Toward evidence-based measures of implementation: Examining the relationship between implementation outcomes and client outcomes

Bryan R. Garner, Ph.D. [a,*], Sarah B. Hunter, Ph.D. [b], Rodney R. Funk, B.S. [c],
Beth Ann Griffin, Ph.D. [b], Susan H. Godley, Rh.D. [c]

[a] RTI International, P. O. Box 12194, Research Triangle Park, NC, 27709-2194, USA
[b] RAND, P.O. Box 2138, Santa Monica, CA, 90407-2138, USA
[c] Chestnut Health Systems, 448 Wylie Dr., Normal, IL, 61761, USA

A B S T R A C T

Background: Developing consistent, valid, and efficient implementation outcome measures is necessary to advance implementation science. However, development of such measures has been limited to date, especially for validating the extent to which such measures are associated with important improvements in client outcomes. This study seeks to address this gap by developing one or more evidence-based measures of implementation (EBMIs; i.e., implementation outcome measure that is predictive of improvements in key client outcomes) for the Adolescent Community Reinforcement Approach (A-CRA), an evidence-based practice (EBP) for adolescent substance use.
Methods: Data for the current study were collected as part of a large-scale federally funded EBP dissemination and implementation initiative. The multilevel dataset included 65 substance use treatment organizations, 308 clinicians, and 5873 adolescent clients. Adjusted multilevel regression analyses were used to examine the extent to which client-level outcome measures assessed at 6-month follow-up (i.e., substance use, emotional problems) could be predicted by four implementation outcomes: two measures of fidelity (i.e., session exposure, procedure exposure) and two measures of penetration (i.e., absolute client penetration, absolute staff penetration).
Results: Adjusting for client substance use at intake, as well as several client characteristics (e.g., age, race, criminal justice involvement), client substance use at follow-up was significantly lower for treatment organizations that had higher procedure exposure ($B = -1.227$, standard error [*SE*] = 0.583, 95% confidence interval = $-2.370, 0.252$; $p < .05$). None of the other three implementation outcome measures were found to predict improvements in client outcomes.
Conclusions: The current study provides support for procedure exposure as an organizational-level EBMI for A-CRA. Thus, future efforts focused on implementing A-CRA could be improved by measuring and monitoring the extent to which A-CRA procedures are being delivered to clients. Additionally, given the dearth of studies that have examined the relationship between organizational-level measures of implementation and client outcomes, this article provides a prototype for future research to identify EBMIs for other behavioral treatments.

© 2016 Elsevier Inc. All rights reserved.

1. Background

A plethora of evidence-based practices (EBPs)—those practices that have been empirically shown to be efficacious and/or effective—are available for a wide range of health conditions. Unfortunately, the difficulty of implementing EBPs in routine service settings has been documented across numerous areas of health (Institute of Medicine,

1998, 2001). The limited implementation of EBPs in routine service settings is a major issue of concern, given that hundreds of billions of dollars are spent annually to provide services that may have little (if any) evidence to support their effectiveness and given that the return-on-investment of the several hundred billions of dollars that have been spent to date developing EBPs is far from being maximized (Kerner, 2006). Implementation research (i.e., the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and hence to improve the quality and effectiveness of health services; see Eccles & Mittman, 2006) has developed numerous guiding conceptual models (Klein & Sorra, 1996; Mitchell, Fisher, Hastings, Silverman, & Wallen, 2010; Simpson, 2002; Tabak, Khoong, Chambers, & Brownson, 2012; Wilson, Petticrew, Calnan, & Nazareth, 2010), but there remains an important need to develop evidence-based measures of implementation (EBMIs; i.e., implementation outcome measure with predictive validity

to a distinct construct of interest measured [e.g., key client outcome] at some point in the future; see Lewis, Weiner, Stanick, & Fisher, 2015).

The concept of EBMIs is relatively new, but recognition of the importance of developing implementation measures is not. For example, nearly 20 years ago, Klein and Sorra (1996) conceptualized implementation effectiveness (i.e., the consistency and quality of targeted organizational members' use of an innovation) as one of the earliest implementation measures. More recently, Proctor et al. (2011, 2009) helped advance a number of different implementation outcome measures, including (a) acceptability, (b) adoption, (c) appropriateness, (d) feasibility, (e) fidelity, (f) implementation cost, (g) penetration, and (h) sustainability. An even more comprehensive list of implementation measures has been described by Damschroder et al. (2009) as part of their Consolidated Framework for Implementation Research and by Proctor, Powell, and Feely (2014) as part of their overview of measurement in dissemination and implementation science, which together suggest the need for multiple types of implementation measures.

Implementation measures are important because they may be able to serve as key intermediate outcomes in relation to service system or clinical outcomes, which are costly and not always practical to collect. Indeed, Proctor et al. (2011) noted that "Once researchers have advanced consistent, valid, and efficient measures for implementation outcomes, the field will be equipped to conduct important research treating these constructs as dependent variables, in order to identify correlates or predictors of their attainment." Implementation measures also are important because they may be able to help better understand why clinical interventions are effective (or not effective). For example, in the absence of implementation measures, if a clinical intervention is not found to be effective, it will be difficult (if not impossible) to know if this was due to shortcomings of the intervention or if the intervention was simply not implemented well. At the present time, however, EBMIs are not readily available. For example, Martinez, Lewis, and Weiner (2014) recently noted that "a paradox has emerged whereby researchers appear to be investigating implementation initiatives with instruments that may not be psychometrically sound." These authors did not discourage the use of implementation measures without robust psychometrics because this is a necessary step toward establishing a measures psychometric quality for a given use. Nonetheless, the authors concluded that "The fact remains that without psychometrically validated instruments, investigators cannot be confident that instruments measure the purported constructs consistently." Among several recommendations, these authors noted the need to establish instrument psychometric properties in terms of reliability and validity.

In response to the need for more psychometrically validated implementation measures, we sought to develop one or more EBMIs for the Adolescent Community Reinforcement Approach (A-CRA) (Dennis, M., 2004; Garner, Godley, Funk, Dennis, Smith and Godley, 2009; Godley et al., 2001), which is one of the most widely disseminated and implemented EBPs for adolescent substance use (Godley, Garner, Smith, Meyers, & Godley, 2011; Hunter, Ayer, Han, Garner, & Godley, 2014). A-CRA is a behavioral treatment based on a menu of 19 procedures (e.g., Happiness Scale, Goals, Communication, Problem-Solving, Caregiver Involvement), which therapists are trained to deliver during treatment sessions (Godley et al., 2001). As noted previously, research to develop EBMIs is quite limited, but the current study complements prior research by Keith, Hopp, Subramanian, Wiitala, and Lowery (2010), which developed and tested an organizational-level Fidelity of Implementation (FOI) measure for a nurse practitioner case management intervention. This FOI measure, which was developed using qualitative data collected from 18 staff across four medical centers, was found to be predictive of better patient outcomes regarding both patient resource utilization and patient mortality.

Implementation measures can be conceptualized, measured, and analyzed at a number of levels (e.g., organization, staff, patient/client), and the specific level or levels that are most appropriate can be debatable. That said, we elected to focus on the development of EBMIs at the

organizational-level in the current project, which we believe is justified given implementation is often a collective effort (Klein & Sorra, 1996). Additionally, while there are several potential implementation outcomes to examine, the current project focused on validating ones that were available and that included (1) fidelity and (2) penetration. In terms of fidelity, which is frequently conceptualized along one or more different dimensions (e.g., exposure, adherence, competence, participant responsiveness, program differentiation) (Dane & Schneider, 1998), we focused on exposure. More specifically, we examined session exposure (i.e., the number of A-CRA sessions implemented) and procedure exposure (i.e., the number of discrete A-CRA procedures implemented). In terms of penetration (i.e., integration of a practice within a service setting and its subsystems; Proctor et al., 2011), we examine absolute measures of client penetration (i.e., the number of clients receiving A-CRA) and staff penetration (i.e., the number of staff trained in A-CRA), which is related, yet distinct from proportional measures of penetration (proportional measure of penetration not able to be calculated as part of the current project). Given that A-CRA is an EBP used for addressing adolescent substance use, the primary client outcome of interest was improvements in substance use. We also examined, however, improvements in emotional problems because A-CRA has also been shown to help with adolescents' co-occurring emotional problems (Godley et al., 2014).

In sum, the primary goal of the current research was to develop one or more EBMIs for a widely disseminated and implemented EBP for adolescent substance use (i.e., A-CRA). In general, we hypothesized greater improvements in client-level outcomes (i.e., reductions in substance use, reductions in emotional problems) among organizations with higher implementation outcome measures (i.e., session exposure, procedure exposure, client penetration, staff penetration). More specifically, because the number of A-CRA treatment sessions delivered has been shown to be an important predictor of outcome (Garner, Barnes and Godley, 2009; Garner, Godley, et al., 2009), we hypothesized that organizations providing a greater number of A-CRA sessions on average (i.e., session exposure) would also have greater improvements in their A-CRA client's outcomes. Similarly, because the number of A-CRA treatment procedures delivered has been shown to be an important predictor of client outcomes (Garner, Barnes, et al., 2009; Garner, Godley, et al., 2009), we hypothesized that organizations providing a greater number of A-CRA procedures on average (i.e., procedure exposure) would also have greater improvements in their A-CRA client's outcomes. Because the absolute volume of patients has been shown to be associated with better organizational outcomes (Mesman, Westert, Berden, & Faber, 2015), we hypothesized that organizations that provided A-CRA to more clients (i.e., client penetration) would also have greater improvements in their A-CRA client's outcomes. Finally, because absolute cumulative team experience has been shown to be important (Elbardissi, Duclos, Rawn, Orgill, & Carty, 2013), we hypothesized that organizations with a greater cumulative A-CRA experience (i.e., staff penetration) would also have greater improvements in their A-CRA client's outcomes. In addition to providing evidence of the validity of available EBMIs for A-CRA, the current research helps provide a prototype of developing EBMIs for implementation research, which is limited within existing implementation research literature.

2. Methods

2.1. Data source

Implementation data (e.g., fidelity, penetration) and client data (e.g., intake assessment, follow-up assessment) used as part of this study were collected as part of a large-scale EBP dissemination and implementation initiative funded by the Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Treatment (SAMHSA/CSAT). The general goal of this initiative was to improve adolescent substance use treatment by providing multiple community-