Psychiatric Comorbidity, Red Flag Behaviors, and Associated Outcomes among Office-Based Buprenorphine Patients Following Hurricane Sandy

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ABSTRACT *In October 2012, Bellevue Hospital Center (Bellevue) in New York City was temporarily closed as a result of Hurricane Sandy, the largest hurricane in US history. Bellevue's primary care office-based buprenorphine program was temporarily closed and later relocated to an affiliate public hospital. Previous research indicates that the relationships between disaster exposure, substance use patterns, psychiatric symptoms, and mental health services utilization is complex, with often conflicting findings regarding post-event outcomes (on the individual and community level) and antecedent risk factors. In general, increased use of tobacco, alcohol, and illicit drugs is associated with both greater disaster exposure and the development or exacerbation of other psychiatric symptoms and need for treatment. To date, there is limited published information regarding post-disaster outcomes among patients enrolled in office-based buprenorphine treatment, as the treatment modality has only been relatively approved recently. Patients enrolled in the buprenorphine program at the time of the storm were surveyed for self-reported buprenorphine adherence and illicit substance and alcohol use, as well as disaster-related personal consequences and psychiatric sequelae post-storm. Baseline demographic characteristics and insurance status were available from the medical record. Analysis was descriptive (counts and proportions) and qualitative, coding open-ended responses for emergent themes. There were 132 patients enrolled in the program at the time of the storm; of those, 91 were contacted and 89 completed the survey. Almost half of respondents reported disruption of their buprenorphine supply. Unexpectedly, patients with psychiatric comorbidity were no more likely to report increased use/relapse as a result. Rather, major risk factors associated with increased use or relapse post-storm were: (1) shorter length of time in treatment, (2) exposure to storm losses such as buprenorphine supply disruption, (3) a pre-storm history of red flag behaviors (in particular, repeat opioid-positive urines), and (4) new-onset post-storm psychiatric symptoms. Our findings highlight the relative resilience of buprenorphine as an office-based treatment modality for patients encountering a disaster with associated unanticipated service disruption. In responding to future disasters, triaging patient contact and priority based on a history of red-flag behaviors, rather than a history of psychiatric comorbidity, will likely optimize resource allocation, especially among recently enrolled patients. Additionally, patients endorsing new-onset psychiatric manifestations following disasters may be an especially high-risk group for poor outcomes, warranting further study.*

KEYWORDS *Buprenorphine, Opioid dependence, Psychiatric comorbidity, Risk factors, Disasters, Substance use disorders, Cross-sectional studies*

INTRODUCTION

Hurricane Sandy struck the Northeastern USA the evening of Monday, 29 October 2012. It was the largest and second-costliest hurricane in US history, resulting in 117 deaths and approximately \$50 to 65 billion in damages.^{1,2} Similar to the devastation following Hurricane Katrina, the New York City region suffered widespread resource loss, prolonged power outages, and disruption to transit, healthcare services, and social systems. Bellevue Hospital Center (Bellevue), a public sector tertiary referral center in the NYC Health and Hospitals Corporation (HHC) network, was closed after flooding damaged the hospital's basement and vital infrastructure, leaving inpatient services closed until February 2013. Outpatient facilities at Bellevue were closed pre-emptively 1 day prior to Sandy and did not re-open for 3 weeks post-event. During this outpatient closure, ambulatory medical, mental health, and pharmacy services were relocated to an affiliate HHC public hospital 70 blocks (3.5 miles) north in Manhattan.

Since 2006, Bellevue has operated a large office-based buprenorphine program within adult primary care, serving predominantly Medicaid and uninsured patients.^{3,4} Primary care physicians see patients in the clinic and provide prescriptions, typically for a 30-day supply of buprenorphine (some patients in longstanding recovery are given prescriptions for up to 3 months of medication), which patients fill at community pharmacies, often at little or no charge (depending on their insurance required co-payment). The disaster led to the suspension of clinic services caring for all 132 active patients, along with a variety of citywide hospital, outpatient clinic, pharmacy, and transit closures.⁵

On the second day after the Hurricane (Wednesday, 31st October), while the inpatient units of the hospital were being evacuated, Bellevue ambulatory care staff downloaded patient schedule information for targeted groups of "high-risk" patients, including those on chronic opioid maintenance (e.g., the buprenorphine clinic), to triage patient outreach. Using this list of patient phone numbers, the buprenorphine program director attempted to make contact with patients in order of appointments scheduled starting with those who had already had appointments canceled that week. As entrance to the hospital was barred for nonstaff, arrangements were made to mail prescriptions for those who had Medicaid or other insurance; for others, there were initially a few ad-hoc patient-doctor meetings immediately outside the hospital entrance to provide prescriptions and directions to other public hospitals.

Within the first week after the hurricane, arrangements were made to house a Bellevue-staffed outpatient walk-in clinic at an alternate public hospital location; patients who needed to be seen were scheduled for appointments at this location when a buprenorphine-certified physician was present. Outside of these phone calls from the clinic director, some patients contacted the buprenorphine clinic physicians via phone numbers "saved" from previous between-visit communications or via online searches for email addresses. Patients with visit intervals of 4 weeks or less were highly likely to have faced difficulties maintaining their supply of buprenorphine peri- or post-event as they would have had the least medication on hand when the storm hit and no refills available.⁵

Bellevue's outpatient facilities, including primary care buprenorphine services, were reopened 3 weeks after the hurricane on 19 November 2012.

Disasters, Substance Use, and Psychiatric Symptomatology

Previous research indicates that the relationships between disaster exposure, substance use patterns, psychiatric symptoms, and mental health service utilization is complex. There have been conflicting findings regarding post-event outcomes (on the individual and community level) and antecedent risk factors.⁶⁻¹² The disaster literature has been growing quickly in the past decade, spanning studies evaluating physical as well as psychiatric/psychological outcomes following natural disasters and manmade disasters (e.g., terrorist activity) alike. For instance, in reviewing dozens of studies, Rodriguez et al. found that although many persons are resilient in the face of exposure to disasters (with up to half of persons never developing symptoms), there is a vulnerable minority that may develop mood, anxiety, and posttraumatic stress disorder (PTSD) symptoms that persist for 18 months or more¹³ depending on level of exposure and antecedent risk factors.¹² By contrast, Rhodes et al. found in a subsequent study of Hurricane Katrina survivors that although severity of exposure affects symptomatology, demographic and other external factors may have more robust predictive power of patient outcomes in response to exposure than originally thought.¹⁴

A smaller body of literature focuses on: (1) mental health issues related to addiction treatment peri-disaster (e.g., outcomes among patients in addiction treatment peri-event, including patients on methadone maintenance or who have recently completed inpatient programs), or (2) mental health services utilization (e.g., rates of patients seeking psychotherapy post 9/11). Regarding substance use, relapse rates post-event, and psychiatric comorbidity, studies document a variety of findings.¹² In general, increased use of tobacco, alcohol, and illicit drugs is associated with both greater disaster exposure and the development or exacerbation of other psychiatric symptoms and need for treatment.^{11,15,16}

Post-disaster Outcomes among Patients Enrolled in Addiction Treatment

There is little known specifically about patients enrolled in addiction treatment programs affected by disasters. Participants in New York City completing alcohol detoxification prior to the 9/11 attacks had higher rates of relapse post-event compared with the period preceding the attacks.¹⁷ Among opioid-dependent patients enrolled in methadone treatment programs (MTP) and intensive outpatient programs, higher rates of illicit substance use and positive urine samples were also reported following the 9/11 attacks.¹⁸ Similarly, some evidence suggests that reports of inaccessible or closed MTP's may have led to increases in heroin and prescription misuse.¹⁹ Following the 2003 Bam earthquake in Iran, an acute reduction in heroin supplies contributed to a surge in opioid-dependent patients seeking treatment for acute withdrawal.²⁰ However, substance use patterns among office-based buprenorphine patients have yet to be described.

It is unclear what background and clinical characteristics are most likely to protect buprenorphine patients from increased drug use and other negative outcomes following a natural disaster such as Hurricane Sandy. Although studies suggest that psychiatric comorbidity and prior traumas or disaster exposures may predispose patients to worse outcomes post-event,^{11,14,21} there is also evidence that psychiatric comorbidity may be associated with greater treatment adherence among

buprenorphine patients, potentially offsetting such liabilities.²²⁻²⁴ In part, better outcomes may be related to buprenorphine activity at the kappa receptor counteracting stress-related and dysphoric symptoms.²³

METHODS

Population and Recruitment

We conducted a cross-sectional survey and retrospective chart review of the electronic medical record (EMR) for a population of opioid-dependent patients enrolled in the Bellevue primary care office-based buprenorphine program at the time of the hurricane. Eligible participants ($N=132$) were adults with an active buprenorphine prescription from a BHC primary care provider on October 30, 2012. Consecutive sampling targeting the entire clinical cohort was conducted from 27th November 2012, until 4th February 2013. The New York University School of Medicine Institutional Review Board approved the study protocol and subjects provided verbal informed consent before completing the survey.

Survey Instrument and Analysis

A 52-item interviewer-administered survey instrument was developed and refined by the research team following a review of the disaster, addiction, and posttraumatic stress literature. The survey assessed self-reported pre/post estimates of drug use, treatment adherence, health behaviors, psychiatric symptoms, and environmental effects of the hurricane using discreet and open-ended items. Baseline demographic characteristics (gender, age, race/ethnicity, housing, employment, and financial status) anchored items querying changes in housing, employment, income and social and government support post-event. Alcohol and drug (tobacco, opioids, stimulants, benzodiazepines, and marijuana) use items were adapted from the Addiction Severity Index.²⁵ Participants were asked to estimate their use of tobacco, alcohol, and drugs during the 12 weeks prior to the hurricane and 4 weeks post-event. Depression symptoms were assessed via the Patient Health Questionnaire 2 (PHQ2). Additionally, open-ended questions probed general peri-disaster experiences, drug and alcohol use, treatment disruptions, psychiatric symptoms, and coping strategies.

Data Collection and Analysis

The survey was administered by the research team by phone or in person; two of the interviewers were buprenorphine clinic physicians. Participants were informed that all responses would be kept confidential and that participation in the survey would have no impact on their regular medical care. Interviews lasted approximately 15 min and were conducted in a private clinic space or by phone. Patients not surveyed during a clinic session were contacted by telephone. Survey responses were recorded in writing by the interviewer and later entered into an electronic database. We collected additional data from a 6-month-pre-storm medical-record review, including date of enrollment, buprenorphine dose, visit interval, urine toxicology results, no-shows, psychiatric history, and active medications.

Pre-storm psychiatric comorbidity or “psychiatric history” was determined by chart review to include: Axis I or II diagnosis on intake visit to the clinic; antidepressant, antipsychotic, or mood stabilizer use in the last visit before the storm; prior admission to an inpatient psychiatric unit (one or more prior discharge summary/ies in the EMR) or

majority-positive (>3) PHQ2 depression screens in the 6 months of visits pre-storm. Patients without a psychiatric history by chart review who flagged positive on the survey-administered PHQ2 (either endorsing depressed mood or anhedonia over the past 2 weeks) were categorized as having new-onset psychiatric symptoms.

Analysis was generally descriptive (counts, proportions, rates of self-reported outcomes of interest). For some variables, we used standard Chi-square tests to compare those reporting any post-event increase in substance misuse to those with no increase. Length of time in treatment and clinical characteristics such as red flag behaviors and visit intervals were compared with multiple ANOVA and *t* test analyses. Open-ended responses were coded using thematic analysis for emergent themes.

RESULTS

Recruitment and Demographics

Of the 132 patients enrolled in the clinic at the time of Sandy, a total of 91 patients were reached to be invited to participate in the study. No patients refused to participate; however, 2 of 91 participants did not complete the entire survey and were not included in the final analysis. Most participants were surveyed within 2 months of the hurricane (71 %), with the remainder surveyed 3–4 months post-event. The 41 patients not interviewed appeared to be a combination of: a) active in clinic post-event but missed by the interviewers and not reachable by phone (often due to visit intervals longer than 4–8 weeks), and to a much lesser extent, b) not in clinic and not reachable by phone (dropouts). Characteristics of patients who responded to the survey versus those who were not reachable are in Table 1 (data from retrospective chart review); the two groups were relatively well-matched.

Beyond widespread power outages and public transit closures (which affected all patients), 62 % of survey respondents endorsed personal losses due to the hurricane (such as evacuation, property damage, or injury, *N*=38) or actual or feared disruption in

TABLE 1 Study sample and clinic population demographic characteristics

	Study sample (<i>n</i> =91; %)	Nonresponders (<i>n</i> =41; %)
Gender		
Male	73 (82)	36 (86)
Insurance		
Medicaid	52 (57)	27 (66)
Uninsured	23 (25)	8 (20)
Medicare	10 (11)	0 (0)
Private	9 (10)	6 (15)
Race/ethnicity		
Caucasian	38 (42)	12 (29)
African–American	34 (37)	17 (42)
Hispanic	18 (20)	12 (29)
Asian	1 (1)	0 (0)
Clinical characteristics		
Median daily bup dose (range)	20 mg (1.5, 24)	16 mg (1, 24)
Mean time in treatment (range)	28 months (1, 71)	32 months (1, 75)

supply of buprenorphine ($N=37$). 22.5 % reported both types of hurricane-related adverse effects.

Among survey respondents, 7.9 % ($N=7$) reported new-onset or increased heroin/opioid use (considered a “relapse” for study purposes). An additional 21 % reported increased tobacco, alcohol, or other drug use. The most significant predictors of patients reporting increased use/relapse were length of time in treatment and a history of “red flag” behaviors, specifically multiple (>1) illicit opioid-positive urine screens in the 6 months pre-storm. For example, whereas 71 % of patients enrolled in the clinic for three or fewer months reported increased use or relapse, only 19 % of those enrolled for more than two years did so ($p=0.001$; see Table 2). Red flags (determined from chart review), such as repeat (>1) positive urine toxicologies for opioids or repeat (>1) no-show visits in the 6 months pre-storm, were also associated with increased self-report of increased misuse among survey respondents (see Table 2). Twenty-five patients had such ‘red flag’ or nonadherent behaviors, 40 % of whom reported increased use/relapse versus 25 % of patients without such behaviors ($p=0.16$).

TABLE 2 Characteristics of patients and self-report of increased substance misuse following Hurricane Sandy

	Patients reporting increased substance misuse ($n=26$)	Patients reporting no increased substance misuse ($n=63$)	p values ^a
Average length of treatment (months)	19.4 (± 6.43)	30.4 (± 4.67)	0.005
High-dose bup (>16 mg daily dose)	50 %	59 %	0.45
>1 opioid-positive urine (6 months pre-event)	27 %	16 %	0.23
>1 no-show visit (6 months pre-event)	19 %	14 %	0.56
Psychiatric History ^b	46 %	52 %	0.59
Self-reported bup supply disruption	62 %	33 %	0.01
Self-reported material loss due to hurricane ^c	54 %	38 %	0.17
Self-reported new-onset psychiatric symptoms post-event	23 %	8 %	0.05
Female gender	15 %	17 %	0.81

^a Derived from Chi-square analyses

^bPsychiatric history defined by chart review as to include: Axis I or II diagnosis on intake; antidepressant, antipsychotic, or mood stabilizer use in visit before event; prior admission to an inpatient psychiatric unit; or >50 % positive PHQ2 depression screens in the 6-month pre-event

^cMaterial loss due to hurricane included patients reporting such as evacuation, property damage, or injury

^dNew-onset psychiatric symptoms included patients with positive response to survey-administered PHQ2

Additionally, patients endorsing storm exposure (either through property loss/damage/evacuation or buprenorphine supply disruption), were more than twice as likely to report increased use/relapse than those not endorsing such exposures; this relationship does not quite reach statistical significance (36.3 vs. 17.6 %; $p=0.06$).

Interestingly, psychiatric comorbidity was not found to be associated with either red flag behaviors pre-storm or increased rates of substance misuse post-event. Among patients with psychiatric comorbidity, 20.7 % had evidence in their charts of repeat no-shows and opioid-positive urines, a lower percentage than among patients without a psychiatric history (31 %). Additionally, 12 of 45 patients (26.7 %) with psychiatric history reported increased use/relapse versus 14 of 44 patients (31.8 %) without evidence of psychiatric comorbidity ($p=0.65$) suggesting little or no association between psychiatric comorbidity and increase in substance use post-storm. Similarly, subanalysis revealed that psychiatric comorbidity did not appear to predispose the patients who specifically reported exposure to storm damage or supply disruption to disproportionately greater rates of increased use either.

Regarding psychiatric symptoms manifesting post-storm, 31 (35 %) of all survey respondents screened positive on a PHQ2 endorsing depressed mood and/or lack of interest in daily activities (anhedonia) in the past 2 weeks.

As hypothesized, patients with psychiatric comorbidity (as defined in “[Methods](#)”) were more likely to screen positive on the researcher-administered PHQ2 post-storm, with 42.2 % scoring positive versus 27.3 % of patients without a psychiatric history; however, this finding did not reach statistical significance ($p=0.14$). Patients screening positive on the survey-administered PHQ2 but without a psychiatric history (i.e., those with new-onset depressive symptoms such as depressed mood or anhedonia) were almost 3.5 times more likely to report increased substance misuse (7 of 12 (58 %)) than those with psychiatric history who screened positive (3 of 18 (16.7 %)) suggesting that patients without a psychiatric history with new-onset depression symptoms may represent an especially high-risk group for relapse and poor outcomes ($p=0.018$).

DISCUSSION

Buprenorphine proved to be an especially resilient treatment modality in the setting of widespread and unexpected service disruption, with only 7 of 89 patients reporting increased misuse of heroin or other illicit opioids and another 19 reporting increased misuse of tobacco, alcohol, or other illicit drugs.

Unexpectedly, patients with psychiatric comorbidity were no more likely to report increased substance misuse than those without psychiatric comorbidity. Rather, risk factors associated with increased use or relapse were (1) shorter length of time in treatment (especially under 3 months), (2) exposure to storm losses such as buprenorphine supply disruption, (3) a history of treatment “red flag behaviors”(in particular, repeat illicit opioid-positive urine toxicologies pre-event), and (4) new-onset post-event depressive symptoms.

These findings are especially meaningful in a national context in which there is a shortage of buprenorphine prescribers and a tendency among primary care and addiction treatment settings to screen out patients with comorbid psychiatric illness. If anything, these data suggest that among our clinic population the patients identified as having psychiatric comorbidity (such as an Axis I diagnosis on intake or SSRI, antipsychotic, or anxiolytic medication in medication reconciliation visit before storm) were less likely to have red flag behaviors or poor outcomes post-

event. One possibility is that the level of functioning necessary for enrolling into the clinic selected against patients with active or untreated mental illness at intake, thus patients who were later identified as having mental illness by chart review may not be representative of the broader spectrum of patients with co-occurring mental illness and opioid dependence. Alternatively, it is possible that patients with a history of psychiatric comorbidity may either have more experience or more outside supports (family/social, etc.) in navigating not-infrequent service disruptions associated with limited financial resources and public programs and were therefore better equipped to maintain treatment adherence in the face of a major service disruption than their peers. This is in contrast to respondents reporting new-onset psychiatric symptoms who may have been unaware of resources and services available to treat their symptoms, and more likely to self-medicate with substances.

Although patients endorsing storm exposure (either through property loss/damage/evacuation or buprenorphine supply disruption), were more than twice as likely to report increased use/relapse, this finding did not quite reach statistical significance ($p=0.06$). Rather than deem such increased use as a “treatment failure,” it is possible that nicotine and alcohol use may serve both as a marker of distress and a coping strategy for addressing it short of relapsing on the drug of choice (opioids), especially in the setting of a potential buprenorphine supply shortage. Such a finding would be consistent with Vlahov and colleagues’ findings in a 6-month follow up of New York City residents post-9/11 wherein the use of non-opioid substances was theorized to have possibly reduced PTSD symptom severity.²⁶ Regardless, the active prevention and treatment of tobacco and alcohol misuse among buprenorphine patients should remain a high priority among treatment programs.

Ultimately, we hope that these findings are reassuring for primary care providers and other physicians considering expanding their practices or clinic programs to include buprenorphine, and for all systems working toward improved integration of mental health, addiction, and primary care services.

Limitations

Major limitations include the accuracy of self-reported survey data, recall bias, and a limited sample size. Prior clinic data suggest a 13 % baseline rate of inaccurate opioid use self-report compared with urine toxicologies (i.e., 13 % of visits involve divergent self-report and urine toxicology results).⁵ Many interviews were conducted by staff known to patients as part of our practice, potentially leading some respondents to under-report substance misuse or other aberrant behavior despite being guaranteed confidentiality. Nonetheless, most respondents were quite forthcoming in describing many types of coping strategies, illicit and licit. To minimize recall bias stemming from the time lapse between the hurricane and the administration of the survey, we launched the survey as soon as possible after the event (starting approximately one month after the hurricane).

Importantly, no diagnostic measures were used to assess psychiatric sequelae post-storm; rather, brief screening instruments such as the PHQ2 detected only an increased probability that a respondent may have developed a mood disorder. The PHQ2 was intentionally chosen as clinic patients are routinely screened for depression at every visit and there was suspicion that few patients would develop mood disorders meeting full criteria for an Axis I diagnosis post-storm. Rather, the PHQ2 was intended as a screen for distress and a proxy for difficulty coping.

Lastly, as our response rate was not 100 %; it is possible that the experiences of our survey respondents are not representative of the broader clinic population.

However, review of records of nonrespondents revealed that most were actually doing very well in care, with low visit frequency due to longstanding sobriety, treatment adherence, and psychosocial stability. Generalizability is also limited as survey respondents came from a single public buprenorphine clinic based in a primary care setting which may not be representative of other buprenorphine treatment settings.

CONCLUSIONS

Our findings highlight the resilience of a prescribed home supply of buprenorphine for opioid-dependent patients encountering a disaster with associated unanticipated service disruption. We found only minimal increases in self-reported substance misuse and a low burden of psychiatric sequelae. Our findings are likely due in part to the modality of buprenorphine in which patients are given a prescription for a home supply of buprenorphine (which can be refilled remotely) as compared with the daily/frequent in-person dosing requirements common among methadone clinics.

In responding to future widespread service disruptions, triaging patient contact and priority in relation to a history of problematic treatment outcomes or “red flag” behaviors within a public sector office-based buprenorphine program, rather than a history of psychiatric comorbidity, will likely maximize resource allocation, especially among recently enrolled patients. Additionally, patients endorsing new-onset psychiatric manifestations following disasters may be an especially high-risk group for poor outcomes warranting further study.

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