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Academic Psychiatry

Volume 42, Number 5
October 2018

Springer

Springer

FEATURE: EDUCATIONAL CASE REPORT

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A significant gap exists between the outcomes of randomized controlled trials (RCTs) and treatment-as-usual in mental health care—this observation has been thoughtfully reviewed by Fortney et al. [1] and is well supported by the primary literature [2–7]. The superior response of psychiatric symptoms to treatment under clinical trial conditions as compared to conventional conditions has been attributed to clinical trial protocols' utilization of measurement-based care (MBC), defined as the routine monitoring of mental health treatment progress using evidence-based patient-reported outcome measures, to guide implementation of algorithm-based treatments [1]. RCTs investigating the impact of patient-reported outcome measures specifically have consistently demonstrated a significant improvement in treatment outcomes [8, 9]. Evidence is also emerging that the framework of MBC may be added to almost any treatment from medication management to various psychotherapies [10, 11]. Despite this, less than 20% of psychiatrists consistently use MBC in their treatments [12], a statistic uncovering a significant lag in translating MBC research into clinical practice. With strong evidence for effectiveness, why is MBC not the current standard of care?

While literature specifically addressing successful models of MBC training and implementation in psychiatry remains sparse, studies show that in order for innovations in clinical practice across medical specialties to be successfully adopted, these changes must be effective, applicable to a large population, cost neutral, positively correlated with patient satisfaction, and relatively straightforward to implement [13]. New technology, known as a measurement feedback system, can automatically assign patient-reported outcome measures based on diagnostic symptom criteria, then score, graph, and norm the completed measure(s), allowing clinicians immediate access to clinically actionable data; measurement feedback

system technology renders adoption of MBC immediately practical in domains of efficacy, applicability, and patient satisfaction. This means of collecting data is patient-centered in that patients may complete assigned measures outside of the clinical space, on their own time, using any web-enabled personal electronic device (e.g., smartphone, tablet, personal computer). Integrating a measurement feedback system into the electronic health record (EHR) creates a seamless flow of objective data documentation that enhances the presence of a patient's own responses and voice within their medical record. These features support the Quadruple Aim of improving patient outcomes and experiences, reducing healthcare costs, and improving clinician satisfaction. For the clinician, EHR-integrated patient-reported outcome measures allow for monitoring of treatment impact both at the level of the individual patient and that of the larger clinical population.

Current models of reimbursement seem to deter the adoption of innovative technologies in medicine, as there is minimal funding or reimbursement to guarantee return on investment. However, the time to implement MBC is now. Payers and accreditation bodies will soon require reporting of patient-reported outcome measures under programs such as MACRA [14], thus there is a looming imperative for practicing psychiatrists to utilize MBC. More basically stated, if the under-resourced mental health system is to provide best care to patients, psychiatry needs to become more receptive to patient feedback about the efficacy of treatment provided.

However, many questions arise when considering the practical aspects of implementing MBC. How can accessibility and quality of care be improved without adding administrative burden or contributing to provider burnout? What options are feasible to implement? Do currently available products have long-term viability? Implementation of MBC via a measurement feedback system can address many of these concerns while offering benefits to a variety of stakeholders from patients to administrators. In psychiatry practices, which use fewer support staff than other specialties, clinicians may make use of measurement feedback system technology to track outcomes while reducing administrative burden and enhancing

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quality of care. In this article, the authors describe their experience researching and implementing MBC via a measurement feedback system in multiple outpatient psychiatry clinics including several training clinics within an academic setting. Training clinics were intentionally included in the initial phase of implementation to provide trainees with practical experience providing MBC and feedback on practice habits through systematically collected data. Through this practice, trainees have the opportunity to develop skills in systems-based practice and practice-based learning for use both now and in future practice.

Process Overview

Departmental Process

In late 2016, a department of psychiatry workgroup was formed with the objective of identifying electronic options to implement MBC into multiple outpatient psychiatry clinics at Oregon Health & Science University (OHSU). This workgroup included faculty members, researchers, staff, and a senior resident. Inclusion of a resident in the implementation process was vital to understanding how residents would receive and utilize this technology. The department demonstrated dedication to this goal by identifying a project leader to facilitate the workgroup and devoting 0.1 FTE faculty time. Additional financial and administrative resources were also available to the project as needed. The interdisciplinary workgroup evaluated whether incorporation of MBC should proceed via an internal build of a unique measurement feedback system into our EHR or via licensing and integration of a third-party, cloud-based software program. Based upon multiple factors including cost-benefit analysis, end-user functionality, time to implementation, and degree of post-implementation flexibility and maintenance, a third-party platform was selected for presentation to appropriate parties within the organization.

Organizational Process

Incorporation of a third-party measurement feedback system into these clinics required extensive review by several organizational committees to evaluate the privacy, security, and feasibility of use within the context of the larger healthcare system. See Fig. 1 for process overview. The development of collaborative working relationships amongst the organizational information technology (IT), EHR, and MBC implementation teams was critical to the successful navigation of the organizational approval process, as technical information from all parties, beyond the scope of knowledge of the project leader, was required for completion.

Successful navigation through the organizational process required identification of a problem to be solved, a description of the importance and coherence of the project with the organization's strategic plans and priorities, and an explanation of what alternatives were considered and why they were rejected. These components were summarized in a presentation to the Clinical Enterprise Information Technology Acquisition and Retention Committee, which ultimately determined if the project could proceed. In addition, the organizational evaluation process included a security control assessment conducted by the Oregon Health & Science University Integrity Program.
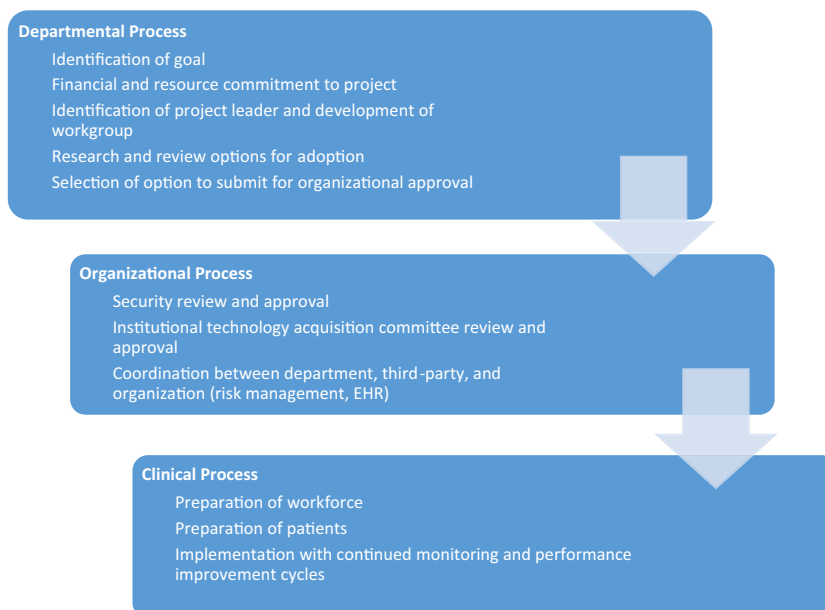
The organizational approval process took approximately 3 months from submission to approval. Following organizational approval, contract negotiations with the measurement feedback system company were completed over a 1-month period, with final approval in March 2017. These negotiations included a business associate agreement or "BAA," which is an apportion term referring to contractual and regulatory instruments that satisfy HIPAA regulatory requirements and create liability between both parties. This was completed at the organizational administrative level by risk management with input from departmental level administration. The Oregon Health & Science University Institutional Review Board determined that the implementation of this project did not constitute research involving human subjects and therefore did not require oversight. This manuscript outlines an implementation process and does not disclose patient or provider data.

Clinical Process

The departmental workgroup set a goal for a "go-live" date within 5 months of organizational approval. In order to meet this deadline, the clinical process occurred in parallel with the organizational process previously detailed. The project leader, working in close collaboration with the measurement feedback system company, employed implementation science and change management concepts to develop a four-phase plan for initial implementation.

Phase 1: Planning and Structure

The clinical basis for the project was electronic implementation of MBC to enhance evidence-based practice in outpatient psychiatry clinics. Phase 1 focused on defining project scope and phase objectives, working with organizational information technology teams to explore EHR integration, and establishing a project timeline. This planning provided structure to the project, while still allowing for flexibility to adapt to the unique needs of individual clinics and inclusion of input from a variety of stakeholders during later phases. The creation of objectives and early scoping was essential to ensure that

Fig. 1 Organizational navigation roadmap

Departmental Process
- Identification of goal
- Financial and resource commitment to project
- Identification of project leader and development of workgroup
- Research and review options for adoption
- Selection of option to submit for organizational approval

Organizational Process
- Security review and approval
- Institutional technology acquisition committee review and approval
- Coordination between department, third-party, and organization (risk management, EHR)

Clinical Process
- Preparation of workforce
- Preparation of patients
- Implementation with continued monitoring and performance improvement cycles

deadlines were met and well-defined expectations were set for all parties involved.

Phase 2: Identify and Engage Clinical Sites

With a project structure in place, the second phase of development focused on exploring ideal locations for initial implementation and determination of the appropriate level of education and training required for staff and clinicians. Conducting baseline assessments of current state workflow, morale, and stakeholder concerns was also completed in this phase. This current state work assisted the workgroup in understanding how to engage and educate users moving forward.

Phase 3: Identify and Engage Users

The third phase included selection of recommended measures (e.g., PHQ-9, GAD-7, Adult ADHD Self-Report Scale), determination of potential clinician users, programmatic training format, and acquisition of stakeholder input to create standard work [15]. The departmental quality improvement committee reviewed and approved the list of recommended measures for use based on established psychometric properties. Clinicians are able to use measures beyond this recommended list according to clinical decision-making. The determination of clinician users started with identification of a small group of early adopters based on information from implementation science literature. Early adopters were identified via discussions over the course of the project to gauge interest in MBC and in the use of new technology. A key strength sought in these early adopters was a willingness to provide feedback to contribute to ongoing "plan-do-study-adjust" (PDSA) cycles (concept reviewed in [15]), which serve to increase

understanding of how adaptations will address barriers and ultimately lead to enhanced adoption. Early adopters were found to be flexible in their approach to new technology and e-health programs, and held a desire to creatively problem solve without being overwhelmed by early struggles. Education and training for clinicians and staff were conducted during this phase. Patient preparation was also a primary goal including introduction of the concept of measurement-based care during patient visits, educational flyers, and clinic signage. With the accomplishment of these tasks, a soft-roll out was completed over 4 months. The total time from exploration of options to completion of initial phase MBC implementation via measurement feedback system with EHR integration took approximately 1 year.

Phase 4: Monitoring Results, Performance Improvement, and Maintenance

The early focus on standard work development for each role in the workflow design was critical to ensure that both process and outcome metrics could be accurately tracked and assessed once the project was "live." To create standard work for clinical processes, stakeholders, from front desk staff to clinicians, met regularly to design the overall workflow and detect opportunities for improvement. This remains an ongoing process with multiple PDSA cycles to identify and share best practices between clinics. The initial workflow was reviewed during the live technology training and continues to be updated via an ongoing strategic communication plan. The updated workflow was not significantly altered from the clinical perspective, other than clinicians (including faculty and residents) educating patients on measurement-based care and utilizing results during appointments to support clinical decision-

Table 1   Adoption: challenges and solutions

	Challenges	Solutions
Organizational	Institutional committee approval	Build case for how project aligns with institutional goals and priorities
	Identification of process for approval	Collaborate with project leaders in other specialties to learn about process experience
	Competing interests for resources	Provide use cases to demonstrate likely outcomes if approved; rationale for use beyond current scope
Departmental	High initial cost of new technology	Negotiation with third party
	Lack of resources to implement and to sustain project	Identification of seed and/or foundation funding targeting innovations in clinical care Revenue offset by MACRA reimbursement and lack of penalties
	Lack of expertise to select appropriate technology for providers	Utilization of both organizational and departmental resources in evaluation process
	New technology impacts existing workflows	Work with all stakeholders to design new workflows
	Lack of institutional experience to evaluate performance of technology	Identify a "live use case" to evaluate the system in current use at another institution
	No strategic plan for implementation	Develop implementation plan, with supported resources
Clinician and Staff engagement	Adoption not externally incentivized	Institutional emphasis on value-based care Educate regarding improvement in patient care Share best practices
	Perceived negative impact on workflow	Training and support Integrate in EHR to automate processes and reduce burnout
	Concern for interference with patient-provider interaction	Discuss experience in other institutions Continue to evaluate patient and provider engagement in process
Patient engagement	Provider engagement required for patient engagement	Focus on provider engagement and education first
	Lack of understanding of rationale for use	Create flyers in patient waiting areas Providers introduce concept to encourage engagement
	Inability to use technology	Create secondary workflow for those with inability to use the technology
	Account set-up	Patient support and problem solving performed by PAS staff
	Timely measure completion	Creation of automated reminders via MFS
Technology	Maintenance problems	Ensure that 3rd party has user manuals, guidelines, and support help available
	Difficulty with data entry and data retrieval	Phased implementation: early adopters test technology and provide feedback on usability and features
	Interface usability	Working with patients to problem solve technical issues, i.e., invitation going to junk mail
	Standards for data entry and retrieval	Meet institutional guidelines to ensure privacy and reliability standards are met
Legal and regulatory	Lack of clear policies and procedures regarding new technology at departmental level	Collaborate with institutional Integrity Program
	Threats to confidentiality and health information disclosure	Complete institutional security review to insure that the technology meets all required standards to protect health information
	Monitoring of use and liability	Assign clear staff roles and responsibilities for creation and deletion of accounts

making. Faculty supervision of residents in the clinic previously included review of measures collected at a given clinic

appointment, whereas now, a similar amount of time can be spent reviewing not only the most current data but also a

patient's historical trends on a given measure. The clinical workflow was intentionally designed to minimize disruption and enhance uptake potential. The implementation phase was successful, but long-term success will only be achieved with ongoing support through a maintenance phase.

Adoption: Challenges and Solutions

The initial implementation of MBC via a measurement feedback system in this academic medical center has successfully met its defined goals. It was not surprising that early challenges required flexibility and detailed collaborative problem-solving. As adopting new technology into healthcare is known to be highly complex, the authors anticipated numerous challenges. Based on the literature, the workgroup preemptively addressed multiple potential barriers in the following categories: organizational, departmental, clinician engagement, staff engagement, patient engagement, technology, and legal and regulatory [16]. These challenges and offered potential solutions are outlined in Table 1.

Of the numerous challenges encountered, patient and clinician engagement required the most focused attention. This was not shocking given a recent NEJM Catalyst Insights Council survey reporting that 63% of respondents called "the time investment required by health teams the biggest challenge in designing patient engagement into care delivery" [17]. The clinician must be engaged and believe in the product for the patient to become engaged. Unützer and colleagues have suggested that linking quality indicators to payment can substantially improve fidelity to evidence-based practices while improving patient outcomes [18]. Clinician engagement efforts in our setting tended to focus on education, sharing of best practices, proof of utility, and reduced administrative burden. Integration of the measurement feedback system into the organizational EHR was reported as a key factor in satisfaction during interviews following implementation. Given current documentation requirements and burnout rates, clinicians in this institution were welcoming of the automated process to support documentation. Challenges with patient engagement were addressed via clinician engagement and education, as well as a patient-facing educational campaign including informational materials, technical support, problem solving assistance from staff, and the creation of automated reminders via the measurement feedback system.

Discussion

Given the changing landscape of medicine toward value-based care, psychiatry must find ways to adopt best practices without adding additional burdens that may contribute to burnout; the use of measurement feedback technology provides this capability. Barriers to adoption of evidence-based practices exist throughout medicine. However, through careful planning, use of implementation science concepts, and technology, it is possible to overcome many of these barriers and achieve programmatic change.

No roadmap of this process was identified prior to the initiation of the project. Harnessing collective institutional knowledge was the key to this project's implementation success. The project leader accomplished this by developing connections with contacts from other specialties that had previously implemented similar products. This shared knowledge helped to demystify and prepare the project leader for common pitfalls. The ultimate goal of this shift in care is toward a population health perspective with expansion of mental health benefits and reimbursements, in addition to the collection of a large repository of data to inform future prevention strategies and novel treatments in psychiatry. The transformation has only just begun.

Evidence-based care is the standard to which psychiatry should aspire. Large-scale dissemination of evidence-based practices, including MBC, can be challenging and complex. Additional studies and process descriptions are needed to identify best practices for enhancing dissemination of MBC utilizing technology across diverse contexts. As technology continues to develop, the principles of implementing a measurement feedback system, whether utilizing a third-party product or integrating an evidence-based medicine module into an existing EHR, will be applicable from an organizational perspective. Further, academic medical centers have an important role in the development and dissemination of model practices and their integration into training to ensure that future psychiatrists are prepared to practice effectively within new models of care.

Compliance with Ethical Standards

Disclosures   On behalf of all authors, the corresponding author states that there is no conflict of interest.

Disclaimer   Trademark and brand names were deliberately not used in the manuscript to avoid endorsement of a particular product.

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