



Multilevel Predictors of Case Managers' Assessment Administration Behavior in a Precursor to a Measurement Feedback System

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Abstract

This study examines factors associated with administration of a treatment monitoring assessment measure (the Ohio Scales) in the context of a precursor to a measurement feedback system in a youth public mental health setting. 82% of all state case managers ($N=46$) completed interviews and administered at least one Ohio Scale over a 12-month period. A multi-level model accounting for variance between both case managers and their administrative offices indicated that case manager characteristics (lower self-reported burnout, more experience) and monthly caseload characteristics (fewer active cases, younger average age of youth, and increased time since initial administration) predicted increased monthly administration proportions.

Keywords Measurement feedback system · Case managers · Assessment · Mental health system

Introduction

Measurement feedback systems (MFSs) are a promising health information technology for potentially improving quality of care and treatment outcomes in large mental health systems (American Psychological Association [APA] Task Force on Evidence-Based Practice [EBP] for Children and Adolescents 2006; Jensen-Doss and Hawley 2010; Lyon and Lewis 2016). MFSs are conceptualized as a tool to support provider implementation of evidence-based assessment strategies, a primary example of which is the use of data collected throughout treatment to help drive clinical decisions (Lyon et al. 2016a, b; Scott and Lewis 2015). The fundamental mechanisms by which MFSs are thought to enhance treatment service delivery and promote data-driven decision making are consistent measurement and timely feedback to providers and/or clients (Bruns et al. 2015). Measurement typically involves the regular administration of one or more

clinically relevant evidence-based assessments related to outcomes, progress, impairment, or other aspects of treatment. Feedback refers to providing objective information gathered via evidence-based assessments to both clinicians and their clients about the extent to which treatment activities appear to be helping clients (Bickman 2008; Bickman et al. 2012). Some of the purported characteristics of effective MFSs include frequent administration of assessment measure(s), timely and coordinated implementation of the system in which feedback is provided concurrent with treatment, feedback provision to both clinicians and families, and consistency in tracking outcomes over time (Bickman 2008). Limited research suggests that when implemented in mental and other health care settings, MFSs typically have a small but positive effect on progress, outcomes, retention in treatment, or other variables related to data-driven decision making (e.g., Bickman et al. 2016, 2011; Duncan and Pozehl 2000; Goebel 1997; Lambert et al. 2003; Lyon et al. 2017; Nadeem et al. 2016; Tam and Ronan 2017). Despite such benefits, as well as a considerable number of commercially available products that foster the creation and maintenance of MFSs, routine use of MFSs in children's mental health services is rare, and much remains to be learned about their ability to impact service delivery in large mental health systems (Hoagwood et al. 2014; Lyon et al. 2016a, b; Lyon and Lewis 2016).

Very little research has examined what predicts provider use of MFSs. In a sample of Canadian psychologists, Ionita

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and Fitzpatrick (2014) assessed characteristics of psychologists that predicted their routine use of progress monitoring measures. They found that those who were English-speaking (as opposed to French-speaking), who served primarily adult clients, who had doctoral degrees (compared to terminal master's degrees), who did not engage in supervision or administration, and who had an eclectic theoretical orientation were more likely to use progress monitoring measures in their work. Kotte et al.'s (2016) study with case managers participating in a statewide MFS implementation effort suggested that barriers to the use of a progress monitoring tools could include perceptions that they are time-consuming, impractical, complicated, of little clinical value or scientific merit, and potentially damaging to therapeutic alliance; as well as organizational factors such as cost, other insufficient resources (e.g., time, staff), and lack of training. Findings from three other studies—one examining an MFS in two mental health clinics (Gleacher et al. 2016), one examining a trial program to assess school-based providers' experiences with standardized assessments (Lyon et al. 2016a, b), and another examining mental health and diabetes patients' views on patient-reported outcome measures (Wolpert et al. 2016), generally converged with those of Kotte et al.'s (2016) work, and further indicated that clinicians and patients saw more than twice as many barriers as facilitators to the implementation of the MFS. However, in the study by Gleacher et al. (2016), strong support for the MFS by leadership staff predicted higher implementation of the system despite misgivings mentioned by providers (Gleacher et al. 2016). Although the Kotte et al. (2016) study involved a state- and system-wide quality improvement initiative, it is worth noting that this kind of research has typically occurred in individual clinics or school settings, rather than large mental health care systems.

In this study, we chronologically follow Kotte and colleagues' (2016) examination of a statewide rollout of a precursor to an MFS in Hawai'i's public children's mental health system by studying the actual assessment administration behaviors of those case managers initially interviewed in that study. The statewide agency under study provides community mental health assessment and treatment services from regional offices called "family guidance centers" (Jackson et al. 2012). Case managers (referred to as "care coordinators" in the State of Hawai'i) are housed in these offices to monitor the coordination of such services. A primary duty of these case managers is connecting children and their families with service providers from an array of contracted provider agencies ranging from outpatient clinics to residential treatment facilities and overseeing the course of treatment (Bruns et al. 2015; Chorpita and Donkervoet 2005). Further, case managers engage in building and maintaining relationships with various school, state, and private agency personnel at the local level (Bruns et al. 2015; Hodges et al.

2006). These efforts help to free mental health service providers from such duties to allow them to focus on clinical service. As civil servants, these case managers tend to stay in their positions longer than public sector therapists, whose tenures are characterized by high turnover rates, similar to those observed in other systems (Glisson 2007; Sawyer et al. 2006; Shim 2010). Other notable differences between case managers and therapists (who are the more common subjects of MFS implementation studies; see Tam and Ronan 2017, for a review) include their increased time performing administrative tasks, fewer hours providing direct client services, and, in some cases, reduced burnout, especially when caseloads are not excessively large, while similarities include comparable caseloads and educational backgrounds (Carney et al. 1993; Hromco et al. 1995; King 2009). Given their unique position in initiating, maintaining, and overseeing the relationship between service providers and the youth they serve, these case managers are particularly well suited to implement an MFS.

As noted in Kotte et al. (2016), a workgroup composed of clinical services office staff and academic researchers was formed to foster the implementation of an MFS toward the purpose of regularly assessing youths' progress in treatment and apprising case managers of this progress, thereby informing their decision making (e.g., to increase or lessen the intensity of services, change providers, end treatment, etc.). This workgroup chose the Ohio Scales assessment (Ohio Scales or OS; Ogles et al. 2001) as a primary tool for system improvement given its wide array of documented strengths (i.e., sound psychometric properties, previous development in a public mental health system, ease of collecting and incorporating multi-informant perspectives, brevity, ease of scoring, simple language, low cost). The OS assessment can be administered to a variety of informants and is designed to measure the level of symptom severity, functioning, satisfaction with treatment, and well-being of children and adolescents (Hawkins et al. 1992).

Once the OS was selected as the primary assessment measure for the MFS initiative, system administrators launched an implementation pilot project in which nine case managers from a total pool of 62 (which included supervisory staff) across all regional offices statewide tested the instrument over a three-month period and provided qualitative feedback. Case manager feedback resulted in some measurement administration changes, such as solidifying a focus on youth (Y-form) and/or youth parent or primary caretaker (P-form) forms [rather than agency worker (W-form)] and administering only the Problem Severity and Hopefulness/Wellness sub-scales (24 items) from those forms. Consequently, a staff training was developed for OS administration, collection, data entry, and report interpretation. Additionally, in preparation for implementing the MFS at the statewide level, case managers were invited to

participate in focus group interviews so as to compile a list of factors to help with implementation success. Case managers provided several useful pieces of feedback that guided initial training efforts during these interviews including: their preference for administering the measure in person as opposed to over the phone; the suggestion to incorporate administration into pre-existing meetings to reduce scheduling difficulties; and the observation that youth responses on the OS appeared to become more “honest” after repeated administrations (Keir et al. 2012).

Currently, case managers administer the OS in hard copy format to caregivers and/or youth once every month. The scales are administered in English and typically not administered (or, on some occasions, administered via interpreter) when youth/caregivers are non-English speaking. Once collected, either case managers or support staff members within the regional office enter the data on an ongoing basis into the mental health system’s electronic health record system, which houses all demographic and treatment data for youth served. Data validation functions in the system minimize data entry error. Staff in the system’s Research and Evaluation Office receive the latest data from the information system office within the first week of each month and then use scoring software to obtain total scores and to generate graph reports of change over time for each youth. OS total problem scales with less than 18 items completed are not included in analyses. Once per month, these staff then transmit the reports via secured e-mail back to the supervisors of case managers in each regional office, who were trained at the outset of OS implementation to distribute the reports to the case managers responsible for each case. To increase buy-in, the Research and Evaluation office allowed each regional office to determine the best-fitting means of distribution of these reports to case managers (e.g., electronically, via fax, via hardcopy printout). Each report graphically and separately displays all utilized OS subscales over the course of treatment episodes for each individual youth, where the x-axis represents “time” and the y-axis represents total “scale scores,” thereby allowing case managers to objectively monitor treatment progress over time. By then sharing these reports with team members (e.g., parents, therapist), various stakeholders are able to track changes in scale scores over time, both within and across youth and parent report forms, facilitating collaborative clinical decision-making.

Notably, various organizational and logistical factors resulted in both a reduced timeline and reduced resources for MFS implementation efforts in the system under study. As such, the assessment paradigm described in this study lacks several key elements of MFSs described elsewhere. The aforementioned process by which measures were scored and reports were delivered to case managers is rudimentary in comparison to that of other available programs, in which measure scoring and report drafting/distribution are

automated and nearly immediate (e.g., Lyon et al. 2016a, b). Particularly noteworthy is the aforementioned delay of a minimum of 1 week and a maximum of over 1 month between a case manager’s administration of the OS and her receipt of feedback from a supervisor. Further, while bona fide efforts were made to implement OS administration among case managers, the implementation of the feedback system, in which supervisors were trained to distribute OS graphs to their case managers for review and discussion, was less standardized and missing several components identified by other researchers (e.g., creating an implementation management group, deploying an implementation plan, providing mentor support calls, etc.; Mellor-Clark et al. 2016). Indeed, at the time of this writing, efforts were ongoing to refine and improve the system, with particular focus on standardizing the feedback process. Despite these flaws, this system carries out, to at least some degree, several of the basic functions of an MFS (administration of progress monitoring measures; compiling of these measures into reports of progress over time; distribution of these reports to supervisory staff for review), and as such we suggest that this system in its current form is best categorized as a precursor to an MFS, and refer to it as such when its current form and functioning are described.

Existing research on case managers has noted various barriers to their use of evidence-based practices (e.g., limited knowledge, unfavorable attitudes, and provision of fewer referrals for services utilizing these practices; Whitaker et al. 2015). That said, research suggests that case managers are more likely to accept and implement an evidence-based innovation if they clearly perceive its positive impact on treatment outcome, and receive increased consultation and administrative support for the innovation (Aarons and Palinkas 2007). Kotte et al. (2016) performed a qualitative analysis of case managers’ perceptions related to the MFS in order to begin to understand factors that might contribute to its successful implementation. Results indicated that while there was variability related to whether certain characteristics of the MFS were experienced as barriers or facilitators (e.g., some case managers saw the OS as a useful source of additional information, while others doubted its utility), case managers most commonly endorsed facilitators related to their own personal qualities (e.g., willingness to problem solve barriers; positive attitude), the clinical utility of the OS (e.g., its ability to elicit previously undisclosed information, thereby fostering additional conversation), and general characteristics of the OS MFS initiative (e.g., it encourages good practices and accountability; Kotte et al. 2016). Regarding barriers, case managers most commonly noted a negative perception of the measure (e.g., lack of trust in the validity of the data collected), infrastructure difficulties (e.g., no time allocated or interest demonstrated by clinic leadership to discuss feedback from the OS during supervision meetings),

workload challenges (e.g., too many cases to consistently administer the measure on a monthly basis), and family barriers (e.g., insufficient English proficiency for parents to complete the measure; Kotte et al. 2016). Researchers also hypothesized broader system barriers (i.e., the lack of an extant electronic medical records system to facilitate the administration, scoring, and distribution of feedback from the OS) and facilitators (i.e., the mental health system's culture, in which efforts are typically made to explore new, empirically supported practices in response to challenges) when considering other factors that might predict successful implementation (Kotte et al. 2016). Finally, while not specifically related to the adoption of evidence-based practices, previous research on case managers has also pointed to various factors that contribute to their job satisfaction and emotional well-being, several of which parallel some of the barriers identified by Kotte et al. Such variables, including level of burnout, amount of experience in the position, age, satisfaction with supervisors, and level of training might also play a role in influencing case manager willingness to engage in MFS implementation efforts, as could caseload characteristics such as size and severity of caseload (e.g., number of youth served with severe disruptive behavior problems), and age and gender of youth served (Carney et al. 1993; Gellis and Kim 2004; Hromco et al. 1995; Intagliata 1982; Van Hook and Rothenberg 2009).

The Current Study

Kotte et al. (2016) identified facilitators and barriers related to the monthly administration of the OS that analyzed case managers' qualitative responses collected through interviews, sorted them into categories, and measured their frequency of occurrence. However, the extent to which specific office (i.e., family guidance center), case manager, or caseload characteristics actually predicted successful administration is unknown. The present study capitalized on a rich longitudinal dataset that cataloged more than 12,000 opportunities for case managers to administer the OS each month to youth and/or their parents, as well as related caseload data (i.e., number of total cases per month, gender, age, and diagnoses of youth served) over the course of more than 2 years after the first rollout of the precursory MFS effort in Hawai'i. These data, along with those pulled from case manager surveys administered upon their initial OS training (e.g., level of burnout, education, ethnicity, and opinions related to standardized assessment), were examined via a multi-level model predicting case managers' assessment administration behaviors. This model examined case manager and caseload characteristics after accounting for random variance across administrative offices and case managers to explore what variables might predict higher monthly

proportions of successful administrations over the first year that each case manager attempted to administer the instrument. It was hypothesized that, convergent with qualitative findings from Kotte et al. (2016) and other aforementioned case manager research, higher levels of burnout, larger caseloads, and a higher proportion of severe cases (e.g., youth with disruptive behavior disorders) would predict lower proportions of administration, while favorable opinions of standardized assessment would predict higher proportions of administration.

Method

Participants

Participants were public sector case managers responsible for the coordination of youth mental health services through the state's department of health. All 56 case managers employed in this position statewide were contacted to participate in this study as part of an initial system-wide training on the implementation of the OS. Four case managers did not attend the training, likely due to typical reasons for work-related absence (e.g., sickness, vacation, scheduling conflicts). The 52 case managers who received this training were invited to participate in this study by completing a pre-training survey battery. 46 (82.1% of all case managers statewide) participants voluntarily consented to participate in the study, completed the battery, and attempted to administer one or more OS to a youth under their care and/or that youth's legal guardian within 1 year of the initial training. As seen in Table 1, case managers typically began administering the OS in the first full month after training (median = 1), though there was significant positive skew in the distribution of this variable, given four participants administered their first OS eight or more months after training. Case manager participants ranged in age from 30 to 68 ($M = 44.0$, $SD = 10.6$), were 73.9% female ($n = 34$), and were ethnically diverse with approximately two-thirds of the sample identifying as Asian or Mixed race. Participants had varying levels of education, experience, and professional specialties with most (58.3%, $n = 28$) reporting earning a master's degree in social work, counseling, or another discipline. More than half of case managers (56.5%) reported a specialty in social work, with the remaining participants noting specialties in various fields of counseling (mental health, addiction, school) or marriage and family therapy. Participants reported extensive years of experience, both in case management broadly ($M = 11.0$ years) and in the care coordinator position specifically ($M = 9.1$ years). Participants worked in eight local administrative offices across four islands and reported receiving approximately 5.8 h of individual or group supervision per month ($SD = 4.0$). Though

Table 1 Case manager demographic, background, and caseload information ($N=46$)

	Mean (SD) ^a
Months between Ohio Scales training and first administration (median, SD)	1 (2.54)
Age (years; $N=43$) ^b	44.0 (10.6)
Female gender	34 (74%)
Ethnicity	
Asian	14 (29.8%)
Multi-ethnic	14 (29.8%)
Caucasian	10 (21.3%)
Pacific Islander/Native Hawaiian	8 (17.0%)
Degree	
Master's	25 (56.6%)
Bachelor's	18 (39.1%)
Unspecified	3 (4.3%)
Professional specialty	
Social work	26 (56.5%)
Counseling, marriage/family, other	17 (37.0%)
Missing	3 (6.5%)
Supervision (hours)	
Group	3.1 (2.4)
Individual	2.7 (2.8)
Experience in youth mental health case management (years)	11.0 (6.9)
Experience as care coordinator (years)	9.1 (6.2)
ASA ^c benefit over clinical judgment subscale score	3.03 (0.63)
ASA ^c psychometric quality subscale score	3.56 (0.44)
ASA ^c practicality subscale score	2.81 (0.48)
Monthly caseload	22.1 (6.9)
Self-reported appropriate caseload	15.3(2.5)
Burnout	5.6 (2.3)

^aMeans are reported for all statistics with two exceptions: months between Ohio Scales training and first administration, for which the median is reported due to positive skew of this variable; and count variables, which are identified by a percentage of the total sample in the parentheses

^bThree case managers did not report age

^cAttitudes Toward Standardized Assessment Scales

case managers typically endorsed between 10 and 20 cases per month as “appropriate,” actual caseloads varied widely (ranging from an average of 13.7–52.6 cases per month). Case manager scores on a self-reported measure of burnout (ranging from 0 to 10, with 10 being the most burnout) were fairly centered ($M=5.6$) and normally distributed ($SD=2.3$).

All data for youth under case managers' care (age, gender, and diagnoses) were extracted from the mental health system's management information system and aggregated into monthly variables to reflect the general characteristics of a given case manager's caseload each month. Case managers had an active caseload of 22.1 youth in a given month

($SD=6.9$). Case managers' caseloads were 64.3% male with a mean age of 14.0 ($SD=1.3$) years, and with most common primary diagnoses related to disruptive behavior ($M=5.7$ cases per month), attention deficit/hyperactivity, ($M=4.2$ cases per month), anxiety/trauma ($M=3.7$ cases per month) and depression ($M=3.1$ cases per month).

Measures

Attitudes Toward Standardized Assessment Scales (ASA)

The ASA (Jensen-Doss and Hawley 2010) is a 22-item measure of clinician attitudes about using standardized assessment in practice. Items are rated on a 1–5 scale (“Strongly Disagree” to “Strongly Agree”) and load onto three subscales: Benefit over Clinical Judgment, Psychometric Quality, and Practicality. Psychometrics were originally established for the ASA using a national sample of 1442 mental health professionals. That sample was 61.8% female, was 90.5% Caucasian, and included clinicians at the masters and doctoral levels (Jensen-Doss and Hawley 2010). All subscales were found to demonstrate good psychometrics and higher ratings on all subscales have been associated with a greater likelihood of standardized assessment use. Notably, although published research on this instrument has thus far been only with clinicians, Cronbach alpha coefficients with this case manager sample fell in the “Acceptable” range for the Benefit over Clinical Judgment = .78 and Practicality = .73 subscales, and in the “Poor” range for the Psychometric Quality = .54 subscale. The more recently developed monitoring and feedback version of this measure (i.e., Attitude Toward Standardized Assessment Scales—Monitoring and Feedback; ASA-MF, Jensen-Doss et al. 2018), although arguably more appropriate for usage in this study, was not utilized because it was not publicly available at the time of data collection.

Background Questionnaire

A 14-item self-report form was created for this study. The questionnaire asked case managers to provide basic background information concerning their training, credentials, and caseload. The items appear face-valid and variations of this measure for therapists have been used in numerous investigations in the past (e.g., Nakamura et al. 2011).

Defining the Criterion Variables

In order to examine youth, parent, and overall administration patterns of the OS per case manager per month, the following three proportion scores were generated to serve as criterion variables: (a) the proportion of youth OS administered out of the case manager's total monthly caseload of youth

who met the age requirement (12 years or older) for administration; (b) the proportion of parent OS administered per case manager's total monthly caseload, and (c) the proportion of cases in which any combination of youth and parent OS were administered (i.e., youth only, parent only, or parent and youth) per case manager's total monthly caseload. These variables were calculated beginning on the first month in which a given case manager administered an OS and for each of the 11 months afterward. Of these criterion variables, (c) was the main variable of interest for the present study as it most accurately reflected a case manager's successful administration of the OS based on system administrators' directives (i.e., case managers were asked to administer at least one OS assessment for each open case per month), and (a) and (b) were conceptualized as supplemental measures to potentially discern additional patterns in case manager administration behaviors (e.g., a tendency to administer more frequently to parents than youth).

Procedure

Eight one-day mandatory trainings on the administration and utilization of the OS, led by the mental health system's chief psychologist, were held between January and December 2014 across the state of Hawai'i's four counties. These trainings were held for all case managers and their supervisors in order to introduce them to the OS and facilitate their regular monthly use of the scales for all clients. Specifically, trainings involved a description of the purpose, application, and interpretation of the OS as a progress monitoring tool; survey administration, collection, and data entry instructions; monthly distribution and review of OS score reports by supervisors, and modeling/role-playing of various collaboratively brainstormed difficult administration scenarios in an attempt to bolster case managers' basic engagement skills and administration competency. Case managers were expected to begin administering the OS within 1 month after trainings were held. These trainings were not required for licensure of any kind and were standard continuing education opportunities. Questionnaires were administered to attendees prior to workshop participation. Prior to any data collection, all participants underwent standardized Institutional Review Board-approved notice of privacy and consent procedures.

Data Preparation

For the purposes of this study, an administration attempt was defined as the case manager obtaining one or more completed item responses on any OS questionnaire. Case managers' attempts were included in the study if they occurred within a 12-month span that began with the first month in which the case manager made at least one administration

attempt. This resulted in a total of 4876 total OS attempted administrations (3007 to parents and 1869 to youth) from January 2014 through March 2016 by the 46 case managers noted above. Among completed measures, missing data occurred at a low rate (of all completed ASA surveys, three were missing one or two responses). Missing data were handled using the Missing Value Analysis (MVA) module of SPSS 22.0 (SPSS, 2013). Within the ASA, the SPSS MVA module first examined missing data patterns with Little's Missing Completely at Random (MCAR) test (Little and Rubin 1987). Next, the SPSS MVA module imputed missing values for continuous MCAR variables through a maximum likelihood method based on expectation maximization algorithms. Little's MCAR tests performed within the ASA ($\chi^2 = 54.4$, $df = 61$, $p = 0.712$) were all non-significant, suggesting that data was MCAR, and thus data were imputed accordingly. Finally, the ASA and continuous demographic data were examined for both statistical outliers and distribution normality.

Analytic Strategy

Preliminary Analyses

Exploratory analyses first examined univariate and bivariate relationships between the number of OS administrations and (a) various case manager characteristics, (b) case manager monthly caseload data, and (c) ASA subscale scores. These exploratory analyses were conducted to determine a preliminary list of variables that might be related to OS administration for inclusion in the multi-level model described in Main Analyses below. Zero-order bivariate correlations were used for continuous-to-continuous and continuous-to-binomial variable comparisons, and univariate analyses of variance (ANOVAs) were used for continuous-to-multinomial variable comparisons. Case manager characteristics included age, gender, race, highest degree earned, years of case management experience, self-reported hours of supervision per month, subjective self-reported burnout at the time of initial OS training (measured on a 0–10 scale, with 10 reflective of the most possible burnout), and months between the case manager's initial training and her first administration of her first Ohio Scale. Monthly caseload data included service month, total number of active cases, percentage of youth with primary diagnoses within nine broad categories (attention problems, adjustment, anxiety/trauma/obsessions/compulsions, depression, developmental disability, disruptive behavior, mood/bi-polar disorder, other, substance use) percentage of males, and average age of youth. Those variables found to be significantly related to any of the three aforementioned Ohio Scale administration proportion scores were retained for main analyses.

Main Analyses

Case managers were housed within multiple administrative offices across the state, and administered the OS across a range of months, which raised the possible need to use multilevel analyses to deal with non-independent data. Intraclass correlations (ICCs; Cohen et al. 2003) indicated that case manager differences and administrative office differences accounted for meaningful variance in all three measures of OS administration (ICCs for case managers ranging from .42 to .46, and ICCs for administrative office ranging from .11 to .14), so multilevel linear regressions using SPSS (SPSS version 24.0; Heck et al. 2013) were used to examine the relationship between OS administration proportion scores and an array of predictor variables. For analyses of changes over time, three-level analyses were used, with monthly administrations (Level 1) nested within case managers (Level 2), nested within administrative offices (Level 3). Initial level 1 variables of interest included aggregate monthly caseload data

(average youth age, proportion of male youth, frequency of primary diagnostic categories, total monthly caseload), date (month/year) of administration, and sequential month of administration (ranging from 1 to 12) over the first 12 months that the OS was administered by a given case manager. Level 2 variables included ASA scores and the case manager characteristics noted in Preliminary analyses. There were no specific Level 3 variables that were amenable to analysis for this study. The variables included at each of these levels were initially informed by bivariate analyses noted above, and non-significant predictors, as well as those that were collinear with other predictors, were iteratively removed from the model until those that were most statistically and theoretically relevant remained. For example, the model was initially run including all predictors noted in Table 2, the *F*-values of each predictor were examined, and the variable that had the weakest relationship with administration proportions (number of youth with an ADHD diagnosis on the case manager's caseload) was removed from the model. The

Table 2 Relationships between selected predictor variables and three measures of Ohio Scales (OS) administration attempts over the first 12 months of administration

	Youth OS attempts/ total eligible caseload	Parent OS attempts/ total caseload	Any OS attempt/total caseload
	F/r statistic	t/r statistic	t/r statistic
Monthly caseload variables			
Caseload	−0.18***	−0.19***	−0.23***
Mean client age	0.036	−0.22***	−0.11*
Proportion of ADHD cases	0.04	0.10*	0.07 [†]
Proportion of adjustment cases	−0.10*	−0.10*	−0.11**
Proportion of thought disorder cases	−0.02	−0.09*	−0.09*
Month of administration ^a	−0.06	0.09*	0.08 [†]
Case manager variables			
Age	0.26***	0.19***	0.20***
Gender ^b	0.12**	0.11*	0.10*
Years experience as care coordinator	0.37***	0.23***	.29***
Hours of group supervision	−0.06	−0.145**	−0.15***
Burnout	−0.15***	−0.26***	−0.25***
Months between prescreen and first administration	−0.15***	−0.14**	−0.13**
ASA practicality subscale	0.08 [†]	0.10*	0.09*
Race ^c	8.16***	11.71***	13.44***
Professional specialty ^b	0.09*	0.13**	0.14**
Administrative Office ^c	22.16***	11.18***	14.84***

ADHD attention deficit/hyperactivity disorder, ASA attitudes toward standardized assessment

^aSequential months beginning with case manager's first OS administration, ranging from 1 to 12. All comparisons are bivariate correlations or point-biserial correlations resulting in *r* statistic except

^bDichotomous variable. Gender coded as 1 for male, 0 for female; Professional specialty coded as 1 for social work, 0 for other

^cAnalysis of variance across four race categories (Asian, Pacific Islander, White, Other) and eight administrative offices resulting in *F* statistic

****p* < .001; ***p* < .01; **p* < .05; [†]*p* < .10

model was then run again and the process was repeated. As such, variables related to youth diagnosis and gender and case manager age, race, and professional specialty were removed from the final model because they did not predict significant variability in OS administration proportion scores in the context of other factors.

Results

Across all monthly opportunities to administer the OS (8634 youth and 12,228 caregiver administration opportunities) during the time period of the study, case managers administered the measure to caregivers in 25.5% of all possible opportunities, to youth in 18.0% of all opportunities, and to at least one informant per case in 32.1% of all opportunities. Significant bivariate correlations and univariate between-group differences were found for many of the variables of interest in relation to all three proportion scores of OS administration (see Table 2 for variables that were significantly related to at least one of these three scores). Of these, larger monthly caseload, greater hours of group supervision per month, greater case manager burnout, months between initial training and first administration, and case manager's racial identification as native Hawaiian/Pacific Islander had the strongest associations with lower administration rates. Increased case manager age, more years of case manager experience, case manager's reported specialty in social work (as opposed to counseling or marriage and family therapy) and case manager identification as Caucasian or mixed race had the strongest associations with higher administration rates.

Multi-level Model

The null multi-level model examining the random variance in proportion of any monthly OS administration attempts indicated that when accounting for both case manager and agency variance in the analysis, significant variability in OS administration proportion occurred at the case manager level ($Wald\ z = 3.73, p < 0.001$) but not at the administrative office level ($Wald\ z = 1.20, p = 0.24$); these findings were consistent across all three measures of the criterion variable. Tables 3, 4, 5 describe the results of the final multi-level linear regression models examining the relationship between the six strongest predictors of interest and the three proportional measures of OS administration while accounting for agency and case manager variability. Regarding any OS administration (i.e., the proportion of cases per month in which the case manager administered to at least one informant per case), smaller caseload ($B = -0.008, t = -3.94, p < 0.001$), less case manager self-reported burnout ($B = -0.03, t = -3.29, p = 0.002$), more years of case manager experience ($B = 0.01, t = 4.08, p < 0.001$), lower mean client age ($B = -0.03, t = -2.32, p = 0.02$), and greater number of months since initial administration ($B = 0.005, t = 2.18, p = 0.03$) predicted a greater proportion of attempted monthly OS administrations. In more practical terms, these results suggest that for every five cases added to a caseload above the mean, administration proportion dropped by 4% (approximately one case), while a one-point increase in burnout score reduced administration percentages by 3%, as did a one-year increase in mean client age. Administration percentages increased by 1% for every additional year of case manager experience above the mean, and by approximately 6% from the beginning to the end of

Table 3 Predictors of proportion of any attempted Ohio Scales administration per total caseload per month

Fixed effects	B	S.E.	t	df	Sig.	95% CI for Odds	
						Lower	Upper
Intercept	0.76	0.22	3.50	1	0.001	0.33	1.20
Monthly caseload	-0.008	0.002	-3.94	1	<0.001	-0.012	-0.004
Burnout	-0.03	0.01	-3.29	1	0.002	-0.04	-0.01
Years of case manager experience	0.01	0.003	4.08	1	<0.001	0.006	0.018
Mean client age	-0.03	0.01	-2.32	1	0.02	-0.054	-0.004
Month of administration (1–12)	0.005	0.002	2.18	1	0.03	0.0005	0.01
ASA Practicality subscale	0.06	0.04	1.43	1	0.16	-0.02	0.13
Random effects	Estimate	S.E.	Z-Score		Sig.	95% CI for Odds	
						Lower	Upper
Intercept	0.034	0.002	15.77		<0.001	0.030	0.039
Case manager	0.012	0.003	3.63		<0.001	0.007	0.02
Administrative office	0.0002	0.001	0.17		0.86	0	19.96

ASA attitudes toward standardized assessment

Table 4 Predictors of proportion of attempted youth Ohio Scales administration per total applicable youth per month

Fixed effects	B	S.E.	t	df	Sig.	95% C.I. for Odds	
						Lower	Upper
Intercept	0.393	0.14	2.83	1	0.006	0.11	0.67
Monthly caseload	−0.003	0.001	−2.51	1	0.01	−0.006	−0.001
Burnout	−0.010	0.005	−1.83	1	0.07	−0.02	−0.001
Years of case manager experience	0.009	0.002	4.37	1	<0.001	0.005	0.013
Mean client age	−0.016	0.008	−2.04	1	0.04	−0.03	−0.005
Month of administration (1–12)	−0.003	0.001	−2.15	1	0.03	−0.006	−0.0002
ASA practicality subscale	0.029	0.024	1.18	1	0.25	−0.02	0.08
Random effects	Estimate	S.E.	Z-Score		Sig.	95% CI for Odds	
						Lower	Upper
Intercept	0.012	0.001	15.78		<0.001	0.010	0.131
Case manager	0.005	0.001	3.57		<0.001	0.003	0.009
Administrative office	0.0008	0.001	0.77		0.44	0	0.01

ASA attitudes toward standardized assessment

Table 5 Predictors of proportion of attempted parent Ohio Scale administration per total caseload per month

Fixed effects	B	S.E.	t	df	Sig.	95% CI for Odds	
						Lower	Upper
Intercept	0.903	0.191	4.73	1	<0.001	0.52	1.28
Monthly caseload	−0.007	0.002	−3.96	1	<0.001	−0.011	−0.004
Burnout	−0.024	0.007	−3.42	1	0.001	−0.04	−0.01
Years of case manager experience	0.010	0.003	3.75	1	0.001	0.004	0.015
Mean client age	−0.044	0.011	−3.98	1	<0.001	−0.065	−0.022
Month of administration (1–12)	0.005	0.002	2.30	1	0.02	0.0007	0.01
ASA practicality subscale	0.051	0.033	1.52	1	0.14	−0.02	0.12
Random effects	Estimate	S.E.	Z-Score		Sig.	95% CI for Odds	
						Lower	Upper
Intercept	0.027	0.002	15.76		<0.001	0.024	0.031
Case manager	0.009	0.002	3.71		<0.001	0.005	0.015
Administrative office ^a	0						

ASA attitudes toward standardized assessment

^aTest statistics could not be calculated due to minimal variability at this level

a given case manager's 12-month administration period (e.g., if a given case manager administered the OS for 20% of cases at month 1, on average she would administer for 26% of cases at month 12). Although the ASA Practicality subscale's positive relationship with administration proportions approached statistical significance ($B=0.06$, $t=1.43$, $p=0.16$), neither this nor any other predictor accounted for a statistically significant amount of variance in administration proportions. As noted in Tables 4 and 5, these results persisted with minimal changes in t scores when the analysis was rerun on the proportion of monthly parent administrations, but changed somewhat when rerun on the proportion

of monthly youth administrations, with greater number of months since initial administration predicting a lower proportion of youth OS administrations ($B=-0.003$, $t=-2.51$, $p=0.01$) and burnout not statistically predictive of youth OS administrations ($B=-0.010$, $t=-1.83$, $p=0.07$).

Discussion

This study is the first to examine significant factors that predict public sector mental health case managers' increased administration of the OS, a treatment progress monitoring

measure provided to youth and their families within the context of the longitudinal implementation of a precursor to a measurement feedback system. More than 80% of all case managers in the mental health system were included in the study, and their administration patterns were observed over each participant's first year of administering the measure. In general, administration rates reflected a moderately low level of penetration (i.e., "the integration of a practice within a service setting and its subsystems," Proctor et al. 2011, p. 70) of OS administration into regular practice, with case managers administering the OS to at least one informant per case in about one-third of all opportunities. Administration rates were particularly low for the youth-completed OS (with OS administrations occurring in only 18% of all opportunities). While there were many significant univariate and bivariate relationships between an increased proportion of administration attempts per month and various case manager and monthly caseload factors, the only such predictors that persisted when examined in a three-level model (accounting for random variance between case managers and between administrative offices in which case managers were housed) were lower levels of case manager burnout, increased years of case manager experience, lower caseloads, lower mean age of youth within a given caseload, and increased number of months that had passed since initial administration. These results generally persisted regardless of how proportion of administrations was measured, with the notable exception of more recent months predicting decreased administrations of the OS measure to youth participants (as opposed to their parents/guardians).

These findings are important in a number of ways. First, regarding the link between case manager characteristics and increased administration, results were generally intuitive in that case managers with higher experience and lower demands (both perceived, as possibly reflected by burnout scores, and objective, as reflected by caseload numbers) tended to do better at administering the OS. Given that these case managers had an average of over 9 years of experience in this occupation, and that more experience seems to be associated with increased administration, organizational supports to manage demands on case managers could be a linchpin in ensuring that high levels of administration are established and maintained (Glisson and Green 2011). A hybrid regular monitoring plan that considers both objective caseload data and subjective burnout ratings could be a useful means for assessing the risk of a case manager's reduced administration capability/motivation. For example, within the context of considering typical rates of case manager burnout (e.g., Hromco et al. 1995; Van Hook and Rothenberg 2009), a receiver operator characteristic (ROC) curve could be used to determine critical levels of burnout or caseload that are associated with the significantly reduced likelihood of meeting a standard minimum monthly

administration proportion. Furthermore, interventions (e.g., reduction in cases, other shifting of duties, other known strategies for reducing burnout) could be put in place if a case manager exceeds those levels for extended periods.

Regarding the association between a lower mean age of youth comprising a given case manager's monthly caseload and higher administration proportions, such findings also seem to comport with practical understanding of this mental health system. Younger youth in this system are more likely to receive services in home as opposed to out-of-home, and therefore are likely to have a parent or guardian who is at least minimally engaged in services (Jackson et al. 2012). This fact, taken with the finding that the overall percentage of successful administrations was 42% higher for parents compared to youth, suggests that when such caregivers were unavailable, administrations decreased. Further, the finding that case managers' proportion of youth administration attempts declined over time, but overall and parent administration attempts did not, suggests that case managers might have been conscious of the difficulty of youth OS administration and changed their tactics over time to focus more on sources of information who they could reach and/or who were more likely to complete the form (i.e., parents). It is unclear from the current study what factors might contribute to this apparent increased difficulty administering the measure to youth (and especially older youth), but they might include increased oppositionality of youth, increased difficulty finding youth in order to administer the measure, especially if their primary concerns relate to disruptive behavior, and/or the comparative convenience of administering the measure to parents, given they are likely the primary point of contact within the family. As such, increased partnership with other team members who might have better access to these youth (e.g., school-based behavioral health specialists; probation officers) could be useful in enhancing youth administration efforts.

A potentially encouraging finding is that successful administration proportions increased over the 12-month period in which a given case manager's administration behaviors were observed. Though such findings should be interpreted with caution, they seem to suggest that once case managers established OS administration as a part of their standard operating procedure, they were able to maintain this behavior over time. As Gleacher et al. (2016) might suggest, it is possible that leadership within one administrative office was more interested in/effective at reviewing OS findings than another and therefore drove consistent administration efforts. However, although administrative office accounted for significant administration variance when examined at the univariate level, this relationship did not persist in the multi-level model, suggesting that decisions to utilize and review OS results might have been influenced more by individual case manager factors than administrative office or leadership

factors. Above all, however, it is important to note that while OS reports were distributed to family guidance center supervisory staff on a monthly basis, it is unknown to what extent supervisors shared these reports with case managers, and, in turn, to what extent case managers shared these reports with youth, families, and therapists.

At the broadest level, these findings might help to illuminate an optimal scenario in which regular administration of treatment progress monitoring measures is consistently and thoroughly carried out. Experienced case managers with reasonable work demands (including appropriate caseloads) and minimal burnout seem to be the most likely to engage in consistent administration efforts. Further, efforts to ease the apparent difficulty of youth administration (e.g., by leveraging school staff or other partners to access hard-to-find youth) while also fostering the accessibility of parents/guardians (e.g., by regularly checking in to update contact information and by sufficiently addressing language barriers) could serve to optimize administration, especially for older youth who are more difficult to contact or engage. While only observed indirectly in the present study, persistent monitoring of administration efforts also seems likely to be necessary in increasing and maintaining high administration rates.

Limitations and Future Directions

Several limitations should be considered when interpreting these findings. First, a true MFS was not studied in the current paper. Although OS administration was systematically implemented and assessed, little can be said about the measurement feedback component of this effort. While efforts were consistently made to distribute OS results to administrative office leadership, there was a considerable delay (ranging from 1 week to over 1 month) between the scoring of the OS and the distribution of results back to regional offices. Additionally, the extent to which leadership staff disseminated and reviewed these results to/with case managers, and in turn the extent to which case managers reviewed these results with clients, families, and therapists, is unknown and likely highly variable within and across administrative offices. Ultimately, however, measurement feedback implementation was not measured. Along these lines, it is crucial to explicate that because only a precursor to an MFS was studied in the current paper, other mental health systems using a true MFS should exercise caution in interpreting these results. That said, there appears to be preliminary value in the current form of this precursor to an MFS as a continuous quality improvement initiative for administrators (i.e., to allow for the consistent monitoring of OS administration), and indeed, initiatives have been taken in the system to encourage administration efforts as a result of such monitoring (e.g., offering trainings for case

managers to improve their broad skills in engaging clients; throwing reward parties for case managers with the best administration records).

Related to limitations inherent in the development of this precursor to an MFS, and as noted above, an alternative version of the ASA, specific to a measurement feedback system, was developed after the date case managers were surveyed for this study, and could arguably more accurately reflect case managers' attitudes about the MFS. That said, the MFS was not in place at the time of ASA administration, and plans for providing feedback were still under development, providing case managers limited context for developing and reporting their MFS-related attitudes. Further, this is the first study to administer the ASA in any form to non-direct service providers, and although preliminary, Cronbach's alphas of two out of three ASA subscales were reliable (and highly similar to those in initial pilot testing; Jensen-Doss and Hawley 2010), suggesting possible generalizability of the measure to other populations.

Two other limitations are related to predictors in the final analytic model. The first is the fact that no specific hypotheses were offered for two of the caseload predictor variables (age and gender of youth). Although these variables were included primarily because of their convenience, one of them (youth age) emerged as having an interesting relationship with OS administration proportions that warranted its further discussion above. The second is the lack of predictors at the 'administrative office' level in the multi-level model. Given previous research implicating organizational leadership as a significant influencing factor in the implementation of MFSs (Gleacher et al. 2016), a variable reflective of leadership buy-in (or more specifically and to address a previous limitation, a measure of the frequency of OS report reviews during case manager supervision meetings) could shed light on such organizational factors. That said, and as previously noted, the random variance accounted for by administrative office differences was non-significant after accounting for the other variables in the model, suggesting that if such leadership effects exist, they are likely intertwined with case manager and caseload characteristics.

Another limitation relates to the time constraints of the study. The choice to examine the first year of OS administration for each case manager was made in an effort to balance maximizing the time window of the study while minimizing the chance that case managers' answers on screener measures might no longer reflect their current situation (e.g., case managers' ratings of burnout might change over time). As such, an examination of more recent data related to continued OS administration would likely be useful to understand longer-term sustainability of the precursory MFS.

Finally, while this study describes interesting administration patterns of a treatment progress measure in the context of a precursor to an MFS, it does not discuss what is

ultimately the most important issue: the effect such efforts might have on improving the outcomes for youth served in this mental health system. Encouragingly, recent meta-analytic research indicating that MFSs are associated with positive treatment outcomes included four studies that examined community and public mental health systems (Tam and Ronan 2017). That said, these studies are still quite rare, effect sizes were generally small, and it is unknown whether such findings will ultimately hold in Hawai'i's system, even after the OS effort transitions into a true MFS initiative. It will be critical that future efforts be made to discern the relationship between large-scale MFS implementation and youth improvements in such systems.

Compliance with Ethical Standards

Conflict of interest Brad J. Nakamura has received contracted research, service, and teaching monies from the State of Hawaii Department of Health Child and Adolescent Mental Health Division. Matthew Milete-Winfrey declares he has no conflict of interest. Amelia Kotte declares she has no conflict of interest. Charmaine Higa-McMillan declares she has no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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