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Linking Science and Service

INTRODUCTION TO THE ISSUE

Our purpose in this issue of *The Bridge* is to focus upon a common language for technology transfer. A hard-working workgroup of representatives of the Addiction Technology Transfer Center Network honors us with the first publication of a new statement on definitions around the concept of Technology Transfer. An expanded version of the current article is forthcoming in the *Journal of Substance Abuse Treatment*. The statement may be seen as a "consensus paper" where the efforts of the best and the brightest produce a synergetic product that would be impossible for a lone individual to produce. Associated with the definitions is a conceptual model of the Technology Transfer process.

The Editorial Board members of The Bridge have studied this document, and have produced a set of commentaries that we hope will generate debate and discussion. Following the presentation of "Technology Transfer: A New Model of the Innovation Process" are short essays by Drs. Gregory Brigham, Steve Martino, Hannah Knudsen, Mike Boyle, Dennis McCarty and myself. This is followed by a "responding essay" by the ATTC Workgroup, of which Dr. Heather Gotham, one of our Board Members, is also a member.

We hope that following a review of these stimulating offerings, our readers will share with us some of their reactions to the issues that are raised. As usual, we invite submissions of your comments for consideration for publication in a future issue.

TECHNOLOGY TRANSFER: A NEW MODEL OF THE INNOVATION PROCESS¹

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1. INTRODUCTION

As funders of substance abuse treatment increasingly require community treatment providers to use evidence-based practices (EBPs), it is imperative that the lag between development of an innovative treatment and its implementation into practice be shortened. Moreover, community treatment providers need assistance with the change process since implementing complex treatments demands significant personnel, clinical, and financial resources, usually over the course of several years.

The term *technology transfer* broadly describes strategies that promote the transfer of new technologies, practices, or skills, such as EBPs for substance use disorders, from one setting to another (Backer, 1991). Routine use of technology transfer methods in substance abuse treatment, however, lags behind that in fields like agriculture, communications, marketing and management, sociology, and even public health, which have been developing, testing, and refining technology transfer methods to successfully disseminate innovations for decades (Garner, 2008; Gotham, 2004; Rogers, 2003; Stirman, Crits-Christoph, & DeRubeis, 2004).

The Addiction Technology Transfer Center (ATTC) Network, funded by the Substance Abuse and Mental Health Services Administration's (SAMHSA) Center for Substance Abuse Treatment (CSAT) since 1993, is a national network of 14 Regional Centers and a National Office. Technology Transfer is the ATTC Network's mandate and mission. As a nationwide, multidisciplinary resource for professionals in the addictions treatment and recovery services field, the ATTC Network's purpose is to 1) raise awareness of evidence based and promising treatment and recovery service-practices, 2) build skills to prepare the workforce to deliver state-of-the-art addictions treatment and recovery services, and 3) change practice by incorporating these skills into everyday use for the purpose of improving addictions treatment and recovery outcomes. Over the past 17 years, the ATTC Network has amassed considerable experience and expertise in the successful transfer of technology within the substance abuse treatment field.

¹ This work has been supported by grants to the ATTC National Office and 14 Regional Centers from the Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration, United States Department of Health and Human Services. The views and opinions contained within this document do not necessarily reflect those of SAMHSA or the US Department of Health and Human Services, and should not be construed as such.

² Workgroup members are listed in alphabetical order and have contributed equally to the production of this work: Heather Gotham, PhD, Holly Hagle, MA, Eric Hulsey, DrPH, MA, Laurie Krom, MS, Nancy Roget, MS, Daniel Squires, PhD, MPH, Pamela Waters, MEd, CAC, CPP, & Aaron Williams, MA.

2. NEED FOR A CONCEPTUAL MODEL OF INNOVATION, INCLUDING TECHNOLOGY TRANSFER

The history of technology transfer begins with theory and research on diffusion of innovations, which has its roots in a study of hybrid seed corn (Ryan & Gross, 1943). Although hybrid seed corn had advantages over standard seed corn, Ryan and Gross found that hybrid seed corn took 13 years to diffuse into communities in Iowa. They plotted the rate of adoption ("S-shaped adoption curve") and studied factors affecting diffusion, including individual farmer factors such as education, organizational factors such as farm size, and external factors such as the importance of exchanging information with neighboring farmers. This work was extended and popularized by Everett Rogers, whose research and seminal book *Diffusion of Innovations* (5th edition, 2003) led to an explosion in this area of study. By 2003 there were over 5000 publications related to diffusion of innovations (Rogers, 2004). Moreover, this body of work covered the whole lifespan of an innovation, from early development through its long-term application in practice or eventual rejection. Technology transfer represents part of this process.

The rapid 'diffusion' of diffusion of innovations theory and research of the past 45 years has led to multiple, overlapping theoretical models, a plethora of terms that are inconsistently and contradictorily used, and a great deal of research on specific aspects of the innovation process that are difficult to integrate into a coherent body. Thus, it is difficult to comprehensively test the validity and reliability of theoretical models related to the innovation process. A more uniform set of terms and definitions would allow for easier grouping of research results and communicating across disciplines. Addressing these issues could serve to better inform and standardize the process through which innovations are understood, investigated, communicated, and transferred to the field.

3. ATTC NETWORK MODEL OF TECHNOLOGY TRANSFER IN THE INNOVATION PROCESS, KEY DEFINITIONS, AND EXAMPLE

Through a process of research and theory review, consultation with experts in the field, and gathering of experience from members of the ATTC Network, the ATTC Network Technology Transfer Workgroup selected and defined seven key terms related to the innovation process and developed a comprehensive model of the continuum of diffusion of innovation. The ATTC model (Figure 1) illustrates the continuum of diffusion of an innovation from conception through implementation. This model draws on theory and research related to diffusion of innovations, implementation science, etc. It is not meant to supplant or correct other models. Rather, it provides a conceptual framework of the whole innovation process, into which various theories and models that refer to different parts of the process can be contextualized.



Technology Transfer in the Innovation Process

The innovation process begins with the development of a new innovation or technology, including its initial evaluation. Next, the innovation goes through translation where the essential elements and relevance of the innovation are explained and the innovation is packaged to facilitate its spread. In dissemination, awareness about the innovation is promoted with the goal of encouraging its adoption. Adoption is not a single decision but a process of deciding to use the innovation. The final phase, implementation, is the incorporation of the innovation into routine practice in real-world settings. Technology transfer is a process that incorporates a set of focused, multidimensional strategies designed to intentionally promote and accelerate the movement of innovations through the continuum. Technology transfer is a dynamic, iterative process that spans the stages of later development, dissemination, and early implementation.

To further explain, next are the key terms and definitions, along with examples of how the model can be used to explain the substance abuse treatment innovation of Motivational Interviewing.

a. Development – Creating and initially evaluating an innovation. An innovation can be an idea, technology, treatment or method.

Rogers' (2003) suggested that developing a technology includes recognizing a problem/need and inventing a technology through basic and applied research. For evidence-based substance abuse treatments, it includes effectiveness research in the field, such as research conducted by community treatment agencies in the National Institute on Drug Abuse's (NIDA) Clinical Trials Network (CTN).

Example: Motivational interviewing is a counseling practice developed by William Miller and Stephen Rollnick (1991). Research shows that MI has a positive effect on retention in care (Carroll et al., 2006), and the effectiveness of MI in the field has been explored through NIDA's CTN (Carroll et al., 2002).

b. Translation – Explaining the essential elements and relevance of an innovation, and packaging it to facilitate dissemination.

As opposed to the National Institutes of Health (NIH) use of translation from basic or "bench" research to applied research (2010), in the ATTC Model, translation refers to the process of adapting knowledge or information from one form to another to promote its application. A prime example of translation is the NIDA/SAMHSA Blending Team products. Blending Teams include ATTC Network staff, NIDA researchers, and treatment providers from NIDA's CTN. The teams develop user-friendly products such as awareness

kits and training packages that introduce treatment providers to an evidence-based treatment method. Thus far, Blending Team products have been created for buprenorphine treatment and its use in shortterm opioid withdrawal, buprenorphine treatment in young adults, treatment planning, supervisory tools for motivational interviewing, and motivational incentives (see <u>http://www.ATTCnetwork.org/blendinginitiative</u>; Martino et al., 2010).

Example: The ATTC Network, in conjunction with NIDA's CTN, developed the *Motivational Interviewing Assessment: Supervisory Tools for Enhancing Proficiency* (MIA:STEP, 2006) product that provides mentoring resources to enhance the MI skills of counselors, as well as supervisory tools to fortify a supervisor's ability to provide structured, focused, and effective clinical supervision. The ATTC Network has also developed newsletters and articles that provide information about MI and the benefits of its use.

c. Dissemination - Promoting awareness of an innovation with the goal of facilitating adoption and implementation. Dissemination strategies include raising awareness, building knowledge, and distributing materials.

It is critical to have standard definitions of the key terms *dissemination* and *implementation* to clarify the difference between the two as they are often used interchangeably. The definition proffered here focuses on dissemination as awareness raising, versus implementation as actually using an innovation. Examples include delivering presentations, building knowledge through trainings, distributing informational materials via mail or internet, and utilizing marketing approaches. The ATTC Network frequently disseminates resources about evidence-based treatments by offering them on the ATTC Network website.

Example: ATTC Regional Centers conduct MI awareness and/or skill-building trainings with clinical staff and supervisors (e.g., between January 1, 2006 and March 31, 2010, ATTC Regional Centers conducted 583 events related to the MIA:STEP Blending Product).

d. Adoption - The process of deciding whether to use an innovation. Adoption may or may not lead to implementation.

The adoption stage is a decision or series of decisions that may lead to implementation. This stage includes a review of information pertaining to the innovation as well as the pros and cons of adoption. Some researchers suggest that adoption may also include a "trying on" period where the innovation is tried out or applied in a limited way.

Example: During the adoption process, the ATTC Network supports organizations to ensure they have the information necessary about MI so that they can authentically decide whether or not to implement it.

e. Implementation – Incorporating an innovation into routine practice. Implementation ideally includes a range of strategies designed to address individual, organizational, and systemic characteristics (e.g., skills training, administrative buy-in, and policy changes).

Implementation is the actual use of the innovation, rather than the earlier stage of dissemination which involves learning about an innovation. The new field of "implementation science" studies the effects of individual, organizational, and systemic characteristics on the process of implementation. Several models of the implementation stage itself have been developed that are applicable to substance abuse treatment (e.g., Fixsen et al., 2005; Simpson & Flynn, 2007). Moreover, Fixsen and colleagues (2005) describe the difference between "paper implementation" where policies or procedures related to an evidence-based practice are put into place, and "performance implementation" where the procedures and processes

involved in an evidence-based practice are utilized with positive outcomes for consumers. Studies have shown that the extent to which an evidence based practice is implemented with fidelity to the original practice affects clients' treatment outcomes (e.g., McHugo et al., 1999).

Example: ATTC Regional Centers support early implementation of MI in several ways: training on the MIA:STEP product with clinical supervisors in order to sustain the use of MI in clinical settings; ongoing technical assistance to program administrators around implementation; periodic coaching sessions with clinical staff to enhance and refresh their MI skills.

f. Technology transfer - A multidimensional process that intentionally promotes the use of an innovation. Technology transfer begins during the development of an innovation, continues through its dissemination, and extends into its early implementation. This process requires multiple stakeholders and resources, and involves activities related to the translation and adoption of an innovation. Technology transfer is designed to accelerate the diffusion of an innovation.

Technology transfer, then, spans from the late development of an innovation or technology, through its early implementation. The goal is to speed up the process of diffusion of innovations through active efforts aimed at multiple stakeholders.

Example: The ATTC Network is charged with providing a range of technology transfer services to accelerate the use of EBPs for substance abuse treatment. The Network is involved with activities related to MI from the translation stage (MIA:STEP Blending Product) through its early implementation.

g. Diffusion – The planned or spontaneous spread of an innovation.

This definition follows Rogers' (2003) use of diffusion as including planned and spontaneous spread of innovations. The model shows diffusion as an overarching construct that spans the whole innovation process following its development.

4. PRACTICAL APPLICATIONS OF THE MODEL OF TECHNOLOGY TRANSFER IN THE INNOVATION PROCESS

The ATTC Model has a number of practical applications for the substance abuse treatment field:

- Allows federal, state and other funders, program directors, and clinicians to more easily comprehend and appreciate the entire diffusion continuum, including the role of specific technology transfer activities;
- Clarifies the multi-tiered change process needed for successful implementation of evidencebased treatment practices;
- Assists stakeholders in determining how to invest limited resources to increase the utilization and monitoring of those interventions;
- Leads to more satisfaction with the change process and fewer failed attempts to use innovations;
- Helps stakeholders to assess where they are along the diffusion continuum and identify which activities are appropriate to facilitate the long-term implementation of an evidence-based practice.

5. **RESOURCES**

The Workgroup has developed a number of resources that addiction and recovery professionals can use to improve services. The ATTC Network's comprehensive website (www.ATTCnetwork.org/technologytransfer) provides information to key stakeholders around the process of integrating addiction science into clinical practice through the lens of the ATTC model, including:

- Interactive version of the graphic through which individuals can review the characteristics of each process;
- Matrix outlining roles for policy makers, agency directors and/or clinicians throughout the innovation process;
- Slide presentations describing the ATTC Model and definitions;
- The Change Book: A Blueprint for Technology Transfer (ATTC Network, 2000), a technology transfer tool designed to assist agencies and staff in implementing change initiatives to improve treatment outcomes.

6. CONCLUSION

For the past 17 years, the ATTC Network has utilized a variety of strategies on multiple levels within the treatment system to increase the sustained implementation of EBPs, and therefore, is in a unique position in the field to synthesize the work of a range of theorists on the diffusion of innovations, incorporate our experiences of diffusing innovations nationally, and propose a uniform theoretical framework. The ATTC Technology Transfer Workgroup believes that the ATTC model and definitions will help federal, state and other funders, program directors, and clinicians to better understand the innovation and technology transfer process; thus accelerating the use of more effective treatments and better serving people with substance use disorders.

7. REFERENCES

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A MODEL WITH A SHAKY FOUNDATION?

The ATTC work group has provided a valuable and timely contribution by suggesting a common set of terms and concepts to clarify the dialogue relating to the transfer of technology. If these terms and concepts are agreed upon widely they will assist policy makers, treatment providers and, scientists communicate and advance in this important area.

The technology transfer structure, phases and, definitions suggested by the workgroup seem quite sound. A difficulty emerges in that this model is built on a shifting and ill defined foundation.

The workgroup begins by suggesting that technology transfer is justified by the need to shorten the time from scientific development and evaluation of treatment innovations to their implementation in practice. This is an easy argument to make and is likely to be met with consensus. The problem starts when terms like innovation, promising practice, state-of-the-art treatments, and recovery services are detached from scientific vetting and used interchangeably with evidence-based practice (EBP). This seems vague and problematic for an essay dedicated to providing clarity of thinking and agreed-upon terminology. Of course this can not be blamed on the workgroup; this is a contemporary dilemma of the substance abuse treatment field.

There is no equivalent to the federal Food and Drug Administration (FDA), which regulates the development of medications and medical devices, for regulation of behavioral treatments. This results in the sponsors or innovators of new behavioral treatments and services disseminating directly to providers. Such dissemination carries the risk of promoting the uptake of a change without adequate evidence to justify the resources. More importantly, such diffusion does not include adequate caution about the practice's limitations and or its potential contra-indications.

The Motivational Interviewing (MI) example used by the workgroup can be used to illustrate this point. While MI is widely accepted as an evidence-based practice that has undoubtedly made a major contribution to improving drug abuse treatment, few MI practitioners are likely to be aware of its limitations or potential contra-indications. In a presentation at the 2010 NIDA Blending Conference, Dr. Bill Miller, the principal architect of this intervention, recently pointed out that there have been over 200 controlled studies of MI and that most of them have been negative³. This suggests there are many situations in which the adoption of MI is unlikely to be an improvement over current practice.

A recent Cochrane Collaborative review of clinical trials with women who are pregnant and have active substance abuse concluded that there was a slight negative effect for MI⁴. Were MI a medication, the FDA regulatory process would require that this type of information be disseminated with the treatment. But where are contraindications addressed in the technology transfer model for behavioral treatments?

 ³ Miller, W. R. (2010). Relationships that heal. Presented at the NIDA Blending Conference, "Blending Addiction Science and Practice: Evidence-Based Treatment and Prevention in Diverse populations and Settings," Albuquerque, NM, April 22-23, 2010http://ctndisseminationlibrary.org/display/454.html
⁴ Terplan, M, Lui, S. (2007). Psychosocial interventions for pregnant women in outpatient illicit drug treatment programs compared to other interventions, Cochrane Database of Systematic Reviews 4. Art. No.: CD006037. DOI:10.1002/14651858.CD0067037.pub2.

Within the current technology transfer model, this may not be a problem if the sponsor has set a reasonable scientific threshold for what is safe and worthy of dissemination. The Blending Products developed by the National Institute on Drug Abuse are a good example of this. In that model, the sponsor, the scientists and the technology transfer experts work together to determine exactly what has been discovered in the scientific process and what should be transferred to practice. But what is the threshold for entering technology transfer in the event of promising practices, state-of-the-art treatments, or recovery services which have not been fully vetted through a scientific process? The workgroup seems to have wisely included evaluation in the initial phase of technology transfer process but it stops short of suggesting a standard or even the use of science for this evaluation.

Without scientific vetting of a practice how does technology transfer differ from marketing? Effective marketing facilitates the dissemination and adoption of a sponsored product or service without regard for the true benefit to or well-being of the consumer. In marketing the sponsor is the real customer. As the workgroup has suggested, technology transfer has the primary goal of improving treatment outcomes. But how will this be known to a reasonable degree of certainty without rigorous scientific evaluation and objective evaluation criteria?

With all of this fuss over what is meant by evaluation in the technology transfer model out on the table it should also be noted that evidence-based practices (scientifically vetted practices) are not the only way or perhaps at times even the best way to improve treatment. An analogy with automobile maintenance comes to mind. If you have a poorly maintained car with worn out brakes and tread-bare tires, a Global Positioning Navigation System representing the best of current science and engineering is probably not the next investment you should make. Rather brakes and tires should be addressed first. The analogous example in substance abuse treatment would be a program with a long waiting list, dirty and broken lobby furniture, and poor sound insulation in the counseling areas. Common sense would dictate that shortening waiting lists and attending to the physical environment would be a smarter initial investment then say an expensive and comprehensive investment in training all of the staff in motivational interviewing or some other EBP.

What is needed is an extension of the clear thinking and communication, like that initiated by the workgroup, regarding what is meant by some additional basic terms and concepts fundamental to technology transfer such as: evaluation, evidence, safety and finally effectiveness thresholds for the dissemination of practices vetted by science and technologies emanating from other sources.

GREGORY BRIGHAM, MARYHAVEN INC.

SUGGESTED REFINEMENTS FOR A MODEL OF TECHNOLOGY TRANSFER

The Addiction Technology Transfer Center (ATTC) Network Transfer Technology Workgroup should be commended for clarifying the multiple overlapping terms that have populated the diffusion of innovations literature and for organizing a model of technology transfer. Specifically, they present 1) "diffusion" as the broad process through which innovations enter practice, 2) "development", "translation", "dissemination", "adoption", and "implementation" as related stages through which the diffusion process unfolds, and 3) "technology transfer" as the intentional promotion of the use of innovations at each of these stage. Their conceptual model is very helpful in bringing order to this field of study.

One area where the model may add confusion is the inclusion of the *Development* stage (creating and initially evaluating an innovation) as part of the diffusion process. Diffusion of innovations implies that an innovation already has been developed (e.g., an empirically supported treatment) and is ready for diffusion. A well established and operationalized model for how empirically supported treatments are developed exists - the stage model of psychotherapy development^{5,6}.

In this model, theory-based ideas about an innovative treatment are first detailed in operational procedures (often in manuals), and methods for training counselors to use the new treatment are established. This is followed by a period of pilot testing of the treatment and methods to measure its effects. In the second stage, the new treatment is tested under tightly controlled research conditions often involving a randomized clinical trial and testing of mechanisms of action. In the third stage, once the treatment has been found to be efficacious, the treatment is further tested to determine if it is effective in the "real world".

During this stage, treatments typically are examined across several programs and implemented by program-based providers, similar to the manner in which treatments have been studied in the National Institute on Drug Abuse Clinical Trials Network⁷. If the treatment is found to be effective, then there is a "hand-off" between the treatment development phase and its diffusion into community practice. Translating the treatment into a form that makes it ready to be disseminated, adopted, and implemented is the starting point of a treatment's diffusion. This approach has been the way in which the NIDA-SAMHSA Blending Initiative has been formulated and conducted for the past decade⁸.

Other than this suggested conceptual adjustment, four other points implied by the ATTC Network technology transfer model merit more discussion. They include preparing programs for diffusion, measuring the effectiveness of technology transfer efforts, sustaining innovative practice, and

⁵ Onken, L.S., Blaine, J.D., & Battjes, R. (1997). Behavioral therapy research: A conceptualization of a process. In S.W. Henggeler & R. Amentos (eds.) Innovative Approaches for Difficult to Treat Populations (pp. 477-485). Washington, DC: Psychiatric Press.

 ^b Rounsaville, B.J., Carroll, K.M., Onken, L.S. (2001). A stage model of behavioral therapies research: Getting started and moving on from Stage I. Clinical Psychology: Science and Practice, 8, 133-142.
⁷ Tai, B., Straus, M.M., Liu, D., Sparenborg, S., Jackson, R., & McCarty, D. (2010). The first decade of the National Drug Abuse Treatment Clinical Trials Network: Bridging the gap between research and practice to

improve drug abuse treatment. Journal of Substance Abuse Treatment, 38 (Suppl 1), S4-S13.

⁸ Condon, T.P., Miner, L.L., Balmer, C.W., & Pintello, D. (2008). Blending addiction research and practice: Strategies for technology transfer. Journal of Substance Abuse Treatment, 35, 156-160.

underscoring the bi-directionality of research and practice as part of the diffusion process. Each area is discussed in more detail below.

Preparing programs

Simpson and Flynn⁹ have noted the importance of helping programs prepare for treatment implementation by considering the readiness of their service providers and organizations for specific changes in practice. Service readiness refers to the extent to which the providers understand the essential principles and procedures of the new treatment and how it will fit into and enhance the current system of clinical care.

Organizational readiness refers to staff perceptions of service needs, resources available to support treatment implementation, and workgroup infrastructure (e.g., organizational climate). If the providers develop a consensus about the potential value of the new treatment and they perceive the organization as poised to support its implementation, the treatment will be more likely adopted and implemented.

Thus, technology transfer often requires an objective information gathering phase (e.g., leadership discussion, staff surveying) to determine the program's strengths and weaknesses, opportunities for the providers to discuss bringing a new treatment into their services to establish buy-in, and resolution of program problems that might thwart the successful diffusion of innovative treatments. Applied to the ATTC Network model, an ounce of preparation during the dissemination stage by technology transfer specialists could be worth a pound of implementation later in the process.

Measuring technology transfer

The workgroup has provided several examples about how the ATTC has tried to promote the use of motivational interviewing (MI) as illustrations of each stage of the diffusion process. Absent in the discussion, however, is how the ATTC gathers evidence about the success of their technology transfer efforts. The number of MI-related material website page views or downloads, skill-building workshops, and MIA: STEP supervisor trainings captures some aspects of dissemination, but none of these are indicators of actual MI adoption and implementation.

While some types of treatment are easily verifiable, such as confirming the provision of buprenorphine or contingency management within programs¹⁰, more complicated psychosocial treatments such as MI may require more objective monitoring to determine if in fact it is being implemented¹¹. Thus, with few exceptions¹², the effectiveness of the specific technology transfer strategies used by the ATTC to promote the use of innovative treatments is unknown to date. More resources, collaboration with researchers,

⁹ Simpson, D. D. & Flynn, P. M. (2007). Moving innovations into treatment: A stage-based approach to program change. Journal of Substance Abuse Treatment, 33, 111-120.

¹⁰ Roman, P.M., Abraham, A.J., Rothrauff, T.C., & Knudsen, H.K. (2010). A longitudinal study of organizational formation, innovation adoption, and dissemination activities within the National Drug Abuse Treatment Clinical Trials Network. Journal of Substance Abuse Treatment, 38 (Suppl 1), S44-S52.

¹¹ Martino, S., Ball, S.A., Nich, C., Frankforter, T.L., & Carroll, K.M. (2009b). Correspondence of motivational enhancement treatment integrity ratings among therapists, supervisors, and observers. *Psychotherapy Research*, *19*, 181-193.

¹² Squires, D.D., Gumbley, S.J., & Storti, S.A. (2008). Training substance abuse treatment organizations to adopt evidence-based practices: The Addiction Technology Transfer Center of New England Science to Service Laboratory. *Journal of Substance Abuse Treatment*, 34, 293-301.

and development of a comprehensive data system are needed for the ATTC to determine how effective it is in transferring treatments to community programs.

Sustaining innovative practice

Just as Simpson and Flynn¹³ have emphasized how preparing a program for treatment implementation is very important, they also note that strategies must be in place to sustain implementation over time. Critical factors that affect the sustainability of implementation efforts include resource allocation and organizational climate. Resource allocations for renewing materials, training, equipment, staffing, and space are often necessary to fully support sustained implementation. Organizational climate factors include issues that impact the providers' commitments and social interactions that support ongoing high quality use of a treatment, such as the program's mission, communication, and stress level, which might affect their use of the treatment and how clients response to it¹⁴. The implication is that technology transfer specialists often need to provide ongoing consultative support to programs to help them sustain implementation. When the consultations are in the service of supporting in-house program advocates, champions or on-site experts (e.g., supervisors with an allegiance to the approach), the diffusion process is likely to be more successful and sustained¹⁵.

Underscoring bi-directionality

Like a chain on the gears of a bicycle's wheels, The ATTC Network diffusion model contains within it a circular cycle. Innovative treatments developed and empirically validated by clinical researchers become adapted by providers as they use them in the field. These adaptations become new innovations that subsequently require empirical validation in their own right. Thus, a bi-directional process exists in which innovative treatments emerge from research and practice. It is the partnership between these entities that drives the clinical advancement of the field. The diffusion of MI is a prime example of this type of bi-directionality. After the publication of several MI textbooks^{16,17} and treatment manuals^{18,19}, the early recognition of MI as an empirically supported addiction treatment²⁰, and the establishment of an international network of trainers¹⁷, more providers began to use MI for addictions, apply it to other

¹³ Simpson, D. D. & Flynn, P. M. (2007). Moving innovations into treatment: A stage-based approach to program change. *Journal of Substance Abuse Treatment*, 33, 111-120.

¹⁴ Broome, K.M., Flynn, P.M., Knight, D.K., & Simpson, D.D. (2007). Program structure, staff perceptions, and client engagement in treatment. *Journal of Substance Abuse Treatment*, 33, 149-158.

¹⁵ Fixsen, D.L., Naoom, S.F., Blasé, K.A., Friedman, R.M., & Wallace, F. (2005). Implementation research: A synthesis of the literature. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231).

¹⁶ Miller, W.R., & Rollnick, S. (1991). Motivational Interviewing: Preparing people to change addictive behavior. Guilford Press, New York.

¹⁷ Miller, W.R., & Rollnick, S. (2002). Motivational Interviewing: Preparing people for change (2nd ed.). Guilford Press, New York.

¹⁸ Miller, W. R. (1999). Enhancing Motivation for Change in Substance Abuse Treatment TIP Series 35. Rockville, MD: U.S. Department of Health and Human Services Publication No (SMA) 02-3693.

¹⁹ Miller, W.R., Zweben, A., DiClemente, C.C., & Rychtarik, R.G. (1992). Motivational Enhancement Therapy manual: A clinical research guide for therapists treating individuals with alcohol abuse and dependence. (Volume 2, Project MATCH Monograph Series) Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

²⁰ Dunn, C., Deroo, L.,, & Rivara, F.P. The use of brief interventions adapted from motivational interviewing across behavioral domains: a systematic review. Addiction, 96, 1725-1742.

problem areas, and integrate MI with different treatment approaches^{21,22}. In turn, these adaptations and new applications of MI have been studied and often have been found to be equally efficacious²³. The development of empirically supported treatments (research) and diffusion into the community (practice) have fed one another.

Final thoughts

The ATTC Network has been an important contributor to the process of transferring innovative treatments into community programs. Experiences gained since 1993 has informed the development of a logic model for how diffusion occurs and implies key pressure points at which technology transfer specialists might promote the process. Effective organizational level and provider-based strategies need to be developed to positively impact these points and increase the probability that the best treatments practiced in the best possible manner are made available to clients.

STEVE MARTINO, YALE UNIVERSITY SCHOOL OF MEDICINE

²¹ Arkowitz, H., Westra, H. A., Miller, W. R., & Rollnick, S. (2008). Motivational Interviewing in the Treatment of Psychological Problems. Guilford Press, New York.

²² Rollnick S., Miller, R. W., & Butler, C. C. (2008). <u>Motivational Interviewing in Health Care:</u> <u>Helping</u> <u>Patients Change Behavior</u>. Guilford Press, New York.

²³ Lundahl, B. W., Kunz, C., Brownell, C., Tollefson, D., & Burke, B. (2010). Meta-analysis of motivational interviewing: Twenty Five years of empirical studies. Research on Social Work Practice, 20, 137-160.

NEW MODELS MEAN NEW QUESTIONS:

HOW THE ATTC TECHNOLOGY TRANSFER MODEL SUGGESTS NEW DIRECTIONS FOR RESEARCH

The Addiction Technology Transfer Center (ATTC) Network Technology Transfer (TT) Workgroup is to be commended for a cogent synthesis of core concepts from the ever-growing literature on technology transfer. This clearly written document offers definitions that should create a common language to facilitate discussions among diverse stakeholders about how technology transfer is a process rather than a discrete event.

While the literature on technology transfer, diffusion of innovations, and implementation science is expanding rapidly, the definitions of these core concepts highlight how much additional research is needed beyond multi-site clinical trials on the effectiveness of treatment interventions. The TT Workgroup describes "translation" as the stage where training packages and resources related to the intervention are made ready for "dissemination," or the stage where awareness of intervention is promoted. The intersection of translation and dissemination is perhaps one of the areas in technology transfer where we need to know more.

Research is needed about whether the training packages developed for effective interventions are themselves effective in raising awareness and building knowledge. In addition, broader questions need to be addressed about the optimal strategies for dissemination:

What are the best modes for disseminating information about new interventions, particularly given the needs of adult learners?

What types of "messages" in these training packages are most persuasive to clinicians?

Are statistics and scientific evidence more persuasive than the narrative stories of individuals who have been helped by the intervention, or would dissemination packages be more effective if they combined these two types of messages?

To what extent can new social media be utilized to increase dissemination?

And at the same time, how can dissemination be accomplished for the programs that are at-risk of being "left behind" due to minimal access to computer resources, limited networking with other providers, and a lack of financial resources to support travel to face-to-face training events?

Given the growing number of evidence-based practices, is there a risk that dissemination efforts will start to become "white noise" that fails to get the attention of providers?

As the ATTC Technology Transfer Workgroup rightly notes, adoption is a process of decision-making about whether an intervention is going to be used. The decision-making aspect of technology transfer is actually an understudied topic. While researchers have made progress on identifying the types of programs that are more likely to adopt an evidence-based practice, less is known about how decisions get made:

For example, for an administrator considering adoption of buprenorphine, what are the key factors that that he or she considers?

How much weight do they give to the potential increase in client retention versus the costs associated with contracting with a physician?

How much more effective does buprenorphine need to be than the current standard of care to be attractive to a given treatment program?

Are they willing to increase efforts to attract more patients with private insurance who therefore have the means to pay for this treatment?

What role do opinion-leaders among the clinical staff and the board of directors have on this decisionmaking process?

Complicating matters even further is the fact that adoption decisions for psychosocial interventions fundamentally require that each individual clinician make the decision to try adding this intervention to their clinical practice. Some key questions for research include:

To what extent are the clinicians who adopt EBPs the ones who are already the "cream of the crop" (e.g., high performers with such strong skills that the clinical performance gains will actually be modest) or clinicians who realize that they need new strategies to increase client retention and treatment completion because too many of their patients are leaving treatment early?

Can clinicians really be persuaded to adopt EBPs that diverge from their current treatment model?

Implementation, or the incorporation of an innovation in routine practice, continues to be a stage of the technology transfer process that needs more research. To return to the example of medication-assisted treatment, we have a paper that is in press in *Journal of Addiction Medicine* that describes the average percentage of clients with opioid dependence or alcohol use disorders who are receiving the FDA-approved medications for these conditions²⁴. In the subset of programs that had adopted MAT, the average rates of MAT implementation were 34% for opioid-dependent patients and 24% for clients with alcohol use disorders. The next question then is, "Why this gap in implementation?" When it comes to implementation of psychosocial EBPs, we need to understand whether clinicians incorporate an EBP with all their patients or treat it as one option from a menu of EBPs based on their patients' characteristics. (And if the latter is the case, how do they decide which EBP for which patient?) Finally, under what conditions will clinicians discontinue using an EBP?

The ATTC Technology Transfer Workgroup has distilled the core concepts of technology transfer into an easy-to-understand resource that should be valued by a range of stakeholders. Hopefully, this document will stimulate additional ideas for research in the emerging field of implementation science. When I read their article, it certainly generated a wide variety of ideas for new directions for my own work, and I hope others have a similar experience.

HANNAH K. KNUDSEN, UNIVERSITY OF KENTUCKY

²⁴ Knudsen, H. K., Abraham, A. J., & Roman, P. M. (in press). Adoption versus implementation of medications in addiction treatment programs. *Journal of Addiction Medicine*. DOI: 10.1097/ADM.0b013e3181d41ddb

THE NEED FOR MORE ATTENTION TO THE REQUIREMENTS FOR IMPLEMENTATION

As Everett Rogers' classic text identified, innovation is not a random event, but rather a predictable evolution within an organization or professional field that has the infrastructure to adapt over time. Rogers noted many instances where innovation occurred across diverse settings that shared similar organizational characteristics, such as farmers adopting hybrid corn or primary care doctors adopting tetracycline in standard practice. In all these settings, practitioners had the skills and infrastructure to adopt as well as thrive through innovation. Farmers changing from one seed corn to another in their planters or physicians writing a different prescription for a medication were relatively simple behaviors once the decision to change was made.

Adopting and implementing evidence based treatments to address substance use illnesses is a far more complex process. While dissemination of information is an important and necessary step in the process, implementation is dependent on the existence of an infrastructure within a provider organization that will allow and support the desired change. This infrastructure is lacking in the majority of the existing treatment programs.

The good news is that we have knowledge of effective treatment approaches based on clinical trials. These treatment interventions include cognitive-behavioral skills training, motivational enhancements including motivational interviewing and contingency management, Couples Behavioral Therapy and the Community Reinforcement Approach. All of these interventions include training manuals, fidelity tools, and implementation guidelines.

Thus, organizations and clinicians have access to information on evidence-based practices through activities such as those provided by the ATTC Network. Nonetheless, simply exposing clinicians to these effective practices through dissemination may not lead to implementation. Adoption of the techniques is far more challenging and requires both the resources to implement the innovation as well as the removal or bypassing of institutional norms and cultures that sustain outdated practices.

The first cluster of barriers that must be addressed are the existing cultural and belief systems. Examples include the belief that the 12-step fellowship is the only process to overcoming an addiction or the belief that the therapeutic community approach of changing the character of a person is the only viable approach. Many persons who have achieved recovery in either model and now serve in counseling roles may have significant difficulty in accepting other treatment approaches. They have experienced a treatment that was life changing for them and have seen the approach change others. They may see little need to add new treatments to their long established repertoire.

This first barrier may not be that dissimilar to the farmer who has used the same seed corn for 20 years and has been satisfied with the results. Exposure to other approaches that are achieving positive outcomes will lead to adoption of evidence-based practices by some treatment organizations that are early adopters but the percentage of late adopters and laggards may be far higher in the addiction treatment field.

A second factor limiting adoption of evidence based practices, despite exposure, is the lack of necessary infra-structure within treatment organizations. Again, it was a minor change for the farmer to use a different seed corn in their planters or for the physician to write a different medication on the prescription pad. Changing to new psychosocial treatments and incorporating the use of medications

when none had previously been used is a very complex process and requires substantial organizational supports.

The ATTC document utilizes Motivational Interviewing as an example of their technology transfer focus. Motivational Interviewing is a highly complex clinical practice and it is highly unlikely that a clinician will be able to successfully implement this approach following initial exposure and training. Ongoing clinical training and supervision by a clinician who is highly skilled in the practice is needed to learn and practice Motivational Interviewing and other evidence based practices. This should include the taping of clinical sessions, their review and scoring by the supervisor and constant feedback to the supervisee to learn from their successes and omissions. Many treatment organizations lack highly clinical supervisors who are highly skilled in evidence based practices. Further, the demands of direct service and limited staffing patterns compete with their ability to devote the time needed to master new clinical approaches.

Many of the evidence based treatments require a substantial amount of the treatment be delivered in individual sessions with the patient and concerned significant others. Yet, the vast majority of treatment sessions are provided in group formats within existing treatment programs. Groups can be used to teach people about the stages of change and for skills practice through role playing but the practice of motivational interviewing requires individualized sessions. Thus, the structure of programs would have to be radically changed if evidence based practices are to be incorporated. The challenge to such a change is that groups tend to be an efficient way to earn reimbursement. While reimbursement structures vary among states and insurers, group services with high attendance will usually earn more revenues per input of staff time than providing an individual session in the addiction field.

Use of medication assisted treatment is an evidence based practice. In fact, the National Quality Forum's Voluntary Consensus Standards for a Substance Use Illness are that medications be routinely used for detoxification and be offered to all persons with alcohol, opiate or nicotine dependency. Many programs do not have the medical infrastructure to prescribe, administer and monitor the use of medications to treat these addictions.

The infra-structure requirements of high quality and time-consuming clinical supervision, ability to provide a substantial amount of individual and family therapy sessions and the lack of medical personal necessary to utilized medications combine to provide barriers to the implementation of evidence based clinical practices.

Imagine a future when the previously discussed issues of clinical supervision and infrastructure barriers have been resolved. In this future, technology transfer from the ATTCs has resulted in staff learning several evidence based practices. Challenges would still remain in insuring that each patient and family received exactly what services they wanted and needed and exactly when they wanted and needed them. This will require continuous assessment and clinical algorithms.

In current practice, assessment is an activity that occurs at the initial of treatment and is used to develop a treatment plan. Ongoing assessment infrequently occurs. Without ongoing assessment of progress during treatment, there is no feedback mechanism to the clinician regarding the need to change or modify the approaches being used.

Assuming ongoing, continuous assessment, guidance could be provided to clinicians regarding what treatment approaches are most likely to effectively address the problems identified. These could be structured as clinical algorithms that suggest what evidence-based practices should be delivered.

Responses to the assessment would trigger the algorithms. Examples of such approaches exist such as medication algorithms for addressing psychiatric disorders.

Efficiently administering ongoing assessment and delivering the treatment recommendations will be achieved through use of new technologies, perhaps in a much faster time frame than many anticipate. These will include the patient responding to the assessment through web-based applications delivered through a computer or smart-phone. In addition to algorithms delivered to the clinician, the responses could give "just-in time" recommendations directly to the patient on activities they could engage in to address the difficulties they report.

While the ATTCs' promotion of Motivational Interviewing may not have yet resulted in a generation of clinicians who are highly skilled practitioners in that treatment approach, they have made a more meaningful contribution to the addiction treatment field. Exposure to the stages of change model upon which Motivational Interviewing is built has resulted in a cultural sea change in a significant number of treatment organizations and individual practitioners. The dissemination of this knowledge has resulted in a large number of substance use treatment organizations discontinuing their traditional use of confrontation to break down perceived denial in individuals. These organizations and their counselors no longer blame the individual for their lack of motivation. They have come to recognize that everyone is pre-contemplating or ambivalent about changes in behavior whether the change is in diet, exercise, or engaging in other potentially beneficial activities.

Addiction Treatment Technology Centers: keep up the great work!

MICHAEL BOYLE, THE FAYETTE COMPANIES

THE ROLE OF THE STATE AUTHORITY IN TECHNOLOGY TRANSFER

Implementation science is emerging from Rogers²⁵ foundational text and a systematic review of implementation research and model for the implementation of innovation²⁶. The ATTC technology transfer model provides a focused framework to examine the process of developing, disseminating, and implementing new interventions for the prevention and treatment of alcohol and drug use disorders. The ATTC workgroup generalized models proposed for the adoption of psychosocial^{27,28} innovations for treating alcohol and drug addiction.

The model will be more useful as it is operationalized for specific stakeholders interested in the adoption and implementation of addiction treatment innovations. One key stakeholder is the Single State Authority for Prevention and Treatment of Alcohol and Drugs (Single State Authority or SSA). Since the early 1970s, federal legislation requires states to designate a state agency to coordinate service development and to receive and manage federal funds for addiction prevention and treatment services. The SSA may purchase services through direct grants and contracts with treatment organizations or through county or sub-state regional entities. Regulations and contracts specify requirements for service delivery. State authorities may also license or certify treatment centers and practitioners. They play leadership roles in setting standards of care and, if they use their authority to its full extent, they can facilitate or inhibit the adoption of innovations. Advancing Recovery illustrates how states can promote the adoption of treatment innovations.

Advancing Recovery

Advancing Recovery was a Robert Wood Johnson Foundation initiative designed to promote the use of addiction treatment medications and/or new models of care for addiction treatment. The project began in 2007 and came to a conclusion in 2010. Twelve states (or local authorities) participated in partnership with selected addiction treatment centers: Alabama, Arkansas, Baltimore, Colorado, Dallas, Delaware, Florida, Kentucky, Maine, Missouri, Rhode Island, and West Virginia. The state and local authorities were encouraged to use levers to accelerate implementation.

The state authority and providers in Maine worked with the legislature to secure an appropriation of \$500,000 specifically to purchase medications. The state authority used its close relationship with Medicaid to prevent requirements for pre-authorization prior to placing patients on addiction medications. Using financing and inter-organizational levers, the Maine state authority stimulated a substantial increase in the number of patients receiving buprenorphine to treat opioid dependence.

Missouri, conversely, was unable to access new funds to support the use of alcohol treatment medications. Instead, they modified contract language to permit treatment centers to use existing funds

²⁵ Rogers, E. M. (2003). Diffusion of Innovations, 5th Edition. (5th ed.) New York: Free Press

²⁶ Fixsen, D.L., Naoom, S.F., Blasé, K.A., Friedman, R.M., & Wallace, F. (2005). Implementation research: A synthesis of the literature. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231).

²⁷ Simpson, D. D. (2002). A conceptual framework for transferring research to practice. Journal of Substance Abuse Treatment, 22, 171-182.

²⁸ Simpson, D. D. & Flynn, P. M. (2007). Moving innovations into treatment: A stage-based approach to program change. Journal of Substance Abuse Treatment, 33, 111-120.

to purchase medications and physician time. The state authority also encouraged the development and use of a standardized screening tool so that every patient was evaluated for appropriate use of medications. The state director in Missouri made an impact when he explained that treatment centers in the "Show Me" state would support use of medications or they would not receive state contracts. Use of these regulatory and contract levers led to increased use of alcohol medications throughout the Missouri.

In Rhode Island, the state authority and its providers fostered the development of a continuing care process to permit treatment centers to maintain a long-term, low intensity contact with patients though periodic telephone follow-ups. Without new resources, the state and providers negotiated a translation of outpatient slots into continuing care slots and permit providers to be reimbursed for continuing care contacts. Billing codes were developed and approved to facilitate the reimbursement process.

Arkansas adopted a similar procedure. Implementation was challenging, however, because counselor turnover was high. The state authority learned that to sustain the model they needed to over-train – train more counselors than needed. Thus, to promote continuing care, the state authorities not only had to use financing and contracting levers, but also had to provide staff training and monitor the process to assure that it was sustained.

Toward an Implementation Science

The ATTC technology transfer model can help the addiction prevention and treatment field stimulate the development of implementation science. Addiction treatment and prevention services are evolving rapidly in response to emerging findings from neuroscience and behavioral science. By using addiction treatment as a platform for testing implementation strategies, we can facilitate the development and articulation of comprehensive models for technology transfer and implementation. The next iteration of the ATTC model will include testable mechanisms for moving an innovation through each step in the technology transfer process and to determine when a product has been developed and transferred.

DENNIS MCCARTY, OREGON HEALTH & SCIENCE UNIVERSITY

STANDARDIZING COMMUNICATION IN TECHNOLOGY TRANSFER: A BIBLICAL PARALLEL?

At some point every field of endeavor defines core problems around inadequacies in communication. Given the surge of activity and interest in technology transfer within treatment of substance use disorders, there is no doubt that we are "talking past each other" a good deal of the time. This is true among both practitioners and researchers, and there is no doubt that researchers are guilty of ignoring the products of their peers as they rush to publish their latest "findings."

The proposal by the National ATTC Task Force for standardized language, embedded in a standardized model, is timely and offers the potential for improving communication. That is, **IF** the publishing researchers, practitioners and range of "experts" decide to adopt it. Aha, another technology transfer problem right in front of us......Can the National ATTC successfully diffuse this set of standardized concepts?

Are we ready for a common language? Well, of course, who wouldn't be? What possible value can come from using different language to talk about the same thing? But then again, maybe yes, maybe no.

It is exciting to stumble upon an "eternal verity" as a context for considering a new suggestion and perhaps shedding some light on its utility. The ATTC concept paper drew me to the very brief Biblical story of the Tower of Babel. I thought I knew this story, but it turns out to be more complicated than I had remembered. As with most Biblical content, my interpretation may be unique and perhaps wrong, but here goes:

To celebrate their emerging sense of power and understanding, God's people constructed a huge edifice, the construction being made possible by the fact that the people shared a common language. The core of the story is that this common language was viewed as an incredible empowerment, and with very clear communication amongst themselves, God observed that the people "could do anything."

Further, a stated motive of the Tower's construction was for the people to "make a name for themselves." Interpreters have focused heavily on this phrase, for it obviously has plenty of traction in today's world. This very tall Tower or complex city, drawings of which have a notably whimsical quality, reached toward or perhaps even into the Heavens.

God's reaction was to go among the people in the Tower and destroy their common language, such that what one said to another became incomprehensible "babble". With their new languages, the people became small diverse groups that became widely scattered. The common language disappeared, along with the threat posed to God by the solidarity of common speech and a common location. But we are left to wonder whether the people truly "threatened" God and whether the ultimate effects were greater strength or greater weakness.

The story seems to say that the people were getting too powerful and perhaps too prideful, and God "put them down," ending the effort to "make a name for themselves." But perhaps a different interpretation was that the Tower and the common language were a dead end. This story is in the Book of Genesis, and the world was pretty new. Having mankind housed in The Tower speaking a common language suggests the end of exploration, the melding of diversity and perhaps the end of new ideas.

With their new tongues and with their scattering to all corners of the Earth, people unable to understand one another had no choice but to "reinvent themselves" rather than sitting in the glory of having "made a name for themselves." The interpretation that God became threatened by the people's unity and did away with it to strengthen His own Hand seems flimsy. More likely He saw that unity and a single magnificent location were premature in the then-newish World.

I likely seem severely out of step, but I suggest that standardization of concepts and ideas at this stage of the development of treatment of substance use disorders might be a harmful curb on invention. I think there are several critical parts of the technology transfer puzzle that we do not understand, and which we may fail to understand if we move too quick toward "closure" on definitions.

First, we have not yet developed a good typology of innovations. Everyone can make the distinction between psychosocial and pharmacological innovations, but that largely misses a number of more important points. Some innovations are intended to replace current practices (motivational interviewing replacing constructive confrontation) while others are intended to supplement current practice (while some may disagree, motivational incentives seems appropriately placed in this category). While there has been much talk about the need to supplement pharmacotherapies with psychosocial treatments, full specification of these models falls considerably short. Finally, some interventions, particularly those associated with the widely-respected NIATx movement, are innovations that can be categorized as treatment management and as organizational management techniques. These do not necessarily address the content of treatment yet can be critically important in guiding the delivery of treatment.

Second, hackneyed as it may sound, we still have no practical working definition of an Evidence-Based Practice. This problem is at least two-fold. The first and most obvious dimension is "how much" evidence is necessary for a new practice to supplant what is currently being done. As should be well known, much of the evidence base involves comparison of new practices against "treatment as usual." While many graphs and tables have documented statistical significance, the actual variation in impact on treatment outcomes is rarely what one would call a "blockbuster." In fact, many have observed that we should pay more heed to telling the world how well we really do with "treatment as usual," a very important point for those not convinced of the value of treatment.

The "how much" question to determine what is and is not a true "EBP" is really the very wrong question. The real question is not "how much," but "for whom." It is here that our field seems to be in only the earliest stages of progress. While nearly everyone readily rejects the "one size fits all" approach to selecting treatment, we still have disappointments when "treatment matching" is attempted. This seems out of favor at the moment due to the outcomes of large and expensive projects that aimed to make breakthroughs on the matching issue. However, there can be no doubt that if the treatment of substance use disorders intends to move toward being a part of medicine, we need much more knowledge about the matching of treatment modalities with patients' clinical and psychosocial characteristics. This seems especially evident with the promising pharmacotherapies, with particular answers needed not only about selection for treatment but duration of treatment.

At the organizational level, we remain in the early stages of learning about implementation, and seem to be stuck at a plateau that suggests implementation is just a lot of adoption. Without this knowledge, standardization of concepts and language seems premature. The implementation issue links with our understanding of the different types of innovations, and how they might be successfully integrated. These patterns of integration may actually produce new models or even new paradigms of treatment.

Further, we need to conceptualize implementation as embodying opportunities for change, not as a final product of putting innovations in place so that everyone uses them as routine. Finally, focus is needed on the issue of adapting innovations to fit local circumstances as part of the implementation process, an issue currently treated as the proverbial hot potato, needs to be examined realistically. To be a bit devilish, I'll just say that it's far too early to close down our imagination on the implementation front.

Returning to the Tower of Babel story for my last point, it seems to have happened that the ATTC was not placed in a single central location, and while I've not been there recently, I have not heard of a sparkling tower reaching into the heavens in Kansas City. The ATTC is dispersed throughout the country, providing opportunities to listen to and attempt to understand the multiple languages spread across each region. The languages to which I refer are those of the State Substance Abuse Authorities as well as those of the (possibly more cryptic) State Medicaid Authorities. We know all too well about the language diversity represented across these quarters. Health care reform will alter these landscapes but it is very unlikely that these alterations will proceed in a uniform fashion. There can be no doubt of the important influence of the States and Territories on the pursuit of technology transfer.

It is indeed a great advantage for the ATTC to have multiple listening posts as the events of the coming months and years unfold. The experiences of the many treatment programs at these dispersed locations are just what we need to advance understanding. In reflecting on the story of the Tower, perhaps the ATTC can use its dispersed locations to "gather these stones (of local evidence) together" as we start to build and use a base of science for using evidence-based practices. We need our dispersion and our many languages (our "babble") to play our roles in inventing what promises to be a very dynamic future for the treatment of substance use disorders.

Paul M. Roman, University of Georgia

RESPONSE TO COMMENTS ON THE ATTC NETWORK MODEL OF TECHNOLOGY TRANSFER

By ATTC Technology Transfer Workgroup

The ATTC Network Technology Transfer workgroup is grateful to the editorial board of *The Bridge* for their thoughtful feedback about the ATTC Network Model of Technology Transfer in the Innovation Process that we put forth in the feature article of this issue. Respectfully, we offer the following response.

A Model with a Shaky Foundation?

Dr. Brigham argues that the field needs a clear definition of "evidence-based practice." We concur that a more cohesive scientific vetting process for evidence-based substance abuse treatment practices would be helpful. While there are systems, such as the APA guidelines, the Cochrane Collaborative, and the NREPP rating system, there is no set of agreed-upon standards or an agency analogous to the FDA to enforce such standards. We appreciate the suggestion that we should have included more specific language in the description of the *Development* phase of the ATTC model to clarify this stated need. We do not, however, feel it was within the purview of the Workgroup to establish the "reasonable scientific threshold" Dr. Brigham discusses. The ATTC Model was designed to be a broad conceptual model, rather than defining or promoting a specific method for operating in any stage of the model. Accordingly, just as we do not delineate a specific method for evaluating an innovation in the *Development* stage, we also do not offer a "correct" model for integrating an innovation into routine practice in the *Implementation* stage. The Workgroup's goal was to provide a framework for discussing the continuum of the diffusion of innovations in a mutually understandable way using like terms. As such, we applaud Dr. Brigham's call for more clear thinking and definitions of basic terms like evaluation, evidence, safety and effectiveness thresholds.

Suggested Refinements for a Model of Technology Transfer

One of Dr. Martino's comments is that the inclusion of *Development* in the ATTC Model may be confusing. He argues that an innovation must first be developed before it is diffused into practice; thus, including *Development* in the model obscures the distinction between these two concepts. He also notes that well-established models of development already exist^{29,30}. We appreciate the delineation of the difference between development and diffusion. In fact, the ATTC Model clearly shows that diffusion begins after development. Somewhat similar to our response to Dr. Brigham, while Onken and colleagues' model of development is well accepted (and prominently mentioned in our forthcoming article in the *Journal of Substance Abuse Treatment*), our intention is to provide a broad framework for the life of an innovation, not to delineate the specifics within each stage. Furthermore, because of the importance of bi-directionality in the innovation process (implementers affect how innovations are developed, and vice versa), we firmly believe that development should be included in the model.

²⁹ Onken, L.S., Blaine, J.D., & Battjes, R. (1997). Behavioral therapy research: A conceptualization of a process. In S.W. Henggeler & R. Amentos (eds.) *Innovative Approaches for Difficult to Treat Populations* (pp. 477-485). Washington, DC: Psychiatric Press.

³⁰ Rounsaville, B.J., Carroll, K.M., Onken, L.S. (2001). A stage model of behavioral therapies research: Getting started and moving on from Stage I. *Clinical Psychology: Science and Practice, 8*, 133-142.

Dr. Martino also highlights the need to prepare programs prior to implementing a new treatment practice, "an ounce of preparation during the dissemination stage by technology transfer specialists could be worth a pound of implementation later in the process." While the Workgroup concurs that individual and organizational preparation plays a key role in the success of implementation efforts, we suggest that such work is most appropriate during *Adoption*. An EBP package should include a list of resources needed for implementation, and this should be highlighted during *Dissemination* as providers learn about new treatments. However, *Adoption* is the stage in which a provider really reviews such information in reference to actual use of the practice. Some of the preparatory work highlighted by Dr. Martino, such as developing a consensus about the potential value of a new treatment, should occur during *Adoption*. Overall, the ATTC Network is keenly aware of the importance of organizational change as evidenced by the principles and steps outlined in one of the Network's seminal publications, *The Change Book*³¹.

Dr. Martino also argues for increased evaluation of whether technology transfer efforts, such as those employed by the ATTC Network, are successful. We also would like to see increased evaluation of ATTC technology transfer efforts although our principal funding stream does not currently allot resources for such work. We note that the Substance Abuse and Mental Health Services Administration recently completed an external evaluation of the ATTC Network, and we are hopeful that when the findings are released more measures of our success will be evidenced.

New Models Mean New Questions: How the ATTC Technology Transfer Model Suggests New Directions for Research

Dr. Knudsen sees the ATTC Technology Transfer Model as a catalyst for articulating new research questions. In considering practical implications for our work, one of the specific hopes of the Workgroup has been that the model would do just that – spark creative ideas for studying the technology transfer process. We are excited by the multitude of potential research questions Dr. Knudsen puts forth based on our field-driven model of technology transfer. We would especially like to underscore two of her lines of inquiry. One is the intersection of translation and dissemination. Dr. Knudsen discusses the need to study whether training packages created in the *Translation* stage are effective and whether there are optimal strategies for dissemination. There is relatively little research, except for several seminal studies^{32;33}, on effectiveness of training in changing clinical skills. In part, this is because often the outcomes of such studies have been measured as whether clinicians use the new skills (which is really implementation), rather than their competence in using the skills. The second line of inquiry which we feel is particularly important is relation to *Adoption*. Dr. Knudsen suggests that the field needs to more closely investigate how organizations approach and make decisions in the "Adoption" stage. Again, some work has been done in this area, including Panzano and Roth's³⁴ study of a risk-based decision-making framework and

³¹ Addiction Technology Transfer Centers. (2000). *The change book. A blueprint for technology transfer.* Kansas City, MO: Author.

³² Miller, W. R., Yahne, C. E., Moyers, T. B., Martinez, J., & Pirritano, M. (2004). A randomized trial of methods to help clinicians learn motivational interviewing. *Journal of Consulting and Clinical Psychology*, *72*, 1050–1062.

³³ Sholomskas, D. E., Syracuse-Siewert, G., Rounsaville, B. J., Ball, S. A., Nuro, K. F., & Carroll, K. M. (2005). We don't train in vain: A dissemination trial of three strategies of training clinicians in cognitive– behavioral therapy. *Journal of Consulting and Clinical Psychology, 73*, 106–115.

³⁴ Panzano, P. C., & Roth, D. (2006). The decision to adopt evidence-based and other innovative mental health practices: Risky business? *Psychiatric Services*, *57*, 1153–1161.

Roman, Knudsen, and colleagues'^{35,36,37} examinations of organizational factors. We agree with Dr. Knudsen that the model encourages research across the diffusion continuum, and think that these two areas are particularly relevant to the field's continued ability to accelerate the uptake of evidence-based interventions in practice.

The Need for More Attention to the Requirements for Implementation

In his response, Mr. Boyle presents a case for why it is more difficult to adopt and implement evidencebased substance abuse treatments than other innovations, such as utilizing a new kind of corn seed or prescribing a different type of medicine. The Workgroup concurs with Mr. Boyle that implementation of complex clinical practices is easier said than done. While changing a business practice or a non-clinical practice, such as providing a more comfortable waiting room, may be relatively easy to target, understand and complete in a short period of time, changing clinical practice is often an intricate process, necessitating a well-coordinated effort at individual, organizational, and systemic levels. Moreover, merely changing clinical practice is not the end goal; rather the goal is to change practice in a particular way that conforms carefully with the way the practice was originally researched. EBPs generally do not work as well as demonstrated in the research if they are not implemented with fidelity^{38,39,40}. Adding the need for high fidelity change creates yet another layer of complexity in the process of implementing evidence-based clinical treatment practices since there exists a variety of distinct contextual factors that exist in "real-world" treatment settings. While full implementation across the spectrum of substance abuse treatment services may be illusive, we heartily agree with Mr. Boyle's argument that promoting such practices has allowed for a "cultural sea change," which, he implies, has benefitted the provision of treatment services.

The Role of the State Authority in Technology Transfer

Dr. McCarty addresses the issue of further operationalizing the ATTC Technology Transfer Model for specific stakeholders, such as the state authority—Single State Authority (SSA). He notes that the Advancing Recovery project (funded by the Robert Wood Johnson Foundation) focused on state authority-provider agency partnerships to spur implementation of evidence-based practices in substance abuse treatment. This is a such a key partnership and Advancing Recovery provided a nice model of how

³⁵ Knudsen, H. K., Ducharme, L. J., & Roman, P. M. (2007). The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. *Drug and Alcohol Dependence*, *87*, 164-174.

³⁶ Knudsen, H. K., Roman, P. M., & Oser, C. B. (2010). Facilitating factors and barriers to the use of medications in publicly funded addiction treatment organizations. *Journal of Addiction Medicine, 4,* 99-107.

³⁷ Roman, P.M., Abraham, A.J., Rothrauff, T.C., & Knudsen, H.K. (2010). A longitudinal study of organizational formation, innovation adoption, and dissemination activities within the National Drug Abuse Treatment Clinical Trials Network. *Journal of Substance Abuse Treatment, 38 (Suppl 1),* S44-S52.

³⁸ Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology*, *41*, 327-350.

³⁹ Gearing, R. E., El-Bassel, N., Ghesquiere, A., Baldwin, S., Gillies, J., & Ngeow, E. (2011). Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. *Clinical Psychology Review, 31*, 79-88.

⁴⁰ McHugo, G. J., Drake, R. E., Teague, G. B., & Xie, H. (1999). Fidelity to assertive community treatment and client outcomes in New Hampshire dual disorders study. *Psychiatric Services, 50,* 818-824.

these two groups can work together in concert toward a shared vision rather than a more antagonistic model of states mandating changes without working with agencies on the implementation process. Clearly a number of stakeholders have roles to play in the complex process of innovation. As a first step toward operationalization, the Workgroup has developed a Matrix companion to the Model, (available at <u>www.ATTCnetwork.org/technologytransfer</u>). The Matrix outlines roles and actions that states and systems (including SSAs), researchers, ATTCs, organizations, clinical supervisors, and clinicians can take at each stage of the innovation process to accelerate technology transfer.

Standardizing Communication in Technology Transfer: A Biblical Parallel?

Dr. Roman provides the Tower of Babel parable, suggesting that it may be too early in the life of implementation science to put forward standardized definitions and models. His reasons, briefly, are that the field does not have a typology of innovations, it does not have a definition of evidence-based practice, and that we may not yet fully understand what implementation is (Dr. Roman notes, is it 'just a lot of adoption'). The Workgroup's intent in advancing the conceptual model is to provide a framework for the major components or stages in the life of an innovation, so that all of the stakeholders can speak a similar enough language to be understood, not to necessarily be definitively correct. As noted several times in this response, the intent is not to prescribe within each stage the specific processes by which each stage works. We recognize the state of the science and the practice in the field is not there yet (nor may ever be). However, it is the Workgroup's opinion that progress and innovation have been hampered by people using the same terms to mean different things. A framework, not a completed tower, and common definitions of key terms can assist in communicating about the technology transfer process to stakeholders across multiple vantage points. That is one of the lessons that the ATTC Network, with our national range and somewhat difficult acronym, has learned. We agree that it is too early to define the specifics within each stage of innovation, but disagree that the type of broad conceptual model that we advance is premature.