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Using Patient-Facing Kiosks to Support Quality Improvement at Mental Health Clinics

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Abstract

Objectives—Evidence-based services improve outcomes in schizophrenia, but most patients at mental health clinics do not receive such services. This gap in care has been perpetuated by a lack of routinely collected data on patients' clinical status and the treatments they receive. However, routine data collection can be completed by patients themselves, especially when aided by health information technology (HIT). It is not known whether these data can be used to improve care quality.

Methods—In a controlled trial, eight medical centers of the Veterans Health Administration were assigned to implementation or usual care. 571 patients with schizophrenia were overweight and had not used evidence-based weight services. The implementation strategy included data from patient-facing kiosks, continuous data feedback, clinical champions, education, social marketing, and evidence-based quality improvement teams. Mixed methods evaluated the impact of the kiosks on utilization of and retention in weight services.

Results—Compared with usual care, implementation resulted in individuals being more likely to use weight services, getting services more than 5 weeks sooner, and using 3 times more visits. When compared to the year prior to implementation, patients at implementation sites saw a three-fold increase in treatment visits. Usual care resulted in no change.

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None for any author.

Conclusions—Mental health clinics have been slow to adopt HIT. This study is among the first to implement and evaluate automated collection of data from patients at these clinics. Patient-facing kiosks are feasible in routine care, and provide data that can be used to substantially improve the quality of care.

Keywords

Health Information Technology; Quality Improvement; Mental Health

INTRODUCTION

Schizophrenia is a chronic serious mental illness (SMI) that occurs in about 1% of the population, and results in substantial morbidity and mortality when poorly treated.¹⁻⁴ Although evidence-based practices improve outcomes and facilitate independence in schizophrenia,⁵ these treatments are not often used.^{3,6} Evidence-based family psychoeducation, for example, has a large effect size in efficacy studies, yet when made available in usual care clinics, is poorly attended.^{7,8} Improving the utilization of services for appropriate patients has been nearly impossible in specialty mental health because existing medical records (including electronic medical records) lack reliable, routinely collected data about patient symptoms, service needs and preferences, and utilization of evidence-based treatments⁹ and clinicians report being too busy to collect these data themselves.¹⁰⁻¹² Collection of such data could allow care quality to be monitored, and improved, by identifying patients who would benefit from a specific evidence-based treatment, fostering access to and monitoring retention in that treatment.¹³ Other medical specialties have successfully used routinely collected patient data to improve care (e.g., Hemoglobin A_{1c} for diabetes), yet mental health clinics have been slow to adopt methods for routine patient monitoring and have not tested whether such data can support quality improvement.¹⁴

Evidence-based quality improvement (EBQI)¹⁵⁻¹⁷ aims to systematically incorporate evidence and data regarding care provision and patient outcomes into quality improvement efforts, and has been utilized to improve care quality for depression.^{18,19} The question of how best to incorporate data—especially patient-centered data—into EBQI efforts targeting those with schizophrenia remains open, and represents an opportunity for HIT. The Institute of Medicine has strongly encouraged the use of HIT to obtain data from patients and then match their needs and preferences to evidence-based services, in order to improve the quality of care.²⁰ Our group has amassed evidence that patients with SMI can complete self-assessments using HIT. In a series of studies, patient-facing kiosks have delivered gold-standard measures to outpatients with SMI and were found to be as accurate as clinician-delivered assessments, as well as reliable, feasible to implement in specialty mental health clinics, and preferred by this population.^{21,22} From our review, though, HIT systems such as patient-facing kiosks have not been used as part of a quality improvement effort in specialty mental health until the current study.

The use of evidence-based weight management services is garnering considerable attention in specialty mental health since up to 75% of individuals with schizophrenia are overweight or obese due to a combination of illness-related factors and use of 2nd generation antipsychotic medications.^{23,24} People with schizophrenia lose 25 or more years of life expectancy, predominantly due to cardiovascular disease.²⁵⁻²⁷ This loss of life expectancy is attributable to obesity, and related diabetes, hypertension, and dyslipidemia, which are 1.5-4 times more common than in the general population.^{28,29} There are effective weight interventions tailored for this population,³⁰⁻³² but these programs are typically implemented in settings where high enrollment and retention rates are ensured (e.g., inpatient wards, day hospitals). In outpatient settings, enrollment and retention rates are consistently low, leading

to an impact less than that observed in efficacy studies, and thereby leaving room for quality improvement.³³

In this article, we report on “Enhancing QUality of Care In Psychosis” (EQUIP) which utilized a Hybrid Type 2 effectiveness-implementation study design. This design balances attention to the effectiveness of the clinical intervention and the implementation strategy that supports the intervention.^{34,35} EQUIP evaluated effectiveness and implementation of evidence-based care for schizophrenia at specialty mental health clinics in the Veterans Health Administration (VHA). The clinical interventions of interest were Supported Employment and psychosocial interventions for weight management; this paper focuses on the latter. The implementation strategy included health information technology (HIT) in the form of routine data collection from patient-facing kiosks; continuous feedback of those data to patients, clinicians and managers; clinical champions; patient and clinician education; social marketing; and evidence-based quality improvement teams. Mixed methods were used to evaluate implementation and effectiveness, relative to usual care. We hypothesized that overweight individuals with schizophrenia at implementation sites would have timelier and greater utilization of weight services compared to similar individuals in usual care.

METHODS

Design

Veterans’ health care in the U.S. is separated geographically into 21 regions known as Veterans Integrated Service Networks (VISNs). This clinic-level controlled trial was conducted in 4 of these VISNs. Leadership in each VISN nominated pairs of specialty mental health clinics. Pairs were matched on academic affiliation (known to affect organizational engagement in quality improvement),^{36,37} and number of patients with schizophrenia. Within each VISN pair, based on the preferences of VISN leadership, one clinic was assigned to implementation and the other to control (usual care), for a total of 4 implementation and 4 control clinics.

The effectiveness evaluation began in January 2008 when patients began enrollment and completed a baseline survey. Patient enrollment lasted an average of 13 months. Final patient interviews began in May 2009. In addition to this assessment, every third patient at implementation sites participated in a short semi-structured interview at post-implementation about the acceptability of the patient-facing kiosks. Utilization of weight management services by each patient was extracted from the electronic medical record for the year prior to baseline and the year of the study.

Participants

Patients were eligible to participate if they: 1) were at least 18 years old, 2) had a diagnosis of schizophrenia or schizoaffective disorder, and 3) had at least two mental health clinic visits during a 6-month eligibility period. From the overall population of eligible patients, a random sample was identified at each site. Probability of inclusion was based on the overall eligible population, desired sample size, and expected non-participation. Eligible veterans were approached in person at clinic visits: 1964 patients were eligible, and 801 of these were contacted and consented to be enrolled (41%). 637 (80%) had a body mass index (BMI) of 25 or greater. Of those 637, 23 were excluded because they were at an implementation site but never used the patient-facing kiosks, and an additional 43 were excluded because they had a weight management visit in the month prior to enrollment, indicating that their utilization of weight services could not be attributed to implementation. Thus a total of 571 individuals (281 implementation, 290 control) were included in the analyses. Of 281 patients

at implementation sites, 83 patients completed the brief post-implementation interview (average of 20 subjects at each site).

Clinicians were eligible to participate if they treated eligible patients. Mental health administrators of the enrolled clinics were also eligible. All clinicians and administrators agreed to participate. Written informed consent was obtained from patients, clinicians, and administrators. The study was approved by the Institutional Review Boards of all applicable sites.

Implementation—Patient-facing kiosks, called the Patient Assessment System (PAS), were placed in the waiting room of each implementation clinic and used for patient self-reporting of clinical status. Kiosks included audio and visual presentation of questions, were designed for people with cognitive deficits or limited literacy, and included a touchscreen monitor, computer, headphones, and a color printer.²¹ A scale was located next to each kiosk. At every clinic visit, before seeing the clinician, patients responded to questions including their current weight, whether they had received a referral to a weight service, and how many weight management visits they had in the past month. Questions were presented visually and orally (see Figure 1). Following the last question, the kiosk immediately printed a Summary Report (see Figure 2), which patients were instructed to take to their clinician that day and use to track their status. The Summary Report included a bar graph showing the patient's current, previous, and ideal weight (corresponding to a BMI of 25). If the individual was overweight, the Summary Report included a page of educational information about weight loss, and "talking points," so that the individual could advocate for a referral to a weight management program. Kiosk data were continuously reported to clinicians, including a nurse care manager at each site, to identify appropriate referrals (anyone with BMI ≥ 25), encourage service attendance, and monitor quality improvement.

The Veterans Health Administration offers weight counseling services through primary care. In addition to these, the EQUIP team developed an implementation toolkit for a weight program to be led by a mental health clinician and delivered in the specialty mental health clinics at each implementation site. The EQUIP Wellness Program was based on "Solutions for Wellness,"³⁸ an evidence-based psychosocial program of weight management topics designed specifically for individuals with cognitive disabilities.

In summary, an EBQI framework that integrated HIT as part of the intervention was utilized at the implementation sites to support the utilization of weight management services. Specifically the strategy included routine collection of data from patient-facing kiosks, data continuously provided to clinicians and administrators, utilization of clinical champions to discuss these data and their relationship to benchmarks, clinician education, automated patient education, social marketing of the EQUIP Wellness Program, and evidence-based quality improvement multidisciplinary teams at each implementation site, some of which worked on barriers to utilization of weight management services.³⁵

Measures

Data from the patient baseline interview were analyzed. Diagnosis was confirmed using an abbreviated version of the Structured Clinical Interview for the *DSM-IV*.^{39,40} Current symptoms were rated using the Brief Psychiatric Rating Scale (BPRS).⁴¹ Demographics, including age, gender, race, marital status, presence of children, and education were collected. Research assistants administered the baseline interview and collected each patient's height and weight. Interviewers were trained to a high level of reliability, and quality assurance checks were completed during the study.⁴¹ It was not possible to blind interviewers to clinic assignment. To reduce bias, interviewers had minimal or no contact with staff involved with study implementation.

Structured chart reviews were completed for each patient using the electronic medical record. Visits that included psychosocial or psychoeducational weight management interventions were counted. The total number of visits for the year pre-baseline and the year post-baseline was computed for each patient.

The semi-structured patient interview guide included questions specific to the patient-facing kiosks, e.g., “Did you enjoy sitting at the computer and answering questions?”; “Did you like having a print-out of what you said? Why?”; “In the future, would you be willing to use a kiosk or computer in the community to provide a report of your symptoms to your doctor? Why would this be a good or bad idea?” The implementation evaluation lead (AH), who is an expert in qualitative data collection and analysis, supervised the research assistants who conducted these interviews.

Data Analysis

All quantitative analyses were conducted using Statistical Software Package SAS Version 9.1.3. Analyses included only those who met the criteria for referral to weight services (BMI ≥ 25), did not have an appointment in the month prior to baseline, and had used the patient-facing kiosks at least once (at implementation sites). Baseline characteristics between implementation and control groups were compared using t-tests for continuous and χ^2 analysis for categorical variables.

Three outcomes were analyzed: 1) presence of a visit for weight management, 2) number of days from baseline to first visit for weight management, and 3) number of visits for weight management within the study year. A logistic regression model was conducted to predict presence of a visit for weight management (yes=1, no=0). Predictor variables were entered by block in the following order: intercept, demographics (age, white race, male gender, years of education), weight category (obese, overweight), and intervention status (control, implementation). A likelihood ratio test was used to test if adding intervention status to the model added significant predictive information, over demographics and weight category.⁴² An odds ratio for intervention status was computed. General linear models (GLM) were conducted to predict the number of days from the baseline to the first visit for weight management and the number of visits for weight management within the study year. Each GLM used the same predictor variables in the same block order as the logistic regression model. The extra sums of squares test was used to determine if each additional block added significant predictive information to the model.⁴² A sensitivity analysis examined the impact of controlling for weight management service use in the year before baseline on all three outcomes. In these additional analyses, the additional covariate was not significant nor did it improve the explanatory power of the model.

Qualitative data (i.e., short answers) from patients were placed in a domain $\times$ respondent matrix by the implementation evaluation lead (AH) and the study co-Principal Investigator (AC), who examined the frequency of positive, negative, and neutral responses and extracted quotes relevant to acceptability of the HIT.

RESULTS

Sample

Characteristics of the 571 participants are shown in Table 1. The average participant was 54 years old, male, either White or African-American, not currently married, and had completed high school or some college. All were diagnosed with schizophrenia. At the baseline interview, the average participant reported having mild psychotic symptoms in the previous week. The majority of the sample had a BMI in the obese range. The only

significant differences between implementation and control were in presence of children and level of education. Level of education was controlled for in all the models.

Visit for weight management

In the year prior to baseline, rates of having at least one weight service appointment were comparable at implementation (13%) and control sites (18%) ($p>.05$) (Table 1). When predicting a weight management visit during the study year, intervention status (control versus implementation) was a significant predictor ($\chi^2 = 10.5$, $p<.01$) after controlling for demographic variables and weight category (Table 2). The likelihood ratio test indicated that this model had significantly more predictive value over a model which only included demographics and weight category ($\chi^2 = 11.1$, $p<.01$). The odds of having a weight service appointment during the study year was 1.9 times more likely if the individual was at an implementation site versus a control site.

Number of days from baseline to first visit for weight management

When predicting the number of days to the first visit for weight management during the study year, intervention status (control versus implementation) was a significant predictor ($t=2.0$, $p=.05$) after controlling for demographic variables and weight category (Table 3). Specifically, individuals at control sites took, on average, 136 days ($SE=17$) to attend their first weight management session, compared to 98 days ($SE=15$) at implementation sites. The model explained 6% of the variance in the number of days to first visit for weight management, which was significantly more explained variance than the model without intervention status ($F(1,143)=4.1$, $p<.01$). Demographic variables and weight category were not significant predictors on their own.

Number of visits for weight management within the study year

Patients who had a weight management visit in the year prior to baseline attended, on average, 3 weight visits at the control sites and 4 weight visits at the implementation sites in that pre-baseline year ($p>.05$) (Table 1). When predicting the number of visits for weight management during the study year, intervention status (control versus implementation) was a significant predictor ($t=-4.6$, $p<.01$) after controlling for demographic variables and weight category (Table 3). Specifically, individuals at control sites attended, on average, 4 ($SE=1$) appointments compared to 12 ($SE=1$) appointments at implementation sites during the study year. The model explained 14% of the variance in the number of weight management visits, which was significantly more explained variance than the model without intervention status ($F(1,146)=21.4$, $p<.01$). Demographic variables and weight category were not significant predictors on their own.

Acceptability of the Patient-facing Kiosks

In terms of acceptability, the majority of patients responded affirmatively that they enjoyed using the patient-facing kiosks ($n=60$; 76%) and liked getting a Summary Report ($n=55$; 71%). Those who found the Summary Report helpful noted that that it helped them visit with their psychiatrist and see their progress “in black and white,” as one patient said. Most ($n=65$; 82%) responded affirmatively that it would be good to use these kiosks in future projects; “sitting at the computer” was noted as one of the highlights of participation in the overall project. Patients noted that kiosk questions promoted self-reflection: “It asked questions that made you think about changing things about yourself;” “It kept me in check with myself;” “I like talking and being heard; I got a lot out of my system;” “The fact that I felt in touch with where I’m at; it helped me connect some dots.”

CONCLUSIONS

The implementation strategy utilized in this study, which included integration of routine data from patient-facing kiosks, resulted in patients being more likely to use weight services, getting to those services more than 5 weeks faster, and staying in services for 3 times as many visits when compared to usual care. Compared to the year prior to implementation, individuals at implementation sites saw a threefold increase in visits, while usual care essentially experienced no change. Sensitivity analyses showed that intervention status (control versus implementation) remained a significant predictor in each model after controlling for weight management service use in the pre-baseline year. It was hypothesized that overweight individuals with schizophrenia at implementation sites would have timelier and greater utilization of weight services compared to similar patients in usual care; this hypothesis was supported.

To the best of our knowledge, this is the first study that increased utilization of weight management services for individuals with schizophrenia in typical specialty mental health clinics. This result is a critical improvement in care for individuals with schizophrenia suffering from obesity and obesity-related illnesses. The EQUIP study was successful in using an implementation strategy, including health information technology that automated routine data collection. The patient-facing kiosks provided the data needed for routine measurement of care quality and identification of patients' service needs, allowing clinics to narrow the gap in receipt of weight management services by overweight patients. These data were used by patients to monitor their own progress and to communicate their preferences and concerns to their clinician; by clinicians to identify, refer, and encourage patients to use services; by administrators to identify service needs and engage in quality improvement; by clinical champions to discuss improvements in relation to benchmarks; and by local evidence-based quality improvement teams to measure progress towards improved care quality goals. The patient-facing kiosks also provided a means by which care became more patient-centered through printed patient reports, which informed the clinical encounter, allowed monitoring of progress toward measurable goals, and fostered patient education and activation. It is also likely that other aspects of the implementation strategy contributed to this significant improvement in weight service utilization including clinician education and social marketing of the weight groups. Consistent with previous findings in a smaller scale study,²² the patient-facing kiosks in this study were found to be acceptable to patients in this large sample.

The strength of this study is the positive impact of health information technology on the quality of care, specifically in the high priority area of overweight and obesity in individuals on antipsychotics, at typical VHA outpatient specialty mental health clinics. This study demonstrates that implementation that includes routine, electronic collection of patient data can be used to support evidence-based quality improvement. Patient-facing kiosks were easily worked into routine care flow at mental health clinics. Patients liked using them and saw their value. These same methods could likely improve care in other settings, whether in the VHA or the community. Future implementation research should examine the use of kiosks with other disorders, including bipolar disorder, depression, and anxiety disorders. Based on feedback from study patients, it could be desirable to also provide education using the kiosks, in addition to assessments. This approach could increase the effectiveness of the kiosks, and perhaps strengthen treatment engagement by patients. While it is possible to use free-standing kiosks, as we did in this study, implementation would be strengthened by integration with electronic medical record systems, where they exist. Subsequent to this study, we worked with VHA to integrate this kiosk data with the existing electronic medical record, producing note templates with data for clinicians, and data tables for quality improvement and performance measurement. It is clear that individuals with serious mental

illness are able to routinely provide information using HIT in the form of kiosks used to improve their treatment and outcomes as a critical component of a quality improvement program aimed at weight management.

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The screenshot displays the EQUIP2 Patient Assessment System interface. At the top, the title "EQUIP2 Patient Assessment System" is on the left, and "I'm Finished" and "HELP" buttons are on the right. The main content area has a yellow background and contains the following text: "» How many times in the **PAST MONTH** did you attend wellness or weight loss groups?" followed by "Use your finger to choose the number of wellness or weight loss groups you attended." Below this is a numeric keypad with buttons for digits 0 through 9 and a "Delete Number" button. Under the keypad, there is a line with two underscores followed by the text "group(s) in the last month". At the bottom of the interface, there are four buttons: "back", "NEXT", "repeat", and "skip".

Figure 1.
Example question from the patient-facing kiosk

Patient Assessment System Report

Results from today's assessment for MLM (Friday, April 25, 2008)

WORKING FOR PAY

You have reported that you are not working but might like to.

WHAT YOU CAN DO

You should discuss with your doctor a referral to a new VA program that helps people find and keep jobs.

YOUR WEIGHT

Your Body Mass Index (BMI) is 40.1. That means, for your height, you are overweight.

WHAT YOU CAN DO

- Talk to your doctor about a referral to your local wellness program. That program can help you lower your BMI by helping you to eat a balanced diet and get enough exercise.

How you are doing with.....

Figure 2.
Example of patient-facing kiosk Summary Report

Table 1

Demographic characteristics of patients

	Sample (n=571)	Implementation (n=281)	Control (n=290)	Test Statistic t score or χ^2
<i>Demographics</i>				
Age	54 (SD=9.1)	54 (SD=9.2)	54 (SD=9.0)	0.96
Male	518 (90.7%)	260 (92.5%)	258 (89.0%)	2.15
Race				5.02
Caucasian	255 (44.6%)	133 (47.3%)	122 (42.1%)	
African American	261 (45.7%)	116 (41.3%)	145 (50.0%)	
Other	55 (9.6%)	32 (11.4%)	23 (7.9%)	
Marital Status				
Presently Married	133 (23.3%)	61 (21.7%)	72 (25.0%)	0.77
Has Children	295 (51.7%)	133 (47.3%)	162 (55.9%)	4.16*
Education				8.77*
Less than high school	52 (9.1%)	35 (12.6%)	17 (5.9%)	
High school graduate or some college	388 (68.1%)	190 (67.6%)	198 (68.5%)	
College graduate or higher degree	130 (22.8%)	56 (19.9%)	74 (25.6%)	
<i>Clinical Characteristics</i>				
Psychosis symptom severity (BPRS)	2.7 (SD=1.8)	2.7 (SD=1.8)	2.7 (SD=1.8)	1.00
BMI category				0.71
Overweight (BMI 25.0 - 29.9)	254 (44.5%)	120 (42.7%)	134 (46.2%)	
Obese (BMI ≥ 30.0)	317 (55.5%)	161 (57.3%)	156 (53.8%)	
<i>Service Utilization</i>				
Number of subjects who had at least one weight management visit in year prior to baseline	88 (15.7%)	36 (13.0%)	52 (18.3%)	2.93
Mean weight service appointments in the year prior to baseline (of those who had at least 1)	2.9 (SD=4.5)	3.5 (SD=6.6)	2.5 (SD=2.1)	-0.83

* $p < 0.05$; BMI=Body Mass Index; BPRS=Brief Psychiatric Rating Scale

Table 2

Variables affecting receipt of a weight management visit during implementation

	Presence of a visit for weight management		
Variable	<i>B</i> (SE)	χ^2	P
Intercept	0.34(0.73)	0.22	0.65
Demographics			
<i>Age</i>	-0.01(0.01)	0.43	0.50
<i>White race</i>	-0.04(0.20)	0.03	0.86
<i>Male gender</i>	-0.56(0.32)	3.02	0.08
<i>Years of education</i>	0.09(0.08)	1.33	0.25
Weight category (obese versus overweight)	0.09(0.20)	0.21	0.65
Intervention status (control versus implementation)	-0.65(0.20)	10.53	<0.01

Table 3

Variables affecting receipt of weight management services during implementation

Variable	Number of days from baseline to first visit for weight management				Number of visits for weight management within the study year			
	B(SE)	t	p	R ²	B(SE)	t	p	R ²
Overall Model	F(6, 143)	1.4	0.22	0.06	F(6, 146)	4.0	0.00	0.14
Intercept	121.8 (65.9)	1.9	0.07		14.8 (5.6)	2.7	0.01	
Demographics								
<i>Age</i>	0.4 (1.0)	0.4	0.69		-0.1 (0.1)	-0.7	0.50	
<i>White race</i>	-10.8 (17.5)	-0.6	0.54		0.2 (1.4)	0.1	0.90	
<i>Male gender</i>	0.9 (26.6)	0.03	0.97		-2.9 (2.1)	-1.4	0.18	
<i>Years of education</i>	-8.0 (7.0)	-1.1	0.26		0.6 (0.6)	1.0	0.33	
Weight category (obese versus overweight)	-30.0 (17.3)	-1.7	0.09		-1.6 (1.5)	-1.1	0.28	
Intervention status (control versus implementation)	36.0 (17.6)	2.0	0.05		-6.8 (1.5)	-4.6	<.01	