The Development and Implementation of an Electronic Health Record Tool for Monitoring Metabolic Syndrome Indices in Patients with Serious Mental Illness

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Abstract

Objectives: 1. A quality performance improvement (QI) project to implement an electronic screening and monitoring tool to record components of the metabolic syndrome (e-MSD) during clinic visits by persons with serious mental illness (SMI). 2. To encourage psychiatrists to use this tool in their documentation. **Methods:** Working with the information technology staff, five psychiatrists developed, tested, revised and embedded the e-MSD tool into the medication management document within the electronic health record. A continuing medical education program on metabolic syndrome was developed and released to psychiatrists and mental health clinicians. Psychiatrist offices at one clinic were equipped with weighing scales, sphygmomanometers, waist circumference tapes, and a QI project was initiated. **Results:** At one month, 9 to 12% of the anthropometric measures (height, weight, body mass index, waist circumference, and blood pressure) were recorded in 974 unique patient encounters, and one year later the numbers moved upward from 15 to 41%. Toward the end of Year 1, a Patient Care Associate was hired to measure the anthropometric measures and, one year later, the documented rates increased to 75–80%. Laboratory recordings (glucose and lipids) remained ≤8% throughout the first year, but moved upward to 25% in Year 2. **Discussion:** Notwithstanding significant administrative and technical support for this QI project, changing clinician practice to screen, monitor and document metabolic indices in persons with SMI in the ambulatory setting changed significantly after the hiring of a Patient Care Associate. Efforts to obtain laboratory measures in real time remain a challenge. Next steps include interventions to promote weight loss and smoking cessation in SMI patients, and effective communication with their primary care doctors.

Key Words: Metabolic Syndrome, Serious Mental Illness, Schizophrenia, Bipolar Disorder, Quality Performance Improvement, Electronic Health Record

Introduction

The loss of 15 to 25 years of life among the seriously mentally ill population (SMI) (1, 2) has prompted the Substance Abuse and Mental Health Services Administration (SAMHSA) to issue a call to action: the "10 by 10" campaign, a national wellness action plan to improve life expectancy by 10 years in 10 years (3). There were specific recommendations for "big systems," one of which was "to require, regulate and lead behavioral health provider systems to screen, assess and treat both mental health and general healthcare issues. Provide for staffing, time, record keeping, reimbursement and mileage with physical healthcare providers" (3).

Even after the publication of guidelines to monitor the metabolic indices of persons with SMI (4), rates of monitoring have been low. A study of glucose and cholesterol monitoring in three state Medicare programs compared >100,000 individuals starting on an atypical antipsychotic agent with >200,000 individuals starting albuterol (but no antipsychotic

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Clinical Implications

A number of resources was brought to bear on this Quality Performance Improvement (QI) project (see Figure 1): 1) the creation of an electronic health record tool with input from frontline clinicians (see Figure 2); 2) the parallel development and release of a CME program; 3) small group discussions with end-users (psychiatrists) before, during and after implementation of this tool; 4) the equipping and training of psychiatrists with weighing scales, waist measurement tapes, sphygmomanometers; and, 5) the piloting of the project in one clinic. Despite this, we saw relatively small gains in screening and recording of the metabolic syndrome measures in the first six months. Careful scrutiny of individual physician data revealed that one psychiatrist, who cared for nearly one-third of the clinic patients, was not engaged or interested in this effort despite one-on-one meetings with the lead clinician. This issue speaks to changing practicing physician habits and what may be the best approaches to achieving such change. We utilized a collaborative rather than a "mandatory" approach but it was not entirely successful in this instance, even though the other practitioners were far more engaged in this initiative, resulting in a doubling of the rates of recording of the anthropometric measures at the one-year mark.

In our QI initiative, the ongoing IT solutions to improve the end-user experience (example: trending the anthropometric and laboratory measures) helped in making this a more useful tool for psychiatrists and for patients to visualize on the computer screen in real time. However, a major shift in the rates of recording occurred *after* the hiring of the Patient Care Associate, as seen in the 75–80% rates of recording at two years (see Figure 3). However, technical issues and other factors have prevented obtaining the glucose and lipid values readily and/or in real time during the clinic visit. Even though the rates of recording of these laboratory measures have improved, they are still in the low 25% range. Problem-solving efforts are ongoing to resolve this issue, especially at an IT level.

drug) during three time periods: 1) before the warnings on glucose and cholesterol were published; 2) during the period when warnings were issued; and, finally, 3) during a period after the institution of these warnings. Initial rates for monitoring glucose (27%) and lipid levels (10%) were low and remained low in those starting atypical antipsychotic drugs and were not noticeably different from those receiving albuterol (5). Commercially insured mentally ill populations did not fare better, either in terms of glucose or lipid monitoring (6, 7). Finally, even in an integrated healthcare system such as the Veterans Administration (VA), clinicians did not monitor cholesterol and weight more often after patients were started on an antipsychotic agent (8).

Several senior faculty members at our institute were involved in research and in interventions to improve the physical health of persons with SMI (9-12) and, consequently, there was high level support to implement strategies to improve the physical health of SMI patients. Informal discussions between the faculty and executive leadership led to the choice of targeting the metabolic syndrome in SMI patients (13-15).

Why Target Metabolic Syndrome? Why an Electronic Health Record Tool for Clinicians?

The metabolic syndrome represents a constellation of measures that reflect modifiable risk factors such as obesity, poor dietary choices, physical inactivity, high blood pressure, and elevated levels of cholesterol or glucose. More importantly, these risk factors can be targeted for lifestyle interventions, especially among the SMI population.

The transformation of the paper medical record to an electronic health record (EHR) in our health system provided the opportunity to create a tool that would alert clinicians to the metabolic syndrome and focus them to screen, monitor, refer and counsel patients on their modifiable risk factors, thereby providing an opportunity to achieve desirable physical health outcomes and hopefully help reverse the mortality statistic in the SMI patient population.

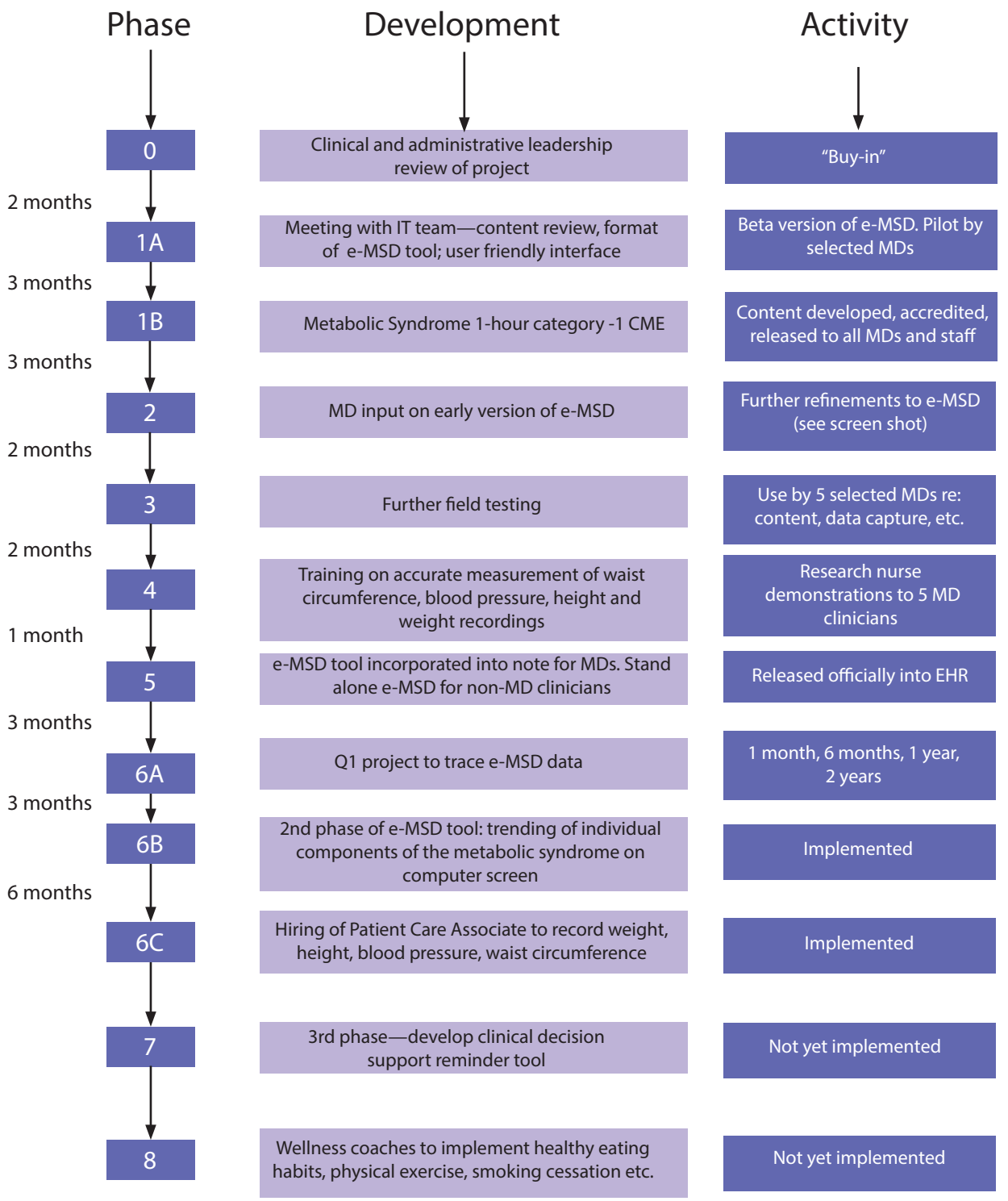
The *aims* of this Quality Improvement (QI) Project were to: 1) create and implement an electronic health record (EHR) tool to screen and monitor the metabolic syndrome in patients with SMI; 2) prompt clinicians to document the individual components of the metabolic syndrome into the EHR; and, 3) encourage clinicians to counsel, refer or undertake intervention strategies such as weight reduction or increased exercise, nutritional counseling or review smoking cessation options. This paper describes the implementation of the first two goals.

Methods

"Buy-In" from Administrative and Executive Staff (Figure 1, Phase 0), and Description of the Department

Discussions were held among administrators and executive officers, frontline clinicians and IT staff regarding the format and content of an EHR Metabolic Syndrome

Figure 1 Time Lines



Document (e-MSD). The Western Psychiatric Institute and Clinic (WPIC) houses the Department of Psychiatry of the University of Pittsburgh School of Medicine and its Medical Center (UPMC), and has over 200 faculty members. It is a nearly 300-bed inpatient psychiatric facility with ambulatory clinics devoted to psychoses, mood, anxiety and eating disorders, serving adults, but also children and adolescents and geriatric patients. WPIC is known as a regional mental health service provider and has a large, nationally recognized research portfolio covering the lifespan of psychiatric

disorder diagnoses. The executive staff reviewed the proposal and agreed to support the development, implementation, and tracking of this QI initiative.

EHR Tool Development, Field Testing, Revisions, and Creation of User Friendly Data Screens (Figure 1, Phases 1A, 2, 3, 4 and 5)

A test version of the e-MSD was developed and one of the authors (KNRC) and four psychiatrists at one ambulatory clinic met with IT staff to refine the initial version to accommodate user friendly screens for data input and also request changes to the content. Psychiatrists working in other clinics within the institute were also asked for their input. Using a test screen embedded in the existing EHR, recordings of weight, height, blood pressure and waist circumference from patients attending the clinic were entered by the psychiatrists. Laboratory data were entered if available in another EHR associated with the health system and, if not immediately available, the data were entered later on by psychiatrists who edited their original signed e-MSD note. After further field testing by clinicians and "debugging" by the IT team, the final version was inserted into the medication management document in the EHR; however, this particular document was available only to MD clinicians. Therefore, a stand-alone e-MSD was also created such that non-MD healthcare staff (nurses, nurse practitioners, physician assistants, others) could also record this information during their patient encounters. This paper does not present data on the usage of this e-MSD tool by non-MD clinicians. Please see Figure 1 for a timeline for the development and implementation of this QI initiative.

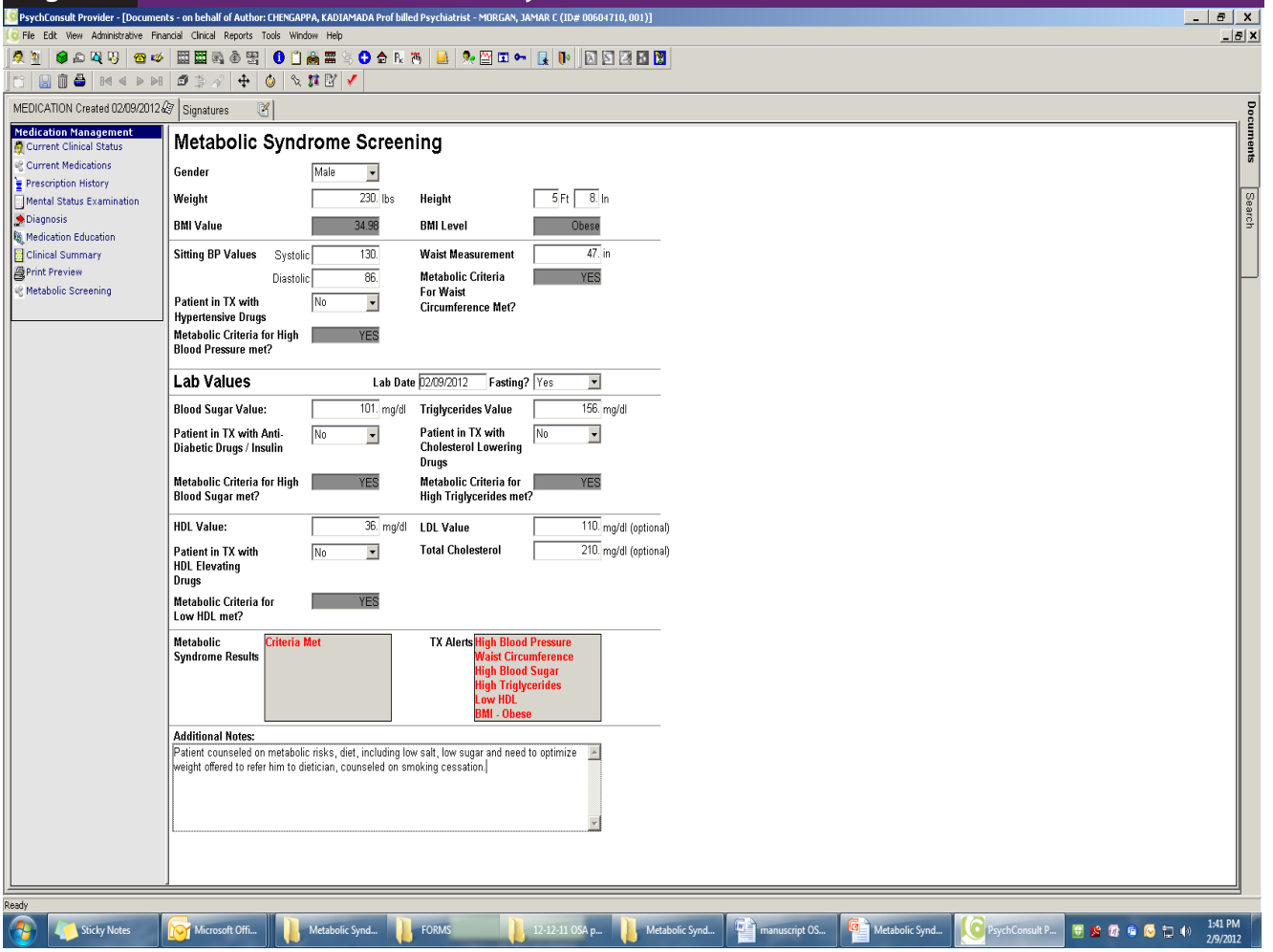
Clinician Education and Training (Figure 1, Phase 1B)

Concurrent with the development of the e-MSD EHR tool, a Continuing Medical Education Program (CME, CE) was developed, focusing the content on Metabolic Syndrome in patients with SMI. The program was accredited as a one-hour category 1 CME that reviewed the literature on the prevalence of the Metabolic Syndrome in patients with SMI, the etiopathological mechanisms involved, lifestyle issues including diet, exercise and smoking, medical consequences for patients and, finally, monitoring, treatment and referral strategies. Three clinical cases of persons with various psychiatric diagnoses were reviewed and the CME faculty panel discussed how a clinician might recognize, monitor and encourage treatment of those subjects who met criteria for the Metabolic Syndrome. This CME/CE program was made available to all psychiatrists at the academic center and its affiliated network hospitals. The program was also made available to nurses, nurse practitioners, pharmacists, physician assistants and other mental health clinicians working at the academic medical center.

In September 2010, five frontline psychiatrists were chosen to pilot the e-MSD tool. These psychiatrists worked at the main academic center, and were either part- or full-time clinician faculty at a large ambulatory clinic serving nearly 1,500 persons with serious mental illness diagnoses. SMI included persons with several psychiatric diagnoses attending this large, university-based, mental health ambulatory clinic: *DSM-IV-TR* Schizophrenia and other psychotic disorders (295.xx, including Schizoaffective Disorder 295.70, Delusional Disorder 297.1, Psychotic Disorder NOS 298.9) and mood disorders (Bipolar Disorders 296.xx, including Bipolar II Disorder 296.89, Bipolar Disorder NOS 296.80, and Depressive Disorders 296.xx). Persons with multiple *DSM-IV-TR* Axis I, II, or III diagnoses were included. There were no specific exclusions, but a few patients did not want to have a specific item of the metabolic syndrome done, e.g., waist circumference. Many patients received antipsychotic drugs (including atypical antipsychotic drugs) as part of their treatment. Just prior to full-scale implementation, research staff (physicians and nurses with experience in metabolic syndrome research) spent two sessions with the clinicians going over accurate measurement methods for blood pressure, height, weight, and waist circumference. The psychiatrists also reviewed the recommendations of the APA/ADA 2004 (4) guidance document on monitoring metabolic and related indices in persons receiving the newer antipsychotic agents. However, for purposes of this QI project, psychiatrists were asked to record the individual components of the metabolic syndrome as many times during the year as they thought appropriate, but to attempt to record all components, especially the laboratory indices (which are more difficult to obtain in an ambulatory setting), at least once per year.

The screen shot of the metabolic syndrome document (see Figure 2) shows the data capture screen for the metabolic syndrome section embedded within the medication management document. Each of the psychiatrists was equipped with weighing scales, tapes to measure waist circumference and sphygmomanometers to measure blood pressure. The body mass index (BMI) was automatically computed and populated into the screen if the height (feet and inches) and weight (in pounds) were entered into the e-MSD. The criteria set for the metabolic syndrome was based on meeting at least three of five criteria based on the recommendations of the NCEP-ATP III (16). The modification of ≤100 mg/dl (rather than ≤110 mg/dl) for blood glucose was programmed

Figure 2 Screen Shot of the Metabolic Syndrome Document



for computing the fasting glucose criterion. If the metabolic syndrome criteria were met, treatment alerts would populate in red colored fonts prompting the psychiatrist to counsel the patient, make referrals and document these items in the comments section of the note (see Figure 2).

Quality Improvement Project Approval (Figure 1, Phase 6A)

The five psychiatrists participating in the pilot program were in full agreement with a QI initiative. The project was submitted to the University of Pittsburgh Medical Center Quality Improvement Committee for approval. The UPMC QI committee works in conjunction with the University's Institutional Review Board (IRB) and distinguishes QI projects from studies that require separate IRB approval. This initiative was approved as a QI project, and regular reports of the group and individual psychiatrists for usage and recording of the e-MSD tool in their medication management notes were tracked at one month, 6 months, 1 year and 2 years by the IT staff.

Results

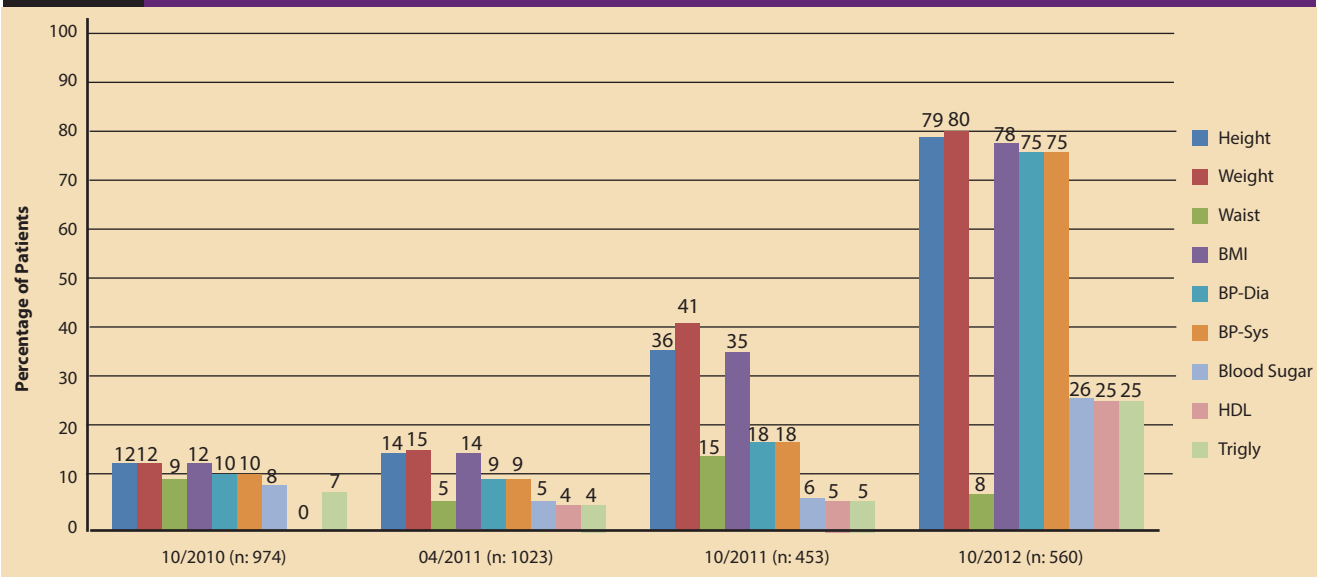
Training and Education

After the release of the CME/CE, 549 participants (including 217 physicians) at the main academic center and its affiliated hospitals participated in the educational activity. The evaluations indicated the program was generally well received and obtained high ratings ("good, very good, and excellent").

EHR Metabolic Syndrome Tool Usage and Documentation

After implementation, the data for the e-MSD were reviewed for the five psychiatrists. It is pertinent to point out that there were no baseline data. Subsequently, we chose an early data point—*one month*—as a proxy for the baseline. One month after implementation, recordings of one or more components of the metabolic syndrome were noted in 12% or less of the 974 patient encounter records; these were records of unique (i.e., unduplicated) patients (see Figure 3).

Figure 3 Recording of Metabolic Indices by Psychiatrists into an Electronic Health Record



At six months, of the 1,023 unique patient encounters (several patients may have been seen more than once during that time period), the data indicated that the rates of recording of the anthropometric parameter—height, weight, BMI, blood pressure—were around the 14 to 15% mark and that the laboratory values remained in the single digits; overall, the numbers remained disappointingly low (see Figure 3). The IT staff provided printouts of rates of documenting the individual metabolic indices for the group as well as for individual psychiatrists. The lead clinician (KNRC) reviewed these outputs on a quarterly basis with individual psychiatrists, encouraging them to improve their performance and went over the remaining issues that presented barriers to the usage and recording of metabolic indices.

One of the main barriers was that the laboratory values were not easily accessible from other electronic databases. Moreover and oftentimes, the laboratory work was done outside the healthcare system and, by the time the results were returned (often, several days later), the doctors typically reviewed and initialed the paper results but would not necessarily remember to edit the previously signed e-MSD document for a particular patient. In such instances, the laboratory data would appear to be "missing" or "not done" for purposes of this data enumeration. Furthermore, careful scrutiny of the data determined that one full-time psychiatrist, who cared for nearly 550 patients in the clinic, was recording only in the 0 to 2% range.

One year post-implementation, the rates for height, weight and BMI were in the 35–41% range, though waist circumference remained at 15%, blood pressure recordings at 18%, and laboratory values were still in the single digit percentages range (see Figure 3). The numbers of encounters were far fewer for this last time period as two full-time clinicians had since left the clinic (one retired and the other moved to another system); nearly 1,000 clinic patients had been cared for by the two of them. Finally, availability of laboratory data in real time was still a challenge.

Additional issues that emerged during the first year of implementation included the need for "double entry" as the "trending" versions were not available in the early e-MSD versions (see Figure 1, Phase 6B). So, for example, doctors who monitored body weight regularly, even before this tool was available, found they were entering weight data not only into the e-MSD document but also elsewhere in the main text of the progress note, especially as they could not track the change in weight from visit to visit using the early version of the e-MSD tool.

Re-Tooling and Interim Solutions

The IT group has since implemented "trending" for BMI, systolic and diastolic blood pressure, waist circumference, glucose and lipid values, such that the first value and the last five recordings in the EHR are graphed for the physician and the patient to visualize on the computer screen during the clinical encounter (see Figure 1, Phase 6B). This has eliminated complaints from clinicians about "double entry," and has led to a more useful tool being available for clinicians and patients. Another major solution has been the hiring of a Patient Care Associate (see Figure 1, Phase 6C) at the end of the first year. One of the key tasks of the Associate

is to invite patients sitting in the waiting area of the clinic to have their height, weight, and blood pressures measured, and also ask questions about tobacco usage and interest in quitting smoking. The Associate records these items on a form, which the patients take with them for review by the psychiatrists at the clinical encounter.

Two-Year Post-Implementation Results

As noted in Figure 3, there has been a doubling in the rates of documentation (75 to 80%) of the anthropometric measures at two years compared to the end of the first year, with the exception of waist circumference. The reason that the waist circumference is recorded at low rates is that with the "Meaningful Use" tracking of data under the Affordable Health Care for America Act (HR 3962), the e-MSD tool has now been merged into a Physical Health Form Tool which tracks "Meaningful Use" core measures for the ambulatory psychiatric clinics, and waist circumference is not a core, but optional, measure for our system. The recordings of lipid and glucose values have improved: i.e., 25% range (a four-fold increase over the previous year), but real-time access to laboratory values remains an unresolved technical challenge. In addition to the hiring of a Patient Care Associate, two newly graduated attending psychiatrists have joined the staff, and are building up their case loads; both physicians are interested in the mental-physical health integration and coordination of care, and this has contributed to a significant improvement in the rates of documentation.

Discussion

What Lessons have been Learned from this QI Project?

A number of resources was brought to bear on this QI project (see Figure 1): 1) the creation of an electronic health record tool with input from frontline clinicians (see Figure 2); 2) the parallel development and release of a CME program; 3) small group discussions with end-users (psychiatrists) before, during and after implementation of this tool; 4) the equipping and training of psychiatrists with weighing scales, waist measurement tapes, sphygmomanometers; and, 5) the piloting of the project in one clinic. Despite this, we saw relatively small gains in screening and recording of the metabolic syndrome measures in the first six months. Careful scrutiny of individual physician data revealed that one psychiatrist, who cared for nearly one-third of the clinic patients, was not engaged or interested in this effort despite one-on-one meetings with the lead clinician. This issue speaks to changing practicing physician habits and what may be the best approaches to achieving such change. We utilized a collaborative rather than a "mandatory" approach but it was not entirely successful in this instance, even though the other practitioners were far more engaged in this initiative, resulting in a doubling of the rates of recording of the anthropometric measures at the one-year mark.

There have been other approaches to monitor healthcare indicators in the SMI population. For instance, the Office of Mental Health in New York State (OMH-NYS) mandated that state-operated mental health outpatient clinics monitor BMI, blood pressure and smoking status; in four months, nearly half the outpatients (7,500 persons) had been screened for these indicators (17). The effort required in the OMH-NYS initiative involved significant organization and administrative support, similar to our experience, albeit ours was on a much smaller scale.

In our QI initiative, the ongoing IT solutions to improve the end-user experience (example: trending the anthropometric and laboratory measures, Figure 1, Phase 6B) helped in making this a more useful tool for psychiatrists and for patients to visualize on the computer screen in real time. However, a major shift in the rates of recording occurred *after* the hiring of the Patient Care Associate (see Figure 1, Phase 6C), as seen in the 75–80% rates of recording at two years (see Figure 3). However, technical issues and other factors have prevented obtaining the glucose and lipid values readily and/or in real time during the clinic visit. Even though the rates of recording of these laboratory measures have improved, they are still in the low 25% range. Problem-solving efforts are ongoing to resolve this issue, especially at an IT level. Another factor that most likely impacted the significant increase in the rates of recording at two years is that two psychiatrists, newly graduated and both interested in the physical/mental health of SMI patients, joined the clinic and were diligent in documenting these measures.

So What! What are the Next Steps?

Does the screening, monitoring, and counseling or referral of patients with SMI who meet criteria for metabolic syndrome actually lead to changes in the physical health outcomes in a positive way?

Reports of metabolic and weight gain concerns with atypical antipsychotic agents began to emerge more than a decade ago (18, 19). These metabolic concerns prompted warnings and precautions to be placed on the package inserts of these agents. Several groups proposed clinical guidelines for monitoring the physical health or metabolic indices among persons with SMI (4, 20, 21). Did the publication and dissemination of such guidance improve the monitor-

ing of these indices among the SMI population? One study suggested that rates of monitoring glucose (27%) and lipid levels (10%) were low and remained low in those starting atypical antipsychotic drugs (5). Furthermore, commercially insured mentally ill populations did not fare better in terms of glucose or lipid monitoring either (6, 7). So, it would appear that simply publishing these guidelines did not significantly impact physician practice (22).

How about an integrated healthcare system such as the Veterans Administration (VA)? Would the VA fare better in terms of monitoring metabolic and physical health indices of SMI patients without the hassles of split care (i.e., medical versus mental health)? One study suggests that this is not entirely the case in the VA system either. Rates of weight and cholesterol monitoring during a three-year period among patients with schizophrenia was low: only 23.5% had both baseline and follow-up total cholesterol measurement, and only 27% had their body weights measured (23). Interestingly, within the VA the starting of a second-generation antipsychotic agent did not predict the monitoring of these parameters, but rather the pre-existing diagnosis of diabetes mellitus or dyslipidemia was associated with an increased likelihood of monitoring (23).

As noted earlier in this article, the e-MSD document has been incorporated into a Physical Health Form (PHF), which is tracking data on "Meaningful Use" core and optional measures for the psychiatric clinics within our healthcare system. Further, we intend to continue to make ongoing improvements to the PHF tool for clinician utility. As noted in Figure 1, Phase 7 involves developing Decision Support reminders for clinicians. For example, if cholesterol or glucose has not been recorded in a year, the electronic reminder will prompt the psychiatrist to counsel the patient, offer a laboratory slip, communicate with the PCP, etc. Phase 8 of the initiative is to consider wellness coaches drawn from peers, or case workers who can be trained for developing wellness initiatives for the SMI population: for examples, healthy dietary choices, exercise, weight reduction and smoking cessation. We hope these steps will address the *"So What and What Next"* questions.

Limitations

Limitations of the QI initiative need to be pointed out. The lack of a baseline rate of recording of individual metabolic indices made us chose an early timepoint (one month post-implementation) as a proxy for the base rate. Further, we did not use a companion clinic within the institute as a "control" to assess the value (or lack thereof) of this QI program. We did not use formal statistical analyses to test for significant increases in the recording of metabolic indices. Laboratory measures—which are critical in tracking some components of the metabolic syndrome—are difficult to obtain in an ambulatory clinic, where patients may have insurance carriers/products that mandate specific laboratories for phlebotomy, and it has been difficult to track the laboratory measures in a significant number of individuals who receive their medical care outside the academic medical center. Finally, due to the turnover of psychiatrists (retirement, move to another system, new hires, etc.) the numbers of subjects tracked for these parameters vary across time.

Conclusions

Antipsychotic drugs notwithstanding, there are several other factors associated with the high rates of overweight/obesity/physical illnesses and metabolic syndrome in patients with SMI (13-15, 24). These include, but are not limited to, poor dietary choices, sedentary lifestyles and very high rates of tobacco usage and the difficulty experienced in quitting smoking (12, 25, 26).

It is pertinent to note that metabolic abnormalities in the SMI patient population may predate the diagnosis and/or treatment of these disorders and cannot always be attributed to treatment alone (27-29).

Several of these are modifiable risk factors and require a concerted, strategic and effective treatment approach on the part of clinicians and systems that provide care to the SMI population. Lifestyle coaching for reinforcing healthy behaviors and disincentivizing unhealthy food habits combined with smoking cessation need to be considered in the management of the SMI patient population. Affordable Health Care for America legislation can provide financial incentives (or penalties) for promoting or neglecting such approaches among service providers but require thoughtful implementation. Communication among various healthcare providers for the SMI patient to realize positive health outcomes by achieving weight loss or smoking cessation and, especially, coordination of such care may benefit from fiscal incentives to healthcare providers and systems. Finally and importantly, QI initiatives such as this are worth implementing if they can help to reverse the alarming mortality statistic in the SMI population.

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Conflicts of Interest

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