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Quality, Utilization, and Economic Impact of a Statewide Emergency Department Telepsychiatry Program

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Abstract

Objective—This study estimates the impact of a statewide centralized emergency department telepsychiatry service provided in non-psychiatric emergency departments on use of mental health services.

Methods—Individuals treated via telepsychiatry were compared to a matched sample of individuals with mental health diagnoses who were treated in non-participating hospitals. Bivariate and two part and generalized linear regression models were used to assess differences in outpatient follow up, admission following the emergency department visit, length of stay, inpatient and total costs between the two groups.

Results—Between March 2009 and June 2013 there were 9,066 patients with at least one telepsychiatry visit. Of these, 7,261 had index telepsychiatry visits which we were able to successfully match. The telepsychiatry group was more likely to receive 30 day outpatient follow up than the matched controls (46% versus 16%, p,.001) and more likely to receive 90 day outpatient follow up (54% versus 20%, p<.001). Those receiving telepsychiatry were less likely to

be admitted to the hospital at the index emergency department visit than the control group (11% versus 22%). The combined effect of having a telepsychiatry consult during the index emergency department visit was a 0.86 day reduction in inpatient length of stay associated with receiving telepsychiatry care. 30-day inpatient costs were $2,336 (p=0.04) lower for the telepsychiatry group. 30-day total health care costs were not statistically different.

Conclusions—Telepsychiatry delivered in the emergency department through a centralized coordinated program has great promise for improving linkage with outpatient mental health services while reducing inpatient utilization and hospital costs.

Emergency department (ED) use for routine care strains the health system by increasing costs, raising pressures to admit patients for inpatient care, and reducing the EDs' capacity to care for true emergencies.[1] Persons with mental disorders account for a large and growing portion of ED visits in the United States. Between 1992 and 2001, there was a 29% increase in the proportion of ED visits related to mental health.[2] Estimates from nationally representative data suggest poor or fair mental health leads to a 1.7 times increase in odds of being a frequent user of EDs (4 or more visits). [3]

Persons seeking mental health services in EDs face challenges both in obtaining high quality care in the initial ED visit and in follow-up care after discharge. A 2005 survey by the American College of Emergency Physicians found that ED personnel feel unequipped and insufficiently trained to address mental health issues.[4] Lack of access to mental health personnel limits ED capacity to manage complex behavioral problems, which has consequences for the patient and the system.

To address these issues, the South Carolina Department of Mental Health (SCDMH) launched a telepsychiatry intervention program in 2009. Previous research had demonstrated that only 32% of South Carolina's EDs had a psychiatric emergency service.[5] The overarching goal of this initiative was to ensure that EDs can reach an available psychiatrist whenever needed. The program provided emergency facilities with access to a larger pool of psychiatrists for consultation using telecommunications, addressing physician and psychiatrist shortages in the state that were limiting psychiatric service access in many EDs.

In this paper we evaluate the impact of the SCDMH telepsychiatry intervention by comparing the telepsychiatry recipients to a group of patients with the same mental health conditions and demographic characteristics but were treated in hospitals that did not have telepsychiatry. Our hypotheses are that the intervention would increase access to outpatient follow up care while reducing overall hospital based service use through improved triage and mental health treatment.

METHODS

Telepsychiatry Program Description

In 2009 eighteen hospitals enrolled their EDs in a telepsychiatry program coordinated by the SCDMH. Participating hospital EDs were recruited by personal communication and by distributing DVDs that explained the videoconferencing system, the training and credentials of the telepsychiatrist and the goal of the collaborative treatment. Site visits by project

leadership team members were also conducted to provide opportunities to discuss the program and resolve any concerns with ED staff.

The telepsychiatry program employed six full-time telepsychiatrists and one part-time telepsychiatrist, all supervised by a lead psychiatrist. This staff provided 24-hour, 7-day per week coverage for all of the participating EDs in the state from a dedicated telepsychiatry hub in Columbia, SC. Each telepsychiatrist was board certified in the State of South Carolina, had at least one year of clinical experience in emergency psychiatry, and was credentialed and privileged in accordance with the Joint Commission on Accreditation Standards.

Telepsychiatrists were recruited throughout the state by contacting schools of medicine. DVDs are used for recruitment and training. The recruitment DVD discussed advantages and disadvantages (such as isolation and working nights, weekends, and holidays) of being a telepsychiatrist, explained how the system worked, and explained privileges and credentialing requirements for different hospitals and availability of the lead psychiatrist. Once recruited, telepsychiatrists were required to complete six hours of clinical review on training DVDs, which were supplemented with handouts, before they began seeing telepsychiatry patients. The training program addressed how to adapt basic ED psychiatry skills to a distance telepsychiatry intervention modality. The course was developed based on standard competencies for telepsychiatry described by Shore et al.. [6] Topics included suicide assessment; addressing violent or agitated patients; overdose; medical issues; substance abuse; management of emergencies in special populations (children and geriatric); and medical legal issues including civil commitment and duty-to-warn regulations.[6] The training also addressed how to use telehealth equipment, documenting via electronic medical record and accessing laboratory values and mental health clinic databases. Subsequently, peer review was conducted every two weeks for the telepsychiatrist's first three months; the lead psychiatrist met with other physicians to discuss the consultation, diagnosis and treatment recommendations.

The ED telepsychiatry system used real time video telecommunications bandwidth to transmit information without loss or distortion. Information technology (IT) support, also under the purview of the steering committee, assured that the telepsychiatry equipment is optimized for picture quality and sound to facilitate the best clinical experience.

Telesychiatry ED Visit Process

When a psychiatric consult was needed at participating EDs, the ED triage nurse or physician on duty completed an online ED intake form, describing the patient's diagnoses, address, current lab values, vital signs, and the reason for the consultation. In addition to information from the ED intake form, consulting telepsychiatrists had information from the medical health record, which provides real-time information on diagnoses, physical health issues, past emergency behavioral health services, and information on filled prescriptions.

Prior to the patient interview, the telepsychiatrist reviewed the ED intake form and information from the health record, and conducted a standard history and mental status examination with the patient via teleconferencing. Standard labs such as CBC/electrolytes

and a substance abuse screen were recommended for all patients. Family members or caretakers were allowed to participate in visits with the patient's permission; both the ED physician and psychiatrist involved families whenever possible. For visits occurring during regular working hours, the psychiatrist obtained permission to contact the patient's primary mental health provider (if applicable) to obtain information about the patient's current mental health treatment and status.

The information collected was synthesized into a treatment plan which included recommendations for acute management in the ED. Upon assessment completion, the telepsychiatrist transmitted a signed consultation recommendation to the ED. After the onsite ED staff instituted the treatment plan, the psychiatrist could have had a second visit/consult with the patient if warranted. Generally this was to reevaluate any subsequent lab values and notes written in the ED. Based on any new information, the psychiatrist helped set a disposition plan with the ED and outpatient mental health team. The psychiatrist was then responsible for providing a full written assessment along with initial medication treatment recommendations, which were included as part of the patient's chart after admission.

If the plan was for discharge to the community, the psychiatrist notified the facility that was the patient's usual source of mental health care. If the patient did not have a usual source of mental health care, the psychiatrist worked with the ED team to schedule an appointment for the patient at the nearest public facility that accepted the patient's insurance (e.g. a CMHC). The psychiatrist's formal consultation form included: Multiaxial diagnosis and reason for presentation, History and mental status examination, Course of care and treatment during the ED stay, Medications on discharge, Recommendations for ongoing psychopharmacological treatment, Recommendations for other psychological or rehabilitative therapies, and recommendations for any social/logistical support (e.g. transportation) needed to ensure appropriate access to outpatient services.

Statistical Analysis

The data on patients who received telepsychiatry services was linked to patient data from the South Carolina Office of Research and Statistics (ORS) data warehouse to assess healthcare utilization. State legislation requiring reporting of both private sector and public sector client-level data, including all-payer healthcare claims data, ensures that the data are comprehensive and complete. The current data warehouse includes information from private sector systems (e.g., hospitals, surgery centers, home health), state agency systems (e.g., Medicaid, mental health, substance abuse, criminal justice), and not-for-profit systems (e.g., free clinics, community health centers). Data usage approvals for the project were obtained from participating providers from whom the data originated. All data linkages were performed at ORS and a de-identified dataset was used for the analyses.

From the ORS administrative claims database we also created a matched sample of patients who were seen in EDs in South Carolina that did not participate in the telepsychiatry intervention. We matched based on age at the time of visit, sex, race, and psychiatric diagnosis, whether they had a psychiatric condition related ED visit in the preceding year, and whether they were treated in the ED on a weekend using an exact matching approach. In

matching we only considered visits to non-intervention EDs where the patient had a psychiatry diagnosis in the first two diagnosis fields on the administrative claim record. The exact matching approach and restriction on which field in the claim the psychiatric diagnosis had to occur was to ensure we were comparing patients with similar psychiatric treatment needs to those who were treated using telepsychiatry.

We performed both bivariate and adjusted regression analyses to test for differences in a multiple resource use and quality outcomes. These outcomes included outpatient psychiatric follow up at 30 and 90 days which was identified through as an outpatient, non-emergency department visit to any provider for psychiatric care, probability of admission from the emergency department including if the patient was transferred to another facility and admitted within 24 hours, length of inpatient stay if admitted, all inpatient charges, and all hospital based charges (ED and inpatient) incurred in treating the patient within 30 days of their initial hospital visit in which they received telepsychiatry or were identified as a match in the case of the control sample patients.

We used logistic regression models used to examine outpatient follow up at 30 and 90 days after the index visit, and these models include hospital random effects to account for the hierarchal nature of the data. We modeled inpatient admission and length of stay conditional upon admission and inpatient cost models using a two part regression modeling approach as has become standard in the health services literature for outcomes with a high proportion of zeroes.[7–9] When examining admission and length of stay, the first part of our two part model was a logistic regression predicting admission immediately subsequent to the ED visit, and the second part was modeled using a poisson distribution with a log canonical link. When examining inpatient costs, the first part of the model was the same, but the second part was modeled using a generalized linear model with a gamma distribution and a log link.[9] When looking at total 30-day total healthcare costs, we simply used a generalized linear model with a gamma distribution and log link because there were no zeroes, as each patient incurred costs for the initial ED visit at a minimum.[9]

All regression models were adjusted for whether the visit was a weekday or weekend visit. Standard errors in all models were clustered at the hospital level to account for potential intracluster correlation which could give rise to incorrect statistical inference. All analyses were performed using STATA v13. This study was reviewed and approved by the IRBs at the University of South Carolina and Emory University

RESULTS

Between March of 2009 and June of 2013 there were 9,066 telepsychiatry patients with at least one telepsychiatry visit. Of these, 7,261 had index telepsychiatry visits which we were able to successfully find a matching patient who had psychiatry related ED visit at a non-intervention hospital in South Carolina. The descriptive characteristics for the telepsychiatry patients we were able to identify matches for (N=7,261), the matched controls (N=7,261), and those telepsychiatry patients who we were unable to match (N=1,805) are in table 1. The average age of those that are included in the analyses was 35.7 years, with 49.8% being female, 73.1% being white, 23.8% being black, and 38.6% being weekend visit. In the

unmatched group the average age was 37.5 years, 47.5% were female, 71.1% were white, 28% were black, and 38.2% of the admissions occurred on a weekend.

Bivariate results for the outcomes in the matched sample are in table 2. Those treated at telepsychiatry hospitals were more likely than those treated at hospitals that did not have telepsychiatry to receive 30 day outpatient follow up (46% versus 16%; p<.001) and 90 day outpatient follow up (54% versus 20%; p<.001). Those receiving telepsychiatry were less likely to be admitted (11% versus 22%; p<.001). Total 30 day inpatient charges were lower among those receiving telepsychiatry ($8,290 versus $11,224; p<.001) and total 30 day total healthcare charges were also lower among those receiving telepsychiatry ($12,634 versus $14,052; p=.001).

Adjusted results for the utilization outcomes in the matched sample are in table 3. The models were adjusted for patient age, sex, race, and are modeled using hospital random effects. The odds of 30 day outpatient follow up were higher among those receiving telepsychiatry (OR=5.48; p<.001). Similarly, the odds were higher for 90 day outpatient follow up (OR=5.68; p<.001).

As noted above, the inpatient length of stay for the index visit was estimated using a two part model. Those who received telepsychiatry were less likely to be admitted at the index visit than those in the control group (OR=0.41; p=.022). The length of stay conditional upon being admitted was .43 days lower (p=.003) in the telepsychiatry group. Thus the combined effect of having a telepsychiatry consult during the index ED visit was a .86 day reduction in inpatient admission length of stay associated with being treated using telepsychiatry.

Inpatient costs in the 30 days following the ED index visit were $2,336 lower (p=.041) among those receiving telepsychiatry (Table 4). However, total health care costs in the 30 days following the index visit were not statistically different, though the point estimate of the effect was negative.

DISCUSSION

In this study we tested the hypothesis that a statewide ED based telepsychiatry program would result in better rates of outpatient follow-up and reduced inpatient service use and cost. Specifically we examined whether those receiving telepsychiatry consults in participating hospitals in South Carolina were more likely to receive follow up outpatient care, and whether their hospitalization rates and 30 day costs of care were lower. In comparing those treated in telepsychiatry to a matched sample of individuals treated at hospitals not participating in the intervention, we found that the telepsychiatry patients were more likely to get follow up, less likely to be admitted to the inpatient setting at their ED visit, had a lower length of stay at that visit, and had lower overall 30 day inpatient costs.

These findings are important for two major reasons. First, from a system wide perspective, persons with mental disorders account for a large and growing portion of ED visits in the United States. [10] Lack of access to mental health personnel may particularly limit Emergency Department capacity to manage complex behavioral problems and ensure

effective mental health follow-up after discharge. [5,11] Our results suggest that telepsychiatry may be an effective way to address this problem in the ED.

Second, and arguably more important for patients in need of mental health care, these shortages of psychiatric practitioners and lack of ED expertise in mental health may reduce opportunities for appropriate evaluation and follow up. [4] Given challenges in recruiting mental health providers to live and work in underserved and rural communities, telepsychiatry has been proposed as a promising approach to expanding emergency departments' capacity to treat mental disorders. [6,12] However, little research has been conducted examining the potential impact of emergency telepsychiatry on costs and outcomes of care. A recent review of the telepsychiatry literature[13] found only one case study [14] and one state foundation report[15] describing telepsychiatry programs based in emergency departments; each found that the programs could be feasible and acceptable to clinicians and patients, but did not report clinical or health services outcomes of the programs. Our findings indicate ED based telepsychiatry has the potential to improve quality and reduce, or at most yield no difference, in health care resource use.

Our study does have limitations. The intervention was not randomized by patient, nor were hospitals randomized to participation. We sought to address this issue by selecting controls matched on key characteristics, however, they may have differed from the intervention group based on unmeasured factors. In addition, there may be hospital characteristics that drove both participation in telepsychiatry and also lead to better performance and lower cost, which could bias our estimates. We assess resource use using utilization and charges, and the latter are typically higher than actual costs. Charges for the telepsychiatry consult were not available, though it is unlikely that it would have fully offset the inpatient cost or resulted in the total 30 day episode being statistically more expensive for the intervention group. In addition, there may be other types of unbilled care which we fail to capture. Finally, 1,805 of the 9,066 patients were unable to be matched to a patient treated at a non-telepsychiatry hospital based on our preferred method. When we include these individuals in sensitivity analysis of adjusted models, the results are qualitatively the same and quantitatively very similar except for the inpatient cost difference, which is $752 smaller in magnitude and not statistically distinguishable from zero.

These limitations notwithstanding how was this ED-based telepsychiatry intervention able to reduce both the probability of admission and length of stay conditional upon admission?

Recent research from the general medical field suggests that rather straightforward changes in the organization and delivery of ED based care can lead to reduced inpatient admissions and more rapid care delivery and thus reap substantial savings among medicine (as opposed to surgical) patients.[16] Much of this change involves treating the right patient with the right service at the right time through the adoption of dedicated protocol-driven services.[16] Telepsychiatry represents a similar change in thinking regarding the process of care for patients in the ED. The program was centrally controlled, and thus allowed for some degree of protocols to be put in place among providers. Also, it represented a dedicated service, with physical space carved out and specific information technology resources made available at each participating hospital, thus emphasizing an organizational commitment to

improving care. Finally, the program took advantage of economies of scale and of knowledge of system resources that was embedded in the coordinating agency, which in this case was the SCDMH.

CONCLUSION

We examined the potential for a statewide ED based telepsychiatry program to improve quality and reduce resource use in South Carolina. We found that having a telepsychiatry visit increased outpatient follow up and may have even reduced resource use. More research is needed into the potential for telepsychiatry to improve ED based behavioral health care, the sustainability of such initiatives, and the key implementation issues.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics of Emergency Department Telepsychiatry Patients Treated in South Carolina from March 2009–June 2013 and Matched Controls

	Telepsychiatry recipients* N=7261		Matched control sample N=7261		Unmatched recipients N=1805	
	Mean (stdev)	%	N (st dev)	%	N (st dev)	%
Age	35.7		35.7		37.5	
	(14.9)		(14.9)		(13.6)	
Female	3, 619	49.8	3, 619	49.8	857	47.5
White	5,313	73.1	5,313	73.1	1,284	71.1
Black	1,728	23.8	1,728	23.8	506	28
Weekend Admission	2,806	38.6	2,806	38.6	690	38.2
Emergency Department visit in the year preceding index	3,195	44	3,195	44	650	36
Schizoprenia	1003	13.8	1003	13.8	397	22.0
Bipolar Disorder	713	9.8	713	9.8	220	12.2
Major Depression	2779	38.3	2779	38.3	556	30.8
Substance Abuse	1118	15.4	1118	15.4	325	18.0
Organic	214	2.9	214	2.9	43	2.4
All other	1434	19.8	1434	19.8	264	14.6

* This is the group of patients who received telepsychiatry for which we were able to identify the patients with the same characteristics treated at non-telepsychiatry using emergency departments. Schizophrenia: dx in: 295 & 298; Bipolar Disorder: dx in: 296.0, 296.1, 296.4, 296.5, 296.7, 296.8; Major Depression: dx in 296.2, 296.3, 311, 300.4; Substance Abuse: dx in 303, 304, 305; Organic: dx in 290, 291, 292, 293, 294; All other (including all 290–319 not in above lists and poisonings)

Table 2

Bivariate Analysis of Emergency Department Telepsychiatry Patients Treated in South Carolina from March 2009–June 2013 and Matched Controls

	Telepsychiatry recipients* N=7,261		Matched control sample N=7,261		Unmatched recipients	
	Mean	St Dev	Mean	St Dev	Mean	St Dev
Admitted following index ED visit	11	31	22	42	24	32
LOS at index visit (in days, including those not admitted as 0)	0.43	2.05	1.35	5.81	1.66	2.17
LOS (in days, conditional on being admitted)	3.96	5.00	6.07	11.08	4.05	5.06
30-day outpatient follow up	46	49.8	16	36.3	47	49.9
90-day outpatient follow up	54	49.8	20	39.7	62	48.5
Inpatient charges in the 30 days following index ED visit	$8,290	18,827	$11,224	34,709	$12,985	32,006
Total healthcare charges in the 30 days following index telepsychiatry visit, index visit included	$12,634	19349	$14,052	34518	$18,741	32,374

ED: Emergency Department, LOS: Length of Stay

* This is the group of patients who received telepsychiatry for which we were able to identify the patients with the same characteristics treated at non-telepsychiatry using emergency departments.

Table 3

Adjusted Utilization Outcomes for Emergency Department Telepsychiatry Patients Treated in South Carolina from March 2009–June 2013 relative to telepsychiatry non-recipient controls (N=7,261)

Outcome:	Estimated effect of telepsychiatry	95% CI	p-value
Odds ratio of admission (OR)	.41	.19 – − .88	.022
LOS (days)	−.43	−.71 – − .14	.002
Combined effect (days)	−.86	−1.27 – − .45	<.001
30-day outpatient follow up (OR)	5.44	4.40 – − 6.72	<.001
90-day outpatient follow up (OR)	5.65	4.60 – − 6.93	<.001

OR: odds ratio

p-values are derived from robust standard errors clustered at the hospital level (61 clusters)

All models include hospital random effects and are adjusted for weekend versus weekday visit, sex, age, and race.

Table 4

Adjusted Charges Outcomes for Emergency Department Telepsychiatry Patients Treated in South Carolina from March 2009–June 2013 Relative to Matched Controls (N=7,261)

Outcome:	Estimated effect of telepsychiatry	95% CI	p-value
Inpatient charges in the 30 days following index ED visit	−$2,338	−$4,582 – −$94	.041
Total health care charges in the 30 days following index telepsychiatry visit, index visit included	−$649	−$3,221 – $1,902	.614

p-values are derived from robust standard errors clustered at the hospital level (61 clusters)

All models include hospital random effects and are adjusted for weekend versus weekday visit, sex, age, and race.