2. Specific Aims

Severe mental illnesses (SMI), such as schizophrenia and major affective disorders, are prevalent and present significant burden to consumers and the service system.[1-3] Illness management and recovery (IMR) is an evidence-based practice (EBP) for setting recovery goals and bolstering knowledge and skills used to manage SMI.[4,5] Longitudinal,[6,7] multi-site,[8-10] and randomized controlled trials[11-13] have supported the effectiveness of IMR, and fidelity to the IMR model has been shown to affect consumer outcomes.[11] However, substantial research suggests that IMR is difficult to successfully implement.[11,14-16]

Fidelity is a critical implementation outcome[17] that demonstrates an EBP has been implemented as intended in the target setting. Moreover, fidelity has been associated with important consumer outcomes, across numerous EBPs.[18-21] Fidelity is a multi-dimensional construct that includes adherence, competence, and differentiation.[22] Research exploring predictors of fidelity has focused on *adherence*-- "the degree to which the therapist utilizes prescribed procedures."[2] Extant research has supported a link between organizational and clinician factors and adherence.[23] Organizational readiness for change,[20,24-27] philosophical match with the EBP,[28] and program-specific resources[26,27,29] have all been associated with adherence. Clinician factors, including perceived importance of the practice and confidence, have also been linked to adherence.[20,26,27,30,31] *Competence*-- "level of skill shown by the therapist in delivering the treatment"--[22,32] has also been linked with consumer outcomes[33-39] and may be particularly important for complex clinical interventions. However, research has not explored the organizational and clinician factors associated with the competent provision of EBPs.

The proposed study will examine the relationship between select organizational and clinician factors and clinician competence in providing IMR. We are in the early phases of an NIMH-funded study examining the relationship between clinician competence and consumer outcomes in IMR. This proposal provides an ideal opportunity to maximize resources to study factors affecting competence that will, in turn, maximize consumers' illness self-management. Guided by self-determination theory[40] and Simpson's 4-Stage Transfer model,[41] we propose that IMR competence is best supported by an organizational culture that motivates clinicians to strive to provide recovery-oriented EBPs, allows the autonomy necessary to skillfully apply IMR principles, and integrates training and supervision to understand and competently provide the practice.

Aim #1: Examine the relationship between organizational factors and IMR competence.

1a. We hypothesize that an autonomy-supporting environment (ASE) will be directly related to higher levels of competence. That is, clinicians who perceive that leadership cares about them, listens to their perspectives, gives them choices, and expresses confidence in their abilities will be motivated to skillfully approach clinical services.

1b. The relationship between ASE and competence will be moderated by other organizational factors (organizational climate, staff attributes, training and supervision resources, IMR-specific resources, recovery orientation, and attitude toward EBPs). More specifically, positive perceived climate, staff attributes, resources, IMR-specific resources, recovery orientation, and attitudes toward EBPs will strengthen the relationship between ASE and competence.

Aim #2: Examine the relationship between clinician factors and IMR competence.

2a. We hypothesize that more positive clinician perceptions of organizational factors (climate, staff attributes, and resources), and IMR-specific resources will predict higher levels of competence.

2b. We hypothesize that higher levels of IMR importance and self-efficacy will predict higher competence.

Aim #3: Examine the mediating effect of clinician factors on the relationships between organizational factors and competence.

We hypothesize that organizational factors will affect clinician perceptions of organizational factors (a mediating factor), which will affect the perceived importance of IMR and the clinician's self-efficacy in providing IMR (subsequent mediators), which will most proximally affect IMR competence.

The proposed study will forward NIMH's Strategic Plan Strategy 4.1: by elucidating organizational and clinician factors affecting the "quality…and the means by which newly discovered effective mental health interventions are disseminated and implemented."[42]

3. Research Strategy

A. Significance
A.1 Fidelity
Fidelity is "the extent to which an intervention was implemented as intended"[22,43] and is comprised of three dimensions: adherence, competence, and differentiation.[22] Adherence is the degree to which the clinician uses model-prescribed (and avoids proscribed) techniques, whereas competence is the level of skill the clinician displays in performing the techniques. Differentiation refers to the model being distinguishable from other models. Competence may be particularly important, especially for programs requiring specific, nuanced clinical interventions. Clinicians must understand the program model elements and have the skills to implement the elements faithfully.[19,44,45] Fidelity plays a critical role in clinical research and implementation of EBPs in the field. In research, fidelity is a key indicator of internal validity-- the degree to which the study actually tested the desired intervention. Effective implementation requires specification of the critical components for a given model,[46] operational definitions for the critical ingredients,[47] and standardized fidelity measures.[18] In the National Implementing EBP Project, fidelity was the critical study outcome variable.[48] Confirming its importance, fidelity to an EBP has been associated with important consumer outcomes. Fidelity has been linked with outcomes such as reduced hospitalization,[18,49-51] increased employment,[18-21] juvenile criminal justice activity,[20,2120,21] and reduction in depression.[33-37]

Competence, in particular, has long been theorized to affect therapy outcome. Early examinations of competence[36,39,52,53] focused on global assessments of clinician competence; more recent examinations have targeted session-by-session examinations of competence using operationalized ratings (e.g., the cognitive therapy scale).[54] Competence varies at the clinician and session level;[39,55] additionally, competence may increase with training and experience.[39,55] Ample research confirms that more competent provision of practices results in better consumer-level outcomes;[33-39] moreover, the effects of competence may be underestimated due to moderating factors.[56] Some evaluations of competence have focused on non-evidence-based practices.[53,55,57] Also, competency research is often conducted in university training clinics or controlled clinical trials;[33,36,38,52,55,58-60] in both cases, clinicians are highly trained, often included because of demonstrated skill, and generally receive supports such as supervision and session feedback. To our knowledge, research on competence in representative community samples does not exist. Given the importance of fidelity in general, and competence more specifically, identifying factors that may increase fidelity is of particular importance.

A.2 Organizational Factors Affecting Fidelity
Simpson's Transfer Model[61] (STM) hypothesizes organizational and clinician factors affect implementation. STM specifies that implementation of EBPs dynamically and fluidly progresses through four stages: exposure, adoption, implementation, and practice. At each stage, organizational and clinician factors differentially affect the likelihood of the EBP being transferred into practice. At the *organizational level*, culture-- staff created norms, values, and expectations,[62,63] are considered key factors.[64]

Extant research on organizational factors affecting fidelity has focused almost exclusively on *adherence.* Schoenwald and colleagues[20,65] found an association between organizational culture and both MST adherence and criminal justice outcomes; moreover, the association between organizational factors and outcomes was no longer significant when accounting for adherence, suggesting that adherence may mediate the relationship between organizational factors and outcomes. Cronley and Patterson[24] found that organizations with a more rigid, competent, and resistant culture showed more frequent use of homeless management information system. Klimes-Dougan[27] found teachers' perceptions of schools' culture and climate were related to teachers' adherence to a childhood conduct problem prevention program. Passive/defensive cultures (subservient characteristics) were positively correlated with adherence, whereas constructive culture (promoting high motivation, individualism, and support) was correlated negatively with adherence. It may be that organizational cultures in which employees "just follow orders" may produce (rote) adherence to models; what is not known, though, is whether such prescriptive environments encourage clinically appropriate application of practices/techniques, especially in the case of clinically complex practices.

Despite its importance, little research has focused on predicting *competence*. Fidelity is multi-dimensional, but fidelity research is incomplete because it has focused primarily only on adherence-- just one dimension. Adherence requires intention and a basic knowledge of the prescribed technique; competence goes beyond adherence by necessitating understanding of the EBP's philosophical underpinnings and recognition of the specific clinical situation. For these reasons, implementation strategies that lead to adherence may not lead to competence. For instance, a "rigid and resistant" organization[24] may mandate implementation of an EBP and provide financial incentives and punishments based on the frequency of using EBP techniques. Clinicians may

increase the frequency of EBP techniques, but lack the clinical and EBP-specific understanding to provide the techniques *competently.* At worst, a clinician may even provide techniques at clinically inappropriate times or sacrifice therapeutic alliance,[55] in service of adherence. Based on self-determination theory, described below, we hypothesize that organizational cultural will have a different pattern of predictions for competence.

A3. Clinician Factors
Clinician-level factors also affect implementation. Lehman et al.[61] found EBP attitudes predicted organizational readiness to adopt an EBP (see also[66]). In a national survey of clinicians,[67] positive clinician EBP attitudes were associated with reported EBP use. Regarding fidelity, Henggeler[26] found clinician attitudes toward behavioral and manualized treatments predicted adherence. Similarly, Stein[31] found positive teacher attitudes toward a reading program led to greater adherence, which, in turn, led to better student outcomes. Several studies have found clinicians with more confidence (self-efficacy) in their ability to provide the EBP have better fidelity scores.[68,69] Finally, clinician views of the organizational climate and resources have been linked with fidelity.[20] Beyond factors specific to a given clinician, organizational factors manifest within the clinician providing the EBP; therefore, the EBP clinician can be a mediator of organizational effects on implementation.

A4. Illness management and recovery (IMR)
IMR is an evidenced-based approach that teaches consumers with SMI how to set and achieve personal recovery goals and acquire the knowledge and skills to manage their illnesses.[4,5] IMR was developed as part of SAMHSA's National Implementing EBPs Project.[70,71] The curriculum includes ten modules, taught to participants using motivation-based, educational, and cognitive-behavioral strategies. Multiple studies[6-13] have linked IMR with better illness self-management, coping, and reduced hospitalization rates. Sites with higher fidelity demonstrated additional benefits to consumers.[11] IMR has been disseminated widely. IMR is a required practice for all psychosocial rehabilitation centers in the Veterans Health Administration[72] and has been translated into several languages (e.g., Hebrew, Spanish, Dutch, Japanese), indicating its broad appeal.

Research indicates variability in IMR implementation. As with most EBPs, training in isolation has proven inadequate to support widespread adoption of IMR. In a survey of IMR trainees,[14] only 50% of trainees reported providing IMR approximately 13 months since training. Research on the fidelity of IMR implementation has been even more troublesome. Hasson-Ohayon and colleagues[11] found cross-site variability in fidelity, with eight out of eleven programs reaching "moderate" fidelity and only 50% of sites participating in the National Implementing EBPs Project reached the "implemented" threshold.[15] Two separate groups[15,16] concluded weak fidelity outcomes may be at least in part due to IMR's "strong representation of clinical elements."[16] Moreover, IMR is particularly complex: it requires dynamic and adaptive inclusion of various clinical techniques (cognitive-behavioral, motivation-based, and educational techniques) and purposeful selection between clinical targets (e.g., psychoeducation, goal setting, symptom coping). The program provides guidelines, but the clinician must determine which technique is appropriate for the particular clinical situation. In these ways, IMR resembles other psychosocial EBPs (e.g., CBT) for which strict adherence measures are inadequate to assess quality of implementation. Rather, measures of clinical competence are most appropriate.[73]

A5. Self-Determination Theory
Self-determination theory asserts that people are at their best when needs of autonomy, competence, and relatedness are met.[40] Ryan and Deci[40] summarized research that provided clear evidence for environments that support autonomy and competence being closely linked to internal motivation (whereas relatedness was more distally related). Looking specifically at work settings, autonomy supporting environments (ASE) refer to the perception that supervisors understands employees, communicate information clearly, values employee input and initiative, and offer employees choices.[74] ASEs have been associated with perceived competence. Baard and colleagues[75] found that perceived autonomy support predicted satisfaction of competence needs as well as self-reported job performance ratings. See also Deci and colleagues for cross-cultural validation.[76]

Clinical studies also provide evidence for autonomy support predicting competence. For example, Williams and colleagues[77] found that perceived autonomy support from health care providers predicted patients' level of perceived competence in managing diabetes 3 months later. Competence predicted self-management behaviors and change in glucose level as well. Similar support has been found in smokers, where autonomy support predicted perceived competence, which was further associated with smoking cessation.[78] Taken together, direct studies of work environments, and indirect studies of parallel processes in clinical settings, suggest that autonomy support should predict greater competence. The proposed study will forward self-determination theory in predicting *objective ratings of competence,* while prior work has focused on perceived competence in performing an action (akin to self-efficacy), or satisfaction of competence needs (degree to which work fulfills employees' needs to feel competent and effective).

A6. Recovery-Oriented Services

Clinicians should function optimally in ASEs. However, an ASE, in isolation, does not guarantee fidelity to IMR. Clinicians may exercise their autonomy to provide a well-intended intervention different than IMR. We suggest additional organizational and clinician factors come into play. <u>At the organizational level, the intervention must match the organizational philosophy</u>. As Glisson and Schoenwald[79] argue, "effectiveness is a function of how well the social context complements and supports the objectives of the core service technology." IMR is based on a philosophy of recovery. Mental health policy[80] as well as mental health advocates[81-84] have been emphasizing the importance of recovery-oriented services. In support of the idea that people with SMI can recover a life of meaning, despite the "catastrophic effects of mental illness."[85] Recovery orientation assesses the degree to which organizations help consumers with life goals, involve consumers in care, provide a diversity of treatment options, support consumer choice, and individually tailor services to consumers.[86] An organization's recovery orientation may affect a clinician's fidelity to IMR directly by increasing the clinician's perceived importance of IMR. Recovery orientation may also affect fidelity indirectly by increasing resources such as the support from the clinician's supervisors and training opportunities.

A7. The Current Study

<u>The current study seeks to explore the association between organizational factors (ASE, recovery orientation, and support of EBPs) and clinician factors (recovery orientation, EBP attitudes, and importance and self-efficacy in competently providing IMR) and IMR competence</u>. We hypothesize that an ASE will be directly related to higher levels of competence. Clinicians who perceive that leadership cares about them, listens to their perspectives, gives them choices, and expresses confidence in their abilities will be motivated to innovatively and skillfully approach clinical services. We also hypothesize that the relationship between ASE and competence will be moderated by organizational philosophy (attitudes towards EBPs and recovery) and instrumental support/resources (training and supervision). We hypothesize that higher levels of self-efficacy and more positive attitudes about EBPs and recovery will be associated with greater competence in providing IMR. Further, we hypothesize that clinician level factors will mediate the relationship between organizational factors and competence. That is, an autonomy-supporting environment, a culture that embraces EBP and recovery, and resources for IMR (training and supervision) will lead to higher levels of clinician self-efficacy and perceived importance of IMR, resulting in higher quality of IMR service provision.

3(b) Innovation

The proposed project is innovative in several key ways. First, although research has made progress in determining factors associated with *adherence* to EBPs, this would be the first project to our knowledge to examine the more clinically nuanced outcome of *competence.* Thus, the study advances scientific knowledge in understanding competence as a critical component of EBP fidelity. This study can also advance our understanding of self-determination theory. Research on ASEs has focused on perceptions of having competence needs met (e.g., feeling challenged by work) or perceived competence (e.g., self-efficacy in behavior change). The proposed study goes beyond these to examine *objective ratings of competence* (in addition to perceived self-efficacy). Finally, according to self-determination theory, competence leads to greater overall quality of effort by workers and persistence in the face of difficulties—these qualities may impact not only early implementation, but *sustainability* of a practice. Although research has advanced significantly in explaining (and encouraging) early adoption, factors important to sustaining an EBP remain an important and largely untapped area. Sites participating in this project will be largely in the latter stages of implementation (Simpson's[41] implementation and practice stages); therefore, the proposed study will be crucial to understanding *sustainability of EBPs.*

C. Approach
C1. Preliminary Studies

IMR Salyers and McGuire conducted some of the early <u>outcomes research on IMR</u>, including 3 effectiveness trials,[7,10,87] an examination of Medicaid claims,[88] and an on-going RCT. Following our group's extensive outcomes and implementation research on IMR, we turned our attention to issues of model fidelity. Interactions with IMR stakeholders and our own experience indicated a need for a competence scale. Our initial work focused on the creation and psychometric testing of the <u>IMR Treatment Integrity Scale (IT-IS)</u>, a 16-item, behaviorally anchored scale.[73] In our initial trial, the IT-IS showed excellent inter-rater reliability (ICC = .97, p < .001). A confirmatory factor analysis supported a one-factor model (α = .89). The scale successfully differentiated between IMR and control groups. Average scores did not differ between raters or study sites. Subsequently, we re-analyzed our data using Rasch Analysis[89]-- a sub-set of Item Response Theory. Results indicates the measure is able to identify three unique fidelity performance strata (i.e., degrees of fidelity). Only 3 items had fit values outside the acceptable fit range and only one item was misfitting enough to distort the

measure. The targeting of the IT-IS was very good, with just 5.8% of rated groups beyond the "ceiling" and "floor" of the IT-IS. In summary, analyses indicated the IT-IS reliably measures one latent "fidelity" construct; items successfully measured fidelity, with some notable exceptions.

Currently, McGuire, Salyers, and Bartholomew are funded by NIH to refine and validate the IT-IS by examining the relationship between IT-IS scores and consumer outcomes (the IT-IS Validation and Leadership Intervention Development (IT-IS VALID) project). The project began on 9/15/12 and is currently in the site recruitment phase; already, 4 community sites and 4 state hospitals have formally agreed to participate. We are recruiting from over 90 sites. Participating sites vary greatly in terms of organizational context and fidelity to IMR (total scores ranging from 1.9 to 4.15 out of 5). Implementation support also varies; while most sites received 2-day state-sponsored training and had access to on-going training and consultation, these additional supports were variably utilized. The same sites will be recruited for the proposed study (see letters of support).

Dissemination and Implementation. Salyers and McGuire have examined the dissemination and implementation of several EBPs. We explored barriers and facilitators to implementation amongst a group of IMR trainees.[14] Currently, McGuire is conducting an examination of the spread and barriers and facilitators of implementation of IMR throughout the VA system. Salyers has also conducted research on the implementation of assertive community treatment and development of fidelity measures.[8,10,18,90-97] Bartholomew examined the adaptation and acceptability of IMR to a state hospital setting.[98] In summary, our research team has extensive experience in the implementation of evidence-based practices and the IMR program. Our preliminary work has included the development and initial reliability evaluation of the IT-IS, with promising results. Given our current NIH-funded study, we are in an excellent position to expand that work to address critical issues in dissemination and implementation research on understanding organizational and clinician factors in fidelity.

Table 1: Work Plan		
Activity	Month	Lead
IRB/JIT	0	AM
Site Recruitment	1-3	TB
Identification of clinical unit	1-5	TB
Session Recordings	1-10	TB
Survey Administration	2-6	AM
Competence Scoring	1-12	AM
Data Analyses	12-15	AM/MF
Report/Articles Write-up	15-18	ALL
italices: IT-IS VALID activities		

C2. Overview of Research and Work Plan
The proposed project will be coordinated with Dr. McGuire's on-going IT-IS VALID project (see Table 1).
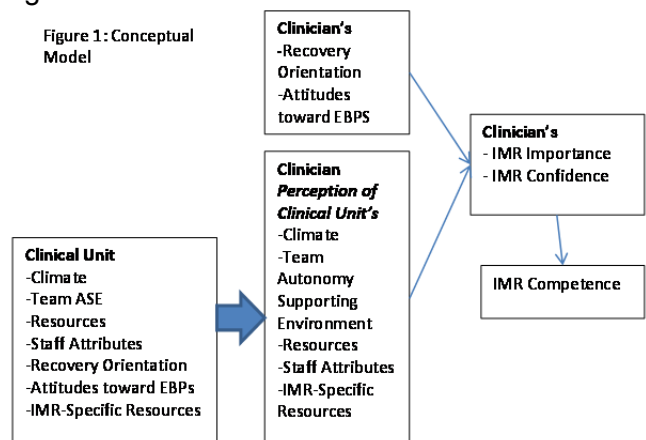
C3. Methods
C3a. Participants
Participants will include IMR clinicians and other clinical staff of each IMR clinician's clinical unit. *IMR clinicians* are the IMR group leaders participating in a currently NIH-funded project examining the relationship between IMR competence and consumer outcomes. IMR clinicians are being recruited for the current project, and we anticipate at least 50 IMR clinicians from at least 25 community mental health centers and psychiatric hospitals in New Jersey. *Clinical unit staff* will include all staff providing direct care within the IMR clinician's clinical unit. We will define the clinical unit on a case-by-case basis by consulting with agency leadership. The unit will be defined based on supervisory lines, team meetings, physical proximity, and shared caseload. Because of the variability in size of clinical units, we anticipate that the number of clinical unit staff could range from 50 to 500.

Figure 1: Conceptual Model

C3b. Measures
C3b.1 Organizational Factors
Organization-level factors will be calculated by aggregating clinician scores from a given clinical unit.[63] Several organizational factors will be drawn from the Organizational Readiness for Change Short Form (ORC-D4; Appendix 2)[99] The ORC-D4 is an updated version of the ORC-S (which displayed strong reliability and concurrent validity)[61,100][32,91] and includes 125 5-point Likert-type items. Three (of four) dimensions are relevant for the current study: organizational climate, resources, and staff attributes.[100]

The *organizational climate dimension* will measure climate at the clinical unit level and includes 30 items divided into 6 subscales (Mission, Cohesion, Autonomy, Communication, Stress, and Change), each demonstrating good reliability.[61,100] Additionally, autonomy support at the supervisory level will be assessed using the Work Climate Questionnaire (WCQ; Appendix 3)[101] which is a modified version of the Health Care Climate Questionnaire,[101] which has shown good reliability (α = .96) and predictive validity.[102] The WCQ was

adapted to capture employees' perceptions of autonomy supportiveness from managers or supervisors.[103] This 15-item questionnaire is based on a 7 point Likert scale from 1 ("strongly disagree") to 7 ("strongly agree").

The o**rganizational resources** dimension (ORC-D4) is 30-item subdivided into 6 subscales (offices, staffing, training, equipment, internet, and supervision). The **Staff attributes** dimension (OCR-D4) measures attitudes/philosophies of staff that support EBP implementation; it includes 20 items and 4 subscales (growth, efficacy, influence, and adaptability).

Recovery orientation will be assessed through the Recovery Self-Assessment: Provider Version (RSA; Appendix 4)[104]. The RSA includes 36 5-point Likert-type items and has showed strong internal consistency (α = .96) and test-retest reliability.[105] The RSA was positively correlated with measures of personal optimism (r = .15, p < .01) and perceptions of potential consumer recovery (r = .39, p < .001) which are supportive of the convergent validity of the assessment.[105]

Attitudes towards evidence based practices will be measured using total scale score of the Evidence Based Practice Attitudes Scale (Appendix 5).[106] The EBPAS was developed to explore the attitudes of mental health service providers towards EBPs and their adoption in community mental health settings.[106,107] The EBPAS has 15 5-point Likert-type items and has demonstrated adequate internal consistency (α =.77),[106-108] predictive validity,[109] and convergent validity.[110]

IMR-specific resources support IMR implementation (e.g., IMR-specific supervision) and will be measured using the IMR Training Follow-up Survey (see Appendix 6).[14] Our team created this survey to assess barriers and facilitators to IMR implementation. It includes 19 items with strong internal consistency (α = .92). The total score was predictive of IMR implementation. Only clinicians who report using IMR will be administered this measure. Scores for all IMR clinicians at the site will be aggregated to produce one clinical unit score.

C3b.2 IMR Clinician-Specific Measures
IMR group leaders participating in the IT-IS VALID study will be administered all the measures above to assess their perceptions of the **organization's climate, staff attributes, organizational resources, their recovery orientation, attitudes toward eBPS, and perceptions of IMR resources**. Additionally, IMR clinicians will be asked to rate the ***importance*** of providing IMR according to the model and their ***self-efficacy*** (confidence) in providing IMR according to the model (1-5 Likert scale). *IMR clinician information* collected will include gender, experience with IMR, training, and educational background as potential covariates. *IMR Competence* will be assessed using the IT-IS (Appendix 7),[73] a 16-item scale used to rate the competent application of IMR techniques based on session audio-recordings. See preliminary studies for a full description (Section C1).

C3c. Procedures
We will obtain contact information for each clinical unit from agency leadership (see letters of support). Clinical unit will be determined collaboratively between the research team and agency leadership based on what group of clinicians constitutes a meaningful organizational unit. All clinicians on the clinical unit will be e-mailed a brief description of the study and a link to an on-line survey. Consenting clinicians will be administered the self-report measures described above. Clinicians indicating they provide IMR will be additionally administered the *IMR Clinician-Specific* measures above. IMR competence data is being collected as part of the on-going study (see preliminary studies section). We will be able to link this data with the survey data through a research ID number. Clinicians responding to the survey will be entered into a raffle in which they can win a gift card.

C3d. Analyses
Due to the nested structure of the data (i.e., clinicians nested within organizations), we will use a multilevel model (MLM) framework for analysis.[111] The intraclass correlation (ICC) is one indicator of dependency among observations (clinicians); the ICC will be calculated and reported. Note that if ICCs are low (i.e., low between-group variability), multilevel models may not be profitable and general linear models will be used instead.

MLMs are comprised of levels: Level 1 represents the individual (clinician), and Level 2 represents the grouping variable (clinical unit). Level 1 predictors include importance and self-efficacy and IMR clinician views of climate (ORC-4D), ASE, staff attributes (ORC-D4), resources (ORC-D4), recovery orientation, attitudes toward EBPs, and IMR-specific resources. The Level 2 predictors include climate (ORC-4D), ASE, staff attributes (ORC-D4), resources (ORC-D4), unit recovery orientation, unit attitudes toward EBPs, and IMR-specific resources. The primary outcome is clinician IMR competence. Applying a MLM framework, for clinician i at organization j, the following equation predicting outcome y is appropriate: $y_{ij} = \alpha_j + \beta_j x_{ij} + e_{ij}$.

For **Specific Aim #1**, two MLMs will be tested. First, ASE will be tested as a predictor of IMR competence. Second, the extent to which the relationship between ASE and IMR competence is moderated by other Level 2 predictors (climate (ORC-4D), staff attributes (ORC-D4), etc.) will be tested. In this model, the main effects of ASE and each of the other Level 2 predictors as well as the two-way interaction terms (ASE X climate, ASE X staff attributes, etc.) will be included to predict IMR competence. Level 1 covariates (gender, experience with IMR) will be included in both models. Variables that are significant at p < .05 (and appropriate main effect terms) will be retained in a final model.

For **Specific Aim #2**, one MLM will be tested to understand which clinician characteristics impact IMR competence. This model will include importance and self-efficacy, and individual clinician views of climate (ORC-4D), ASE, staff attributes (ORC-D4), resources (ORC-D4), unit recovery orientation, unit attitudes toward EBPs, and IMR-specific resources as predictors. Level 1 covariates (gender, experience with IMR) will be included as well. Variables that are significant at p < .05 will be retained in a final model.

For **Specific Aim #3**, a Multilevel Structural Equation Model (MSEM) will be used to test clinician-level factors as mediating effects of organizational variables on IMR competence. That is, the organizational characteristics are expected to affect clinician-level mediators that, in turn, affect clinician IMR competence. Relatively recent advances in mediation permit tests of mediation using bootstrapping and Product of Coefficients techniques.[112,113] The meditational model proposed in Aim 3 is called *upper-level* mediation[114] (2-1-1 mediation), where organizational variables (Level 2) operate on clinician competence (Level 1) through clinician factors (Level 1). The significant Level 1 predictors of IMR competence identified as part of Aim 2 will be tested as potential mediators. We will use the Multilevel Structural Equation Model (MSEM),[113,114] which accounts for biases inherent to multilevel models (i.e., incorrect conflation of the mediation effect) by partitioning the Level 1 and Level 2 variance and treating them as orthogonal. The MSEM is a flexible model that permits more than one mediator as well as longer mediational chains. The indirect (mediated) effect is calculated within the MSEM and the significance of the effect/confidence intervals around the effect are calculated using the delta method, the distribution of the product method, or the parametric bootstrap. All MLM analyses will be conducted using SAS, version 9.3 (Cary, NC). MSEM analyses will be conducted using MPlus,[115] using code provided by Preacher et al.[116]

C4. Methodological decisions, possible limitations, and alternative strategies

Sampling frame. For organizational level data, we chose to collect data at a unit uniquely defined for each agency rather than surveying entire agencies. This decision was made because a meaningful unit can differ significantly across sites. For instance, a small agency may have few staff at one location who all work in close proximity, whereas other agencies have multiple locations with service lines that rarely interact. Our intention is to capture the unit with sufficient cohesion to reasonably be expected to share a unified culture and philosophy.

Time-sensitivity. Competence data is being collected for the IT-IS VALID project. This is a strength, given that the larger project and the proposed project can act synergistically. However, if there is substantial lag in the funding and start of the proposed project, competency and organizational data may not be contemporaneous. The impact of this is minimized by the lack of an active implementation intervention in the on-going study. Nonetheless, if survey data for this project are collected significantly later than the IT-IS data, we will collect an additional sampling of session recordings from each site to confirm the stability of competence over time.

Variability on key variables. In order to meaningfully examine hypothesized relationships, variability across programs in both predictor variables and competence will be necessary. As noted in the preliminary studies section and Bartholomew's letter, potential sites vary substantially in their organizational support for IMR and organizational climate. Even amongst sites that have committed to IT-IS VALID, some sites are notably lacking in organizational commitment to recovery-oriented services. Given the variation in training attendance, and follow-up supervision and consultation, we also anticipate sufficient variability in clinician-level competence.

C5. Future Directions

This project will provide crucial data regarding organizational and clinician factors affecting the competent implementation of complex clinical interventions. We will use the results of this study synergistically with our ongoing work to develop a multi-level framework for implementation strategies to support competency. A subsequent R21 or R34 project will develop a toolkit of organization and clinician-level implementation supports. This course of research will eventually lead to a multisite R01 testing the effectiveness of implementation strategies in increasing clinician competence and ultimately consumer outcomes.

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