Published in final edited form as:

Community Ment Health J. 2020 October ; 56(7): 1311–1317. doi:10.1007/s10597-020-00645-0.

The Effects of an Enhanced Primary Care Model for Patients with Serious Mental Illness on Emergency Department Utilization

Connor Belson¹, Dr. Brian Sheitman², Dr. Beat Steiner²

¹University of North Carolina School of Medicine, Chapel Hill, North Carolina

²University of North Carolina at Wakebrook, Raleigh, North Carolina

Abstract

Objective: Patients with Serious Mental Illness (SMI) have high rates of emergency department visits and high premature mortality rates, often due to poor primary care. A model of enhanced primary care services integrated in a behavioral health location is being implemented and studied at the UNC WakeBrook Primary Care Center (UNCWPC).

Methods: This research was conducted as a retrospective cohort study. ED Visit Utilization before and after establishing care at UNCWPC were calculated for a cohort and a subset of patients.

Results: There was a decrease in ED utilization after years 3–4 of enrollment for physical health complaints for the overall cohort (n=101), from 3.23 to 1.83 visits/person/year, and for patients with multiple physical comorbidities (n=50), from 4.04 to 2.48 visits/person/year.

Conclusions: This study indicated that an enhanced model of primary care can help decrease ED utilization for primary care conditions. The decline was not seen until the patients were well-established.

Background/Introduction

The diagnosis of a serious mental illness (SMI), which typically includes psychotic disorders, bipolar disease, and major depression, has wide-ranging effects on individuals, families, communities, and the health care system. Approximately 10.4 million American adults, or 4.2 percent of the population, suffered with SMI in 2016.¹

Terms of use and reuse: academic research for non-commercial purposes, see here for full terms. <https://www.springer.com/aam-terms-v1>

Corresponding Author Name: Connor Belson, Contact Information: connor_belson@med.unc.edu, Telephone: (443)-812-3304.

Publisher's Disclaimer: This Author Accepted Manuscript is a PDF file of an unedited peer-reviewed manuscript that has been accepted for publication but has not been copyedited or corrected. The official version of record that is published in the journal is kept up to date and so may therefore differ from this version.

Compliance with Ethical Standards: This study was reviewed and approved by the University of North Carolina IRB for human subjects research (Approval date: 3/19/2018, Study Number: 18–0072)

Disclosure: The corresponding author reports a grant from the National Institute of Health to conduct the research. The corresponding author states that there is no other conflict of interest to reveal in this study.

Patients with SMI have a significantly higher number of emergency department (ED) visits than does the general population.² However, many of these ED visits are considered preventable because they can be managed effectively in an outpatient setting.³ In general, high emergency department usage for patients with defined chronic conditions may identify quality-of-care problems as well as healthcare access issues, such as to adequate insurance or to the appropriate level of services, and may contribute to the mortality gap for patients with SMI in particular.³ Such patients have a life expectancy that is 12–25 years shorter than the general population.^{4,5} A majority of deaths are due to poorly-managed chronic physical medical conditions, such as cardiovascular diseases, respiratory diseases, diabetes, and hypertension.^{4–7}

New collaborative care models have been designed as a means of improving patient care for people with mental illness based on the patient-centered medical home (PCMH). The PCMH model incorporates six main ideals related to patient care—that care is patient and family centered, continuous, comprehensive, accessible, coordinated, and accountable.^{8,9} The core principles of these models for patients with SMI are the colocation of behavioral health care in primary care settings and the provision of additional services, such as care management, self-management support, and peer support.^{10,11} Studies of the Improving Mood-Providing Access to Collaborative Treatment (IMPACT) collaborative care model indicate that integration of physical and mental health services can improve patient clinical outcomes and can lead to lower rates of emergency department and hospital encounters for patients with anxiety and depression.^{12,13} Additionally, results of a small, comparative effectiveness study through the SAMHSA Primary and Behavioral Health Care Integration (PCBHI) Grant Program indicated that consumers served by integrated clinics showed improvements on some physical health indicators, such as dyslipidemia, hypertension, and diabetes.¹⁴ However, these models have not been well-studied for patients with SMI with regards to ED utilization.

A model that incorporates additional enhanced primary care for patients with SMI has been implemented at The University of North Carolina WakeBrook Primary Care Office (UNCWPC) to address this need. Preliminary data suggests improvement in some measures of physical health outcomes for patients at UNCWPC, which could potentially impact ED utilization as well.⁸ This study examined whether the model of enhanced primary care adopted by UNCWPC affected ED utilization for patients with severe mental illness. It also aimed to address whether ED utilization differed for patients who had several existing physical health comorbidities within the first four years after establishing care.

Materials and Methods

Study Population:

The University of North Carolina WakeBrook Primary Care Office (UNCWPC) is an accredited NCQA level 3 patient centered medical home co-located within a psychiatric facility. The WakeBrook Campus currently consists of two buildings. Located within one building are the WakeBrook Facility-based Crisis Service, the WakeBrook Alcohol and Drug Detoxification Unit, Crisis and Assessment Services, and the primary care office. The UNC Hospitals at WakeBrook's 28-bed inpatient psychiatric unit is located in the second building.

¹⁵ UNCWPC offers additional health behavior counseling, peer support, and social work services to its patients.^{8,16} Patients are referred from community behavioral health teams, including Assertive Community Treatment teams and university and community psychiatric clinics, and the clinic provides broad-scope primary care. Patient adherence to the care provided by the team is encouraged and implemented by maintaining an appropriate panel size that allows for sufficient visits per year and time per visit for proper care with each patient and developing the strong therapeutic relationships that build and maintain necessary trust, as well as by maintaining close working relationships and open and ongoing dialogue with the psychiatric providers of the patients.⁸ This was a single site study, with the study population including Medicaid adults over the age of 18 with severe mental illness (SMI) who are established patients at UNCWPC and had at least one ED visit during the study period. Only Medicaid patients were included in the study in order to utilize the Community Care of North Carolina's (CCNC) claims data for Medicaid patients, which provides ED visits that occurred at emergency rooms both inside and outside of the University of North Carolina system, which subsequently helped to provide a more comprehensive analysis of ED utilization. It should be noted that the state Medicaid program's eligibility criteria remained the same throughout the study period. Established care was defined as having had at least one visit at UNCWPC in the 18 months period from December 1, 2016 through May 31, 2018. Severe Mental Illness (SMI) was defined as having an active diagnosis of a psychotic disorder, bipolar illness, or major depression. Psychotic disorders were defined as both schizophrenia and schizoaffective disorder.

Study Design and Data:

This research was conducted as a retrospective cohort study over the period of time from September 1, 2014 to May 31, 2018. This date range was selected because of the availability of complete claims data for ED visits for Medicaid patients from Community Care of North Carolina (CCNC). ED visit reports were used to identify all Emergency Department visits over the study period for the patient panel. Data from the CCNC claims reports also classified visits as either emergent or non-emergent, and therefore potentially preventable, based on an algorithm developed by New York University School of Medicine.¹⁷ Inclusion criteria was limited to ED visits that did not result in admission to the hospital to focus on potentially preventable ED encounters. Data from CCNC was used to determine enrollment in Medicaid and ED utilization. Data was also manually extracted from each patient's electronic medical record (EPIC @ UNC), including demographic information, first completed medical visit at UNCWPC, and medical diagnoses. All authors certify responsibility for the manuscript. The corresponding author reports a grant from the National Institute of Health to conduct the research. The corresponding author states that there is no other conflict of interest to reveal in this study.

Data Analysis:

The date of each ED visit was compared within Microsoft Excel to the date when care was established at UNCWPC for that particular patient to determine the specific year after establishing care that visit belonged. ED visits were then assigned to either year 0–1, 1–2, 2–3, or 3–4 and grouped together. Person-days represents the total amount of days within a study timeline that a person or group of persons were available to contribute possible ED

visits to the study. The number of available person-days was calculated for each patient by counting the number of days after establishing care at UNCWPC until the end of the study timeline. The number of months that each patient was not enrolled in Medicaid during each year was removed from each of these values to provide the final available person-days for each patient, and this value was divided by 365 to provide number of person-years for each patient. Average number of ED visits per person per year was used as a marker for overall ED utilization by creating a ratio of total ED visits to number of person-years for a given cohort. Previous studies have used ED visits per 100 persons per year for a marker of ED utilization; however, this rate was adjusted to be per individual person due to the smaller sample size of the study.^{18,19} The following equations display how variables were calculated.

$$\text{Number of Person-Years} = \frac{(\text{Total Number of Days} - \text{Days Patients Not Medicaid-Enrolled})}{365}$$

$$\text{ED Visit Utilization} = \frac{\text{Total Annual Number of ED Visits for Cohort}}{\text{Total Number of Person-Years}}$$

Yearly ED utilization rates after establishing care at UNCWPC were calculated for the overall cohort and for the subset of patients with multiple physical comorbidities. These utilization rates were differentiated into rates for visits related to mental-health diagnoses and for visits related to physical-health diagnoses. Only ED visits related to physical-health diagnoses were analyzed in this study. This was done in order to focus specifically on changes in these patients' physical comorbidities over time. Overall, the mental health-related visits comprise a small proportion of the overall ED utilization rates, and a majority of ED visits for these SMI patients were instead due to the general medical problems. The yearly utilization rates were plotted over time in a separate graph for each cohort and were statistically analyzed to identify changes and trends over time. ED utilization rates for both analyses were analyzed within an open-source online software developed at Emory University and the Rollins School of Public Health.²⁰ Within the software, annual person-time rates for each cohort were compared to previous years' rates by calculating a Conditional Maximum Likelihood estimate of Rate Ratio (CMLE Rate Ratio), with a 95% confidence interval upper and lower limit, and using a Fisher's Exact Test, all of which was used to determine statistical significance within changes in rates from the data. The CMLE Rate Ratio provides the best-estimate rate ratio between two rates, with a subsequent 95% confidence interval within which the actual rate ratio falls, and a Fisher's Exact Test p-value can also be used to determine whether the difference between two rates is statistically significant and the likelihood that the difference is not due to random chance. These specific statistical values were selected based on literature best-practice recommendations found within the open-source software on how to compare person-time rates.

Results

Characteristics of the 101 patients in the study are shown in Table I. Mental health diagnoses and physical health comorbidities are included. For the purposes of this analysis, smoking

was listed as a separate comorbidity rather than an associated health behavior due to the significant impact it can play on physical health for patients with SMI.²¹ A subset of 50 patients had multiple physical comorbidities. Of the patients, a quarter of patients have no physical health comorbidities, and half of patients have more than one chronic physical health diagnosis.

Over the study period, these patients visited the Emergency Department 981 times, an average of 2.59 ED visits per person per year. Of these 981 ED visits, 38% were considered non-emergent or preventable. The national averages for these rates are 0.43 ED visits per person per year, with 14–27% of visits being considered preventable.^{22,23} In addition, 18% of the ED visits were related to a mental health diagnosis, compared to the national average of 4.1%, which includes visits related to substance use disorders as well.^{22,23} In 2015, the average for the entire North Carolina population was 0.7 ED visits per person per year.²⁴ For the last 18 months of the study period only, from December 1, 2016– May 31, 2018, the panel had 388 ED visits, an average of 2.67 per person per year; 47% of these visits were considered preventable, and 21% were related to a mental health diagnosis. Overall, the patient panel has had 729 primary care visits at UNCWPC in the last 18 months, an average of 4.81 visits per person per year, compared to the national average of 1.60 visits per person per year.^{22,23} A total of 71 patients had at least one month during the study period when they were not enrolled in Medicaid, which could result from no longer meeting eligibility requirements temporarily. As such, ED visits during those periods would not be collected in the database. In order to account for this, the months when patients were not enrolled in Medicaid were excluded from the analysis. The average number of months excluded from the study for these 71 patients was 12.8.

The ED Utilization Rates over time after establishing care at UNCWPC decreased. For the overall patient panel (n=101), there was a significant decrease in ED Utilization related to physical health diagnoses between years 3 and 4, from 3.23 to 1.83 visits/person/year (CMLE Rate Ratio= 0.5665, 95% CI 0.3594–0.864, p= 0.009317) (Figure I). For the patients with multiple chronic health diagnoses (n=50), there was a significant decrease in ED Utilization for physical health-related ED visits between years 3 and 4, from 4.04 to 2.48 visits/person/year (CMLE Rate Ratio=0.6145, 95% CI 0.3862–0.9482, p= 0.03413) (Figure II).

Discussion

This study sought to assess ED utilization for SMI patients enrolled in an Enhanced Primary Care Model of primary care at UNCWPC and to examine the potential differences between patient utilization based on severity of physical health comorbidities. To our knowledge, this is the first study that aims to understand the impact of physical and mental health integration using the Enhanced Primary Care Model on ED utilization for patients with Serious Mental Illness, and the results indicate that this model at UNCWPC has a positive impact on reducing ED utilization for these patients related to physical health comorbidities after at least three years of established care. Similar studies have also shown that the integration of physical and mental health services in one location can improve ED utilization for patients

with mental illness.⁸ However, these studies have not focused specifically on patients with SMI.

The results of this study indicated that the behavioral changes involved in decreasing ED utilization may take several years, rather than months, before becoming effective. For the overall study group (n=101) and for the subset with multiple chronic physical health diagnoses (n=50), a statistically significant decrease in physical health-related ED visits was only found by year 4 and not before then. This may be explained by the patients needing several years of more highly managed outpatient care and care management to bring physical health diagnoses under control and to access appropriate levels of care more effectively. The reason for the initial rise in ED utilization in years 1 and 2 is less clear but may be as a result of an increased awareness of health concerns after establishing care. Prior to establishing care, these patients may not have been monitoring conditions such as blood pressure or blood sugar and might not have had the awareness to seek care. There may be other explanations for this initial rise. These results, indicating that enhanced primary care has a positive impact on reducing ED utilization but only after several years, have important policy implications if they can be replicated in other settings. Future health systems contemplating similar models may need to provide longer timeline for patients to become well-established in order to see decreased ED utilization.

The ED utilization changes over time at UNCWPC should continue to be monitored in the coming years to identify any future changes in utilization trends. Similar research on ED Utilization should be conducted at other locations that incorporate similar models into their care for patients with SMI. Future research also could analyze changes and differences between high ED utilizer and low ED utilizer cohorts. Finally, this model should be compared to other possible models that exist for managing patients with Serious Mental Illness in terms of its effectiveness in reducing ED Utilization and managing chronic medical conditions in order to create fully informed recommendations moving forward on how best to manage patients with Serious Mental Illness in the context of healthcare utilization.

Several limitations to the study must be acknowledged. First, this research was a single-site study. Second, the data only included Medicaid patients. Uninsured individuals tend to have greater health risks and utilize the ED more, which is why this was an appropriate group for this pilot study. Although a significant portion of UNCWPC patients, and patients with SMI do have other insurance coverage, this presents opportunities for future studies to include patients with all types of insurance. Third, it is possible that listing smoking as a separate physical health comorbidity might impact the data and results that were identified, as smoking often contributes heavily to the development of other physical health problems. Finally, the data only included months during which patients were enrolled in Medicaid, and the average number of months that each patient was not enrolled in Medicaid over the study period was 12.8.

Conclusions

These results suggest that health systems contemplating establishing this type of care model need to invest in a sufficient amount of time to see a reduction in ED utilization. Larger studies are needed to confirm the results of this study, but the results from this study are encouraging. The PCMH model at UNCWPC, in which enhanced primary care and behavioral healthcare are offered in the same location, can be a successful method of managing patients with Serious Mental Illnesses and their health in the context of Emergency Department utilization. However, ED utilization may remain unchanged or even rise initially and a decrease in ED utilization only appears several years after the patient has established care.

Research Funding and Acknowledgements:

This work was supported and funded by grant number T35-DK007386 from the National Institutes of Health and the Carolina Medical Student Research Program.

References

1. "Mental Illness." National Institute of Mental Health, U.S. Department of Health and Human Services, 11 2017, www.nimh.nih.gov/health/statistics/mental-illness.shtml.
2. Heslin KC (AHRQ), Weiss AJ (Truven Health Analytics). Hospital Readmissions Involving Psychiatric Disorders, 2012. HCUP Statistical Brief # 189. 5 2015 Agency for Healthcare Research and Quality, Rockville, MD <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb189-Hospital-Readmissions-Psychiatric-Disorders-2012.pdf>.
3. Benbassat J, Taragin M. Hospital Readmissions as a Measure of Quality of Health Care Advantages and Limitations. Arch Intern Med. 2000;160(8):1074–1081. doi:10.1001/archinte.160.8.1074 [PubMed: 10789599]
4. Parks Joe, et al. "Morbidity and Mortality in People with Serious Mental Illness." Health Program Directors Medical Directors Council, 10 2006, www.nasmhpd.org/sites/default/files/Mortality%20and%20Morbidity%20Final%20Report%208.18.08.pdf.
5. "Premature death among people with severe mental disorders" World Health Organization Information Sheet, World Health Organization, www.who.int/mental_health/management/info_sheet.pdf.
6. Kalseth J, Lassemo E, Wahlbeck K, Haaramo P, Magnussen J. Psychiatric readmissions and their association with environmental and health system characteristics: a systematic review of the literature. BMC Psychiatry. 2016;16:376. doi: 10.1186/s12888-016-1099-8. [PubMed: 27821155]
7. Kripalani Sunil, et al. "Reducing Hospital Readmission: Current Strategies and Future Directions" Annual review of medicine, U.S. National Library of Medicine, 2014, www.ncbi.nlm.nih.gov/pmc/articles/PMC4104507/?report=reader. doi:10.1016/j.jamda.2015.01.076.
8. Perrin J, Reimann B, Capobianco J, Wahrenberger JT, Sheitman BB, Steiner BD. A model of enhanced primary care for patients with severe mental illness. N C Med J. 2018;79(4):240–244. [PubMed: 29991617]
9. Arend J, Tsang-Quinn J, Levine C, Thomas D The patient-centered medical home: history, components, and review of the evidence. Mt Sinai J Med. 2012;79(4):433–450. [PubMed: 22786733]
10. Physical and Mental Health Integration. (n.d.). Retrieved January 20, 2018, from <https://www.medicaid.gov/state-resource-center/innovation-accelerator-program/program-areas/physical-and-mental-health-integration/index.html>
11. Center for Integrated Health Solutions. Behavioral Health Homes for People with Mental Health & Substance Use Conditions: The Core Clinical Features. Washington, DC; 2012 www.integration.samhsa.gov.

12. Reiss-Brennan B, Brunisholz KD, Dredge C, et al. Association of Integrated Team-Based Care With Health Care Quality, Utilization, and Cost. *JAMA*. 2016;316(8):826–834. doi:10.1001/jama.2016.11232 [PubMed: 27552616]
13. Unutzer J, Katon W, Callahan CM, Williams JW Jr., Hunkeler E, Harpole L, et al. Collaborative-Care Management of Late-life Depression in the Primary Care Setting. *JAMA*. 2002;288(22):2836–45. [PubMed: 12472325]
14. Scharf DM, Eberhart NK, Hackbarth NS, et al. Evaluation of the SAMHSA Primary and Behavioral Health Care Integration (PBHCI) Grant Program: Final Report. *Rand Health Q*. 2014;4(3):6 Published 2014 Dec 30. [PubMed: 28560076]
15. WakeBrook UNC Medical Center. (n.d.). Retrieved May 08, 2020, from <https://www.uncmedicalcenter.org/uncmc/care-treatment/mental-health/unc-hospitals-at-wakebrook/>
16. “Defining the Medical Home.” Defining the Medical Home | Patient-Centered Primary Care Collaborative, Patient-Centered Primary Care Collaborative, 24 1 2018, www.pcpcc.org/about/medical-home.
17. Ghandi Sabrina, and Sabik Lindsay. “Emergency Department Visit Classification Using the NYU Algorithm.” *American Journal of Managed Care*, 4 2014, www.ajmc.com/journals/issue/2014/2014-vol20-n4/emergency-department-visit-classification-using-the-nyu-algorithm?p=2.
18. “National Hospital Ambulatory Medical Care Survey: 2015 Emergency Department Summary Tables” NCHS, National Hospital Ambulatory Medical Care Survey, 2015, Center for Disease Control, 2015, www.cdc.gov/nchs/data/nhamcs/web_tables/2015_ed_web_tables.pdf.
19. Li Guohua, et al. “Emergency Department Utilization in the United States and Ontario, Canada.” *Academic Emergency Medicine*, vol. 14, no. 6, 2007, pp. 582–584., doi:10.1197/j.aem.2007.02.030. [PubMed: 17470903]
20. Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06, accessed 2018/10/30.
21. Druss BG, MD, MPH, & Walker ER, MAT, MPH. (2011). *Mental Disorders and Medical Comorbidity. The Synthesis Project Research Synthesis Report*, 21(Robert Wood Johnson Foundation). Retrieved 2020, from https://www.integration.samhsa.gov/workforce/mental_disorders_and_medical_comorbidity.pdf
22. “National Ambulatory Medical Care Survey: 2015 State and National Summary Tables” National Ambulatory Medical Care Survey, 2015, Center for Disease Control, www.cdc.gov/nchs/data/ahcd/namcs_summary/2015_namcs_web_tables.pdf.
23. “National Hospital Ambulatory Medical Care Survey: 2015 Emergency Department Summary Tables” National Hospital Ambulatory Medical Care Survey, 2015, Center for Disease Control, www.cdc.gov/nchs/data/nhamcs/web_tables/2015_ed_web_tables.pdf.
24. North Carolina Department of Health and Human Services, Division of Medical Assistance. (2016, October). *Access Monitoring Review Plan October 2016*. Retrieved 2020, from https://files.nc.gov/ncdma/Access_Monitoring_Review_Plan_2016_10.pdf

Figure I.

ED Utilization Curve for overall UNCWPC Panel (n=101)

Note: *** indicates a statistically significant change in ED utilization from prior year ($p<0.05$)

Figure II.

ED Utilization Curve for Patients with Multiple Chronic Illnesses (n=50)

Note: *** indicates a statistically significant change in ED utilization from prior year ($p<0.05$)

Table I.

Patient Panel Characteristics (total n=101)

<i>Age</i>	
<i>18–33 years</i>	26
<i>34–49 years</i>	33
<i>50 and older</i>	42
<i>Gender</i>	
<i>Male</i>	48
<i>Female</i>	53
<i>Mental Health Diagnosis</i>	
<i>Bipolar Disorder</i>	22
<i>Major Depressive Disorder</i>	41
<i>Psychotic Disorders</i>	58
<i>Multiple Diagnoses</i>	24
<i>Physical Health Comorbidity</i>	
<i>None</i>	26
<i>Diabetes</i>	28
<i>Hypertension</i>	45
<i>Smoker</i>	57
<i>Chronic Obstructive Pulmonary Disease</i>	17
<i>Coronary Artery Disease</i>	4
<i>Multiple (>1)</i>	50