note that this subsample was not structurally different from the remaining sample who did not have all three CANS assessments in terms of demographic characteristics and baseline functioning. At baseline (T_0) the *concordant* group scored higher on all domains except Strengths, the largest difference being 1.1 standard deviations higher than the *discordant* group on Risk Behaviors ($p<.001$). By 30 days into RTC (T_1), the differences had narrowed, and the only significant difference was in Risk Behaviors ($p=.03$). At six months into RTC (T_2), there were no significant differences between the two groups.

Table 4 reports the change in the domain scores over time. The *concordant* group showed significantly greater change from T_1 to T_2 than the *discordant* group in Life Domain Functioning ($p<.04$), Behavioral/Emotional Needs ($p<.01$) and Risk Behaviors ($p<.01$). There were no significant differences in change between T_1 and T_2. From T_0 to T_2, the *concordant* group's improvement in Behavioral/Emotional Needs ($p<.01$) and Risk Behaviors ($p<.01$) were significant compared to the *discordant* group.

Table 2
Group characteristics.

	Concordant group (n = 449)			*Discordant* group (n = 95)		
	%	Mean (SD)	Median	%	Mean (SD)	Median
Age	–	14.8 (2.3)	15.2		14.6 (2.5)	15.1
Gender						
Male	62.8%	–	–	60.0%	–	–
Ethnicity						
African American	61.5%	–	–	58.5%	–	–
Caucasian	32.0%	–	–	36.2%	–	–
Hispanic and others	6.5%	–	–	5.3%	–	–
Wait for placement (days)[a]		79.6 (92.8)	51.0		84.1 (95.8)	60.0
Length of stay (days)[b]	54.6%	363.1 (238.3)	334.0	56.8%	354.7 (208.2)	302.5
Historical events[c]						
Prior residential placement	50.3%	–	–	46.3%	–	–
Prior hospitalization	60.8%	–	–	50.5%	–	–

[a] Days between date of CAYIT staffing and admission to residential placement.
[b] Days in completed, uncensored RTC, among 245 children in the *concordant* group and 54 children in the *discordant* group.
[c] At least one prior episode of residential treatment and/or at least one prior hospitalization.

Table 3
Standardized CANS at CAYIT staffing (T_0), 30 days after residential placement (T_1), and 6 months after placement (T_2)[a].

			T_0		T_1		T_2	
CANS domain	Group	n	Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
Trauma Symptoms				**		N.S.		N.S.
	Concordant	177	0.09 (0.98)		−0.05 (1.12)		−0.06 (1.12)	
	Discordant	41	−0.39 (1.00)		−0.36 (0.96)		−0.20 (0.94)	
Strengths				N.S.		N.S.		N.S.
	Concordant	177	0.05 (1.01)		−0.02 (1.11)		−0.09 (1.00)	
	Discordant	41	−0.22 (0.92)		−0.08 (1.13)		−0.37 (0.84)	
Life Domain Functioning				**		N.S.		N.S.
	Concordant	177	0.11 (0.97)		−0.71 (1.09)		−0.89 (1.11)	
	Discordant	41	−0.48 (1.00)		−0.90 (1.03)		−1.17 (0.81)	
Behavioral/Emotional Needs				***		N.S.		N.S.
	Concordant	177	0.16 (0.92)		−0.43 (1.16)		−0.51 (1.22)	
	Discordant	41	−0.68 (1.06)		−0.72 (1.12)		−0.66 (1.04)	
Risk Behaviors				***		*		N.S.
	Concordant	177	0.19 (0.92)		−0.68 (1.18)		−0.93 (1.28)	
	Discordant	41	−0.82 (0.94)		−1.13 (1.03)		−1.20 (0.86)	

[a] Higher standardized CANS scores denote greater clinical severity. Two-tailed t-tests were conducted to compare scores of the two groups at T_0, T_1, and T_2.
* $p<.05$.
** $p<.01$.
*** $p<.001$.

Table 5 reports the results from the mixed design ANOVA. The hypothesized Group × Time interaction was significant ($F(1.86, 400.74) = 4.6$, $p<.05$), showing that the overall change in scores over time was significantly different between groups. There was also a significant Time × Domain interaction ($F(6.08, 1313.97) = 12.13$, $p<.001$), indicating variability in the pattern of score change across CANS domains. The Time × Domain interaction somewhat differed by Group as shown by the three-way interaction of Group × Time × Domain ($F(6.08, 1313.97) = 1.93$, $p = .07$). This trend indicates that the way different CANS domains changed over time differed by group.

Each CANS domain was compared to all other domains pooled (i.e., five sets of contrasts). In these subgroup analyses (not shown), Group × Time × Domain was broken down to examine how Group × Time × one CANS Domain differed from Group × Time × all other CANS Domains, and to test for linear and quadratic trends. There was evidence of Group × (Time × Domain) interactions in Strengths ($F(1, 216) = 10.56$, $p<.001$) and Risk Behaviors ($F(1, 216) = 4.58$, $p<.05$), indicating that changes in Strengths and Risk Behaviors across time were different across groups from those in other domains combined. Strengths worsened initially but improved for the *discordant* group, which illustrated a quadratic trend, while the *concordant* group steadily improved in Strengths. These tendencies were not observed in the remaining domains. Unlike the other four domains, Risk Behaviors improved significantly in both groups over time.

3.2.2. Placement stability

Among children completing treatment (n = 299), the median length of stay of the *concordant* (363 days) and *discordant* (355 days) groups were similar. Exploratory Kaplan–Meier survival analysis (not shown) found that, consistent with the mean and median lengths of stay between the two groups, the survival curves (i.e., time until placement completion) were similar, as confirmed by the test of equality of survival functions ($\chi^2 = 0.42$, $p = .66$).

Table 6 shows that the hazard ratios (HR) for the *concordant* and *discordant* groups were similar when controlling for other factors. Among statistically significant predictors, males had a longer length of stay at the CAYIT-designated RTC than females (HR = .59, $p<.001$), as were children with more Risk Behaviors at baseline (HR = 0.95, $p = .03$).

Table 4
Change in standardized CANS scores from CAYIT staffing (T_0), 30 days after residential placement (T_1), to 6 months after placement (T_2)[a].

			T_0–T_1		T_1–T_2		T_0–T_2	
CANS domain	Group	n	Mean (SD)	p	Mean (SD)	p	Mean (SD)	p
Trauma Symptoms				N.S.		N.S.		N.S.
	Concordant	177	0.14 (1.38)		0.01 (0.93)		−0.06 (1.12)	
	Discordant	41	−0.03 (1.19)		−0.16 (0.77)		−0.20 (0.94)	
Strengths				N.S.		N.S.		N.S.
	Concordant	177	0.07 (1.35)		0.08 (.94)		0.14 (1.29)	
	Discordant	41	−0.15 (1.29)		0.29 (0.99)		0.14 (1.14)	
Life Domain Functioning				*		N.S.		N.S.
	Concordant	177	0.82 (1.29)		0.18 (1.01)		1.00 (1.30)	
	Discordant	41	0.42 (1.16)		0.27 (1.14)		0.69 (1.22)	
Behavioral/Emotional Needs				**		N.S.		**
	Concordant	177	0.59 (1.33)		0.08 (1.08)		0.67 (1.37)	
	Discordant	41	0.04 (1.21)		−0.06 (1.02)		−0.02 (1.36)	
Risk Behaviors				**		N.S.		**
	Concordant	177	0.87 (1.29)		0.25 (1.03)		1.12 (1.39)	
	Discordant	41	0.31 (1.03)		0.07 (1.27)		0.38 (1.16)	

[a] Positive differences denote improvement; negative differences denote decline. Two-tailed t-tests were conducted to compare score changes from T_0 to T_1, T_1 to T_2, and T_0 to T_2.
* $p<.05$.
** $p<.01$.

Table 5
Mixed design ANOVA on three factors: Group, Time, and CANS Domain.

Source	SS	df[a]	MS	*F*	*p*	η^2
Group	76.73	1	76.73	13.80	***	0.05
Error (Group)	218	216	1.01			
Time	60.42	1.86	32.56	15.76	***	0.07
Group × Time	17.72	1.86	9.55	4.62	*	0.02
Error (Time)	827.95	400.74	2.07			
Domain	134.25	3.46	38.77	29.69	***	0.12
Group × Domain	7.43	3.46	2.15	1.64		0.07
Error (Domain)	976.64	747.94	1.31			
Time × Domain	44.11	6.08	7.25	12.13	***	0.05
Group × Time × Domain	7.02	6.08	1.15	1.93		0.01
Error (Time × Domain)	785.41	1313.97	0.60			

[a] Greenhouse–Geisser correction was used to correct for violation of sphericity.
* $p<.05$.
** $p<.01$.
*** $p<.001$.

However, children with a history of at least one runaway had a shorter length of stay than those without such history (HR = 1.63, $p<.001$).

4. Discussion

This study empirically examined children under Illinois state custody who were placed in residential care, by comparing multidisciplinary team decision-making based on the Child and Youth Investment Teams (CAYIT) with a decision support algorithm based on ratings on the Child and Adolescent Needs and Strengths (CANS). It was hypothesized that *concordant* decisions between the two models would lead to greater clinical improvement and stabilization, and placement stability than *discordant* decisions. Results showed that youth assigned to residential placements consistent with the decision support algorithm (i.e., the *concordant* group) experienced more positive clinical change over time, particularly on behavioral and emotional symptomatology, than youth assigned to residential placements that were inconsistent with the decision support algorithm (i.e., the *discordant* group). Placement stability, as measured by length of stay at the designated residential placement, was not significantly different between the *concordant* and *discordant* groups.

There are several clinical and policy implications that expand the current literature. As one of the first studies of its kind on the child welfare population, overall clinical findings from this study lend support to the importance of informed placement decision-making as a predictor of outcome, even in residential treatment facilities for which research findings on effectiveness at times have been inconclusive (Epstein, 2004). The data suggest that a hybrid of practice-based evidence (i.e., multidisciplinary team decision-making) and evidence-based practice (i.e., decision support algorithm) can co-exist and inform each other for the betterment of the most behaviorally and emotionally disturbed children who require residential treatment. Secondly, independent of *concordant* and *discordant* decision-making, both groups of children improved over the course of placement, which shows that there is a stabilizing effect of the intensive residential setting, particularly shortly after entry to placement, and maintenance of this stabilization (Hussey & Guo, 2002). Further, the magnitude of improvement was the strongest in the clinical domains that are most relevant to residential treatment: Life Functioning, Risk Behaviors, and Emotional Instability (Lyons et al., 2001). Clinically, this study also demonstrated that *concordant* and *discordant* decisions led to differential clinical trajectories which helps validate the CANS Algorithm as an assistive, decision-support algorithm for residential placement: when the CAYIT agreed with the CANS Algorithm, significant clinical improvement was noted; when there was disagreement with the CANS Algorithm's recommendation for residential placement, clinical improvement was noted but minimal.

Interpretation of the generally positive findings on *concordant* decision-making and the utility of the CANS Algorithm from an implementation and intervention perspective should be contextualized by several key caveats. First, given the applied context, *concordant* group and *discordant* group membership occurred naturalistically without randomization. This quasi-experimental approach allows for an informative and exploratory understanding of existing patterns of decision-making, since the final decisions are made by the multidisciplinary CAYIT, rather than the CANS Algorithm. The possibility of a larger *concordant* group was expected because both common practice and literature suggest that the most severely disturbed (behaviorally and emotionally) children not only are appropriate candidates for residential care, but also are clinically identifiable by the CAYIT and by the CANS Algorithm.

Significant improvement of the *concordant* group based on the five CANS domain scores must be understood within the context of a more severe baseline status than the *discordant* group. This finding may be due to the fact that the cause of placement decision-making for the *concordant* group could be more crisis-oriented (e.g., triggered by current placement disruption or unusual clinical events that warrant the highest level of care) than the *discordant* group. Consequently, forming the *concordant* group with clinically severe children was bound to result in the dramatic clinical improvement observed in this study, by virtue of regression to the mean. To dispel this chicken-or-egg phenomenon (i.e., is *concordance* predicting improvement or regression to the mean the real predictor?) would call for methodologically controlling for baseline severity as a key covariate. However, other studies of outcome trajectories with the CANS suggest that youth similar to the *discordant* group actually demonstrate improvement on the CANS in community settings, which argue against a complete regression to the mean interpretation of these findings; the actual population mean of the CANS is well below the mean in residential samples (Lyons, 2009).

The decision not to control for baseline tied back to the purpose of this study, which sought to understand phenomenological outcomes. Specifically, extremely symptomatic children under state custody are not uncommon within the child welfare population. Concerns about regression to the mean of our clinical outcomes would merit greater weight if we were comparing the child welfare population with the general, intact-family population. Similar to a placement decision-making study on substance abuse treatment (Magura et al., 2003), methodologically controlling for or treating baseline severity as a covariate might actually underestimate the effects of the *discordant* placement decisions, as baseline severity was a key criterion of the CANS Algorithm. Hence, regression analysis or ANCOVA would not be a viable method, since

Table 6
Cox regression predicting hazard ratio (HR) of placement stability.

Predictor	b	Hazard ratio (HR)	z	*p*
Discordant group	0.04	1.04	0.22	N.S.
Age	0.05	1.05	1.48	N.S.
Gender				
Male	−0.52	0.59	−4.21	***
Ethnicity[a]				
Caucasian	−0.13	0.88	−0.95	N.S.
Hispanic and other	−0.09	0.92	−0.34	N.S.
Baseline CANS (T_0)				
Trauma Symptoms	−0.01	0.99	−0.62	N.S.
Strengths	0.01	1.01	0.33	N.S.
Life Domain Functioning	0.02	1.02	1.41	N.S.
Behavioral/Emotional Needs	0.03	1.03	1.38	N.S.
Risk Behaviors	−0.05	0.95	−2.20	*
Historical events[b]				
Prior runaway	0.49	1.63	3.68	***
Prior residential placement	0.04	1.04	0.29	N.S.
Prior hospitalization	−0.16	0.86	−1.14	N.S.

[a] African-American was the reference group.
[b] At least one occurrence of the specific event before T_0.
* $p<.05$.
*** $p<.001$.

baseline severity directly affects group membership, and baseline CANS was highly correlated with follow-up CANS. Understanding the limitation on the extent to which *concordant* and *discordant* decisions might impact outcomes, the practical significance of our study should be acknowledged despite the constraint that baseline CANS contributed to group membership and to the repeated measures of clinical outcomes. As shown in Table 1, which outlines the eligibility criteria for residential care based on the CANS, not all CANS items or all CANS domains were used (e.g., "Strengths" and "Life Domain Functioning"); and there are many possible permutations and combinations of scores and items to meet the same criterion, which distinguish CANS as a decision support tool from CANS as a clinical assessment tool. Given this non-overlap of CANS items and CANS domains as criterion of the CANS Algorithm versus items and domains as repeated outcome measures, there is more meaning to *concordance* and its associated clinical improvement beyond the mere interpretation of "more severe children improved more over time." Further, there was sustainability of gained improvement, whether via *concordance*, regression to the mean, or both factors, in the *concordant* group six months into placement to a statistically comparable level as the *discordant* group. This is quite a remarkable finding, considering the *discordant* group represented children whom the CAYIT believed to benefit from lower levels of care.

Besides the importance of *concordance*, some non-significant findings from the *discordant* group warrant interpretations and implications. When the CAYIT recommended residential care but the CANS Algorithm recommended a lower level of care (e.g., foster home, specialized foster home, or group home), the *discordant* group generally had fewer clinical gains compared to the *concordant* group. These *over-placed* children are similar to patients *over-placed* with more intensive services than necessary. In the decision-making of alcoholism treatment that ranged from outpatient to inpatient care, Magura et al. (2003) found that *over-placed* alcoholic patients either had equal or negative outcomes in terms of alcohol use compared to patients who were placed at the same level of care per clinicians and per the American Society of Addiction Medicine (ASAM) Patient Placement Criteria. In accordance with the practice of least restrictive placement and educated resource allocation (e.g., staffing and expense) within the state system, the *discordant* group might be better served in a lower level of care, given that their outcome was not improving enough to be considered significant or that there was even a mild exacerbation of traumatic symptoms and a temporary compromise of strengths, perhaps due to the "contagious" effect of being surrounded by a much higher risk residential population of peers. In the end, the premise that residential treatment is neither helping nor worsening the well-being of these children should not justify their placement, which should go to more deserving children who have greater potential of benefit from the intensive treatment. These conclusions resonate with findings that suggested children who are placed in residential treatment yet are not demonstrating risk behaviors, are better served in community-based, outpatient settings (Lyons et al., 1998). Since finding the right out-of-home placement is often the first task after a child is removed from home, this type of needs-based, empirically supported planning of placement is desperately needed in child welfare (Durbin et al., 2001).

However, length of stay in residential treatment center did not differentiate the *concordant* group from the *discordant* group enough to draw substantial conclusions. Expectedly, children with a history of runaway had a shorter length of stay at their designated residential placement, while males and children with a more severe risk behavior baseline. Although Teare et al. (1999) found that wards of state were three times as likely as youth from intact families to disrupt in residential care, this study's residential sample had median and average length of stay of longer than a year. Without a comparison group of non-child welfare children, these results seem aligned with findings by Sunseri (2005), which asserted that the highest level of care tends to demonstrate the greatest placement stability. Whether longer length of stay equates placement stability, and whether placement stability is in itself a positive outcome for residential treatment, are both debatable. Nevertheless, this study provided a glimpse into the complexity of placement stability of a restrictive placement type that is often perceived as an undesirable last resort.

Other confounding factors, limitations, and related future directions should be acknowledged. First, although the CAYIT team decision-making model has the state's support and is fully implemented, the overall empirical base for team placement decision-making in child welfare has considerable space to grow. Specifically, in order to position team placement decision-making as a clinical approach and for it to be compared to other models of decision-making, the CAYIT team model and other similar team models can benefit from having indicators of reliability and validity in the placement recommendations. Even so, the clearly defined role of each team member (reviewer, coordinator, facilitator and implementation coordinator etc.) set forth by the IDCFS in the CAYIT protocol (Illinois Department of Children and Family Services, 2010) is expected to ensure consistency and validity. Further, there are internal CAYIT supervisors that oversee all teams and their decisions.

Second, there are debatable definitions of "residential treatment" (Foltz, 2004; Wells, 1991) and inter-site differences in treatment outcome among residential providers (e.g., in Illinois) (Lyons et al., 2001). This study did not account for children's placement of origin prior to their residential placement. Thus, the implications of a child "stepping up," "stepping down," or "laterally moving" were not accounted for.

Third, although this study has positioned team decision-making as the main driver of *concordance* and *discordance*, both the literature and field knowledge indicate that pragmatic factors such as bed openings are unavoidable. Thus, *discordance* might be an outcome of community with fewer bed openings, which could in turn influence the teams to deviate from residential treatment even if it is warranted. Future research should help delineate other exogenous factors that impact decision-making. As a related concern, the aforementioned phenomenon of *over-placing* children also has a counterpart: *under-placing* children, or the fact that children who, by clinical expertise or algorithm-based knowledge, need a higher level of care are instead placed in a lower level of care. Magura et al. (2003) found that *under-placing* alcoholic patients are associated with negative outcomes such as fewer days of abstinence. Thus, the granularity of *discordance* should similarly be parsed out further into *over-placement* and *under-placement* to understand its complex impact on outcomes.

By the same token, considering the diverse ways to operationalize placement stability (e.g., placement disruption, multiple moves, placement patterns, and treatment opportunity day rates) can constructively inform the placement decision-making literature (James et al., 2004), as will the use of mixed effects modeling methods to examine repeated measures at irregular time points and varying frequencies (e.g., CANS) to accurately capture the long-term outcomes. The latter recommendation arises from the exclusion of children who did not have all three CANS assessments at the time of CAYIT staffing, initial placement, and six months into placement. Although this limitation might raise concerns about selection bias or potentially systematic differences between children who frequently get assessed versus those who do not, we confirmed that this subsample of excluded children was not different from the remaining sample on any demographic characteristics.

5. Conclusions

At a time when evidence-based treatments and evidence-based practices are proliferating in child welfare, evidence-based placement decision-making must also be considered. In terms of child welfare policy and innovative ways to improve child welfare outcomes, there is still much to learn about out-of-home placement decision-making, its mechanism, and its effect on children's well-being beyond a task on

a checklist. This study has shown promising evidence of combining multi-disciplinary decision-making with the help of a decision-support algorithm in Illinois. In order for other state systems that either have similar decision-making practices in place or those that want to incorporate these practices, further research linking episode of care and long-term outcomes with needs-based decision-making is needed.

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