Risk of Arrest in Persons With Schizophrenia and Bipolar Disorder in a Florida Medicaid Program: The Role of Atypical Antipsychotics, Conventional Neuroleptics, and Routine Outpatient Behavioral Health Services

Richard A. Van Dorn, PhD; Ross Andel, PhD; Timothy L. Boaz, PhD; Sarah L. Desmarais, PhD; Kristen Chandler, MSW, MPH; Marion A. Becker, PhD; and Andrew Howe, PharmD

Objective: To examine (1) arrest outcomes for adults with schizophrenia and bipolar disorder who were treated with first-generation antipsychotics (FGAs) or second-generation atypical antipsychotics (SGAs) and (2) the interaction between medication class and outpatient services in a Florida Medicaid program.

Method: In a secondary data analysis, Florida Medicaid data covering the period from July 1, 2002, to March 31, 2008, were used to identify persons diagnosed with schizophrenia, schizoaffective disorder, and bipolar disorder and to examine antipsychotic medication episodes lasting at least 60 days. There were 93,999 medication episodes in the population examined (N = 36,519). *Medication episodes* were coded as (1) SGA—aripiprazole, clozapine, olanzapine, paliperidone, quetiapine, risperidone, risperidone long-acting therapy, or ziprasidone; or (2) FGA—any other antipsychotic medication. *Outpatient services* were defined as the proportion of 30-day periods of each medication episode with at least 1 behavioral health visit. Survival analyses were used to analyze the data, and they were adjusted for the baseline propensity for receiving an SGA.

Results: Second-generation antipsychotic episodes were not associated with reduced arrests compared to FGA episodes; however, the interaction between outpatient services and SGA episodes was significant (hazard ratio [HR] = 0.68; 95% CI, 0.50–0.93; $P = .02$) such that an SGA episode with an outpatient visit during at least 80% of every 30-day period of the episode was associated with reduced arrests compared to SGA episodes with fewer outpatient services. There was no significant effect for concurrent FGA episodes and outpatient treatment (HR = 0.81; 95% CI, 0.60–1.10; $P = .18$). Substance use, poor refill compliance, and prior arrest increased risk of subsequent arrest.

Conclusions: The interaction between outpatient visits and treatment with SGAs was significantly associated with reduced arrests. These findings indicate the importance of concurrent antipsychotic medications and outpatient services to affect arrest outcomes for adults with schizophrenia and bipolar disorder.

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Corresponding author: *Richard Van Dorn, PhD, Department of Mental Health Law & Policy, Florida Mental Health Institute, College of Behavioral & Community Sciences, University of South Florida, 13301 Bruce B. Downs Blvd, MHC 2718, Tampa, FL 33612 (rvandorn@fmhi.usf.edu).*

For persons with serious mental illness, including schizophrenia and bipolar disorder, arrest disrupts continuity of care and can impact both mental health and well-being. Behaviors contributing to arrest can be associated with psychiatric instability, substance use, homelessness, and other criminogenic factors[1] that are present at increased rates among adults with serious mental illness.[2] Given the multitude of interacting reasons for arrest, comprehensive interventions, including the concurrent delivery of outpatient services and effective pharmacologic interventions, may prove beneficial in reducing arrests among adults with serious mental illness.

Pharmacologic Interventions and Arrest

Pharmacologic interventions have become the primary mode of treatment for adults with serious mental illness. Although their effectiveness has been demonstrated across a range of outcomes, including reduced violence[3–5] and aggression,[6,7] symptoms,[8] hospitalization,[9,10] and substance use[11] and improved functioning,[12,13] there is a dearth of research examining the ability of pharmacologic interventions to reduce arrests. Findings from one study provide evidence for the protective role of pharmacologic intervention, showing decreased recidivism rates associated with receipt of clozapine among psychotic patients with prior criminal justice involvement.[14]

Outpatient Services and Arrest

Outpatient services for mentally ill offenders are available but are often underutilized[15] or attended inconsistently.[16] Postrelease Medicaid enrollment, which can facilitate the timely delivery of services, has been linked with increased postrelease treatment participation, increased community tenure, and fewer arrests.[17,18] While the provision of mental health services in correctional facilities has increased over time,[19] problems remain in ensuring continuity of care during community reintegration.[20–22] Specific programs have been deemed effective in reducing arrests[23,24];

however, evidence for the role of outpatient treatment in this context is equivocal. For example, experimental and usual-care conditions have performed similarly on multiple measures,[25] and site-specific differences in treatment outcomes sometimes exist.[17]

Clinical Points

- The concurrent use of second-generation atypical antipsychotic medications and monthly outpatient treatment reduced arrest for adults with schizophrenia and bipolar disorder.
- Clinicians should carefully attend to medication noncompliance and substance use, both of which increased arrest risk.

Given the mixed or preliminary evidence related to both pharmacologic interventions and outpatient services in affecting arrest outcomes, it is clear that more study is needed. However, estimates of treatment effects are often difficult to obtain when using data from observational studies, which is why we have used propensity scores in the current research.

Self-Selection Into Treatment in Observational Studies and the Use of Propensity Scores

Evaluation of treatment outcomes is of critical importance to the identification of best practices; however, there are difficulties in doing so. Many studies, including this one, involve self-selection into treatment condition, which can result in bias.[26] In the absence of random assignment to treatment, statistical methods can be used, including propensity scores.[27] Propensity scoring also allows for the examination of the degree to which the measured covariates are "balanced" after inclusion of the propensity weight.[28] The use of propensity scores in studies of adult mental health outcomes is increasing.[11,29–32]

The Present Study

The present study sought to address 3 questions: Does one medication class confer an advantage over the other in terms of reduced risk for arrest? Are there significant main effects for the receipt of medication alone or outpatient treatment alone on risk of arrest? Does the interaction between outpatient treatment and medication class confer a significant advantage over the main effects?

METHOD

The study was reviewed and approved by the University of South Florida Institutional Review Board. The data used for this analysis were drawn from multiple sources. First, Florida Medicaid data were accessed. These data contain inpatient, outpatient, physician services, and pharmacy claims. Next, we used data from the Florida Department of Children and Families to identify treatment provided in crisis units and state hospitals. Florida Department of Law Enforcement (FDLE) data were used to identify arrests. Data from these 3 datasets were available for the time period from July 1, 2002 to March 31, 2008. Propensity scores were created from the "baseline" data (ie, July 1, 2002–December 31, 2003); the relationship between treatment effects and arrest was assessed between January 1, 2004, and March 31, 2008. Link King[33] and FDLE probabilistic matching routines were used to match individuals across datasets.

Data Structure

Data were organized into treatment *episodes* that corresponded to continuous receipt of medication treatment. For an episode to be included in the study, the recipient must have been Medicaid-enrolled for at least 12 months prior to the beginning of the episode. An episode of oral antipsychotic treatment was defined as a period of time exceeding 60 days during which an individual was prescribed a given antipsychotic medication with a gap in treatment with no medication available not exceeding 15 days.

Although the majority of medication episodes were associated with oral prescriptions (reviewed below), we also accounted for depot and risperidone long-acting therapy (RLAT) episodes. For the former, episodes started the day an individual received the first depot injection, provided that he or she received at least 2 injections within the episode. For the latter, episodes started the day an individual received the first RLAT, provided that he or she (a) received a third injection within 42 days of the first injection and (b) had at least a 21-day supply of an oral SGA at the time of the first injection. Risperidone long-acting therapy episodes started 21 days after the first injection[34,35] if criterion *b* was not met.

Episodes ended under the following conditions: (a) a 15-day or greater gap between the end of medication supplied from one prescription to the start of medication from the subsequent prescription; (b) an arrest that occurred between the 31st day after the first filled prescription and 30 days after the last day of drug possession for the last filled prescription; (c) termination of the observed treatment episode with no arrest 30 days after the last filled prescription; and/or (d) the end of the study.

Measures

Subjects with an arrest were compared to those without an arrest.

Type of pharmacologic treatment was coded into mutually exclusive categories, and according to the "episode" structure described above: (1) second-generation antipsychotic [SGA]–prescription for aripiprazole, clozapine, olanzapine, paliperidone, quetiapine, risperidone, RLAT, or ziprasidone; and (2) first-generation antipsychotic [FGA]–prescription for any other antipsychotic medication (but none of the above). *Polypharmacy* episodes were identified by an indicator variable in the survival analyses.

Routine behavioral health services utilization was operationalized to include outpatient therapy, case management, or any other outpatient encounter that was not a crisis service, one-time assessment, or medication refill. The number of 30-day periods within an episode with at least 1 outpatient

visit was divided by the total number of 30-day periods in the episode; those with a ratio of .8 or greater were compared to those with a ratio less than .8.

Diagnosis was based on Medicaid data. Included diagnoses were schizophrenia and schizoaffective disorder (classified as schizophrenia) and bipolar I and II disorders (classified as bipolar disorders). The most frequently occurring diagnosis throughout the study period was used if patients had multiple diagnoses.

Refill compliance,[36] or gaps in medication availability, was measured as the total number of medication episodes during the study.

Other clinical predictors that were examined included psychiatric hospitalization (0 vs 1 or more admissions during an episode) and substance use, assessed via both Medicaid diagnostic claims and billed services. It also should be noted that we subtracted the total number of inpatient days during the episode from the episode's overall duration in order to account for time at risk of arrest in the community. *Demographic covariates* included age, sex, and race.

Propensity Scores

Measures of the above variables during the baseline period were used to calculate propensity scores based on the likelihood of receiving an SGA prescription. This approach, inverse probability of treatment weighting,[37] has the effect of balancing the multivariate distributions of the measured covariates across treatment groups. Creation of the propensity weight was based on numerator and denominator calculations predicated on exposure to initial treatment.

Analyses

First, results from a regression model predicting receipt of an SGA were output to create propensity scores. Second, we estimated the relative risk of arrest using Cox proportional hazards regression for repeated events.[38] We treated each episode as an individual observation interval, pooling all intervals into one analysis. We used a cluster-correlated robust estimate of variance[39] to calculate robust standard error estimates.

We measured time until the first arrest in each episode or right-censored the data for the end of episode or dropout. Results are presented in the form of hazard ratios (HRs). An HR greater than 1.00 indicates an increased risk of arrest while an HR less than 1.00 indicates decreased risk. A 95% confidence interval was used, setting the significance level at a 2-tailed $P < .05$.

RESULTS

Sample description. There were 93,999 treatment episodes in the population examined (N = 36,519). Treatment episodes ranged in length between 60 and 1,552 days. The mean length was 209.83 days, with a standard deviation of 262.71 days, a median of 100 days, and a mode of 60 days. Table 1 shows episode mean and median lengths by SGAs and for FGAs as a group.

Table 1. Medication Episode Information for Persons With Schizophrenia or Bipolar Disorder in a Florida Medicaid Program[a]

Episode	No.	%	Days, Mean	Days, Median
All SGA episodes	85,572	100	228	144
Aripiprazole	13,986	16.34	209	131
Clozapine	2,410	2.82	357	225
Olanzapine	15,796	18.46	223	149
Paliperidone	184	0.22	149	113
Quetiapine	21,415	25.03	216	137
Risperidone	20,713	24.21	250	152
RLAT	2,150	2.51	250	168
Ziprasidone	8,918	10.42	212	133
All FGA episodes	8,427	100	249	142

[a]Percentages do not add to 100 due to rounding.
Abbreviations: FGA = first-generation antipsychotic, RLAT = risperidone long-acting therapy, SGA = second-generation antipsychotic.

Table 2. Baseline Propensity for Second-Generation Antipsychotic (SGA) Model

	SGA Prescription		
Characteristic	Odds Ratio	95% CI	*P* Value
Dispositional factors			
Age	1.01	(1.00–1.01)	< .001
Sex, male	1.09	(1.06–1.12)	< .001
Race			
White (reference)	…	…	…
African American	0.83	(0.80–0.86)	< .001
Hispanic	1.07	(1.03–1.11)	< .10
Other	0.97	(0.92–1.01)	
Criminal justice involvement			
Any arrest during baseline period	0.81	(0.77–0.84)	< .001
Clinical factors			
Bipolar disorder (reference)	…	…	…
Schizophrenia	1.28	(1.24–1.32)	< .001
Substance use	0.53	(0.49–0.57)	< .001
Outpatient treatment			
At least 80% of 30-day periods during baseline episodes with outpatient visit	1.35	(1.32–1.39)	< .001
Inpatient treatment			
Any inpatient admission during baseline episodes	1.20	(1.16–1.24)	< .001

Symbol: … = not applicable.

Regarding sex distribution, 48.1% (N = 17,561) of the subjects were male and 51.9% were female (N = 18,958). Age ranged from 18 to 64 years, with a mean of 42 years, a median of 43 years, and a standard deviation of 11.5 years. Over half of the subjects were white (N = 18,711), 19.9% (N = 7,265) were African American, and 19.6% (N = 7,161) were of Hispanic ethnicity. The racial/ethnic status of the remaining 9.3% (N = 3,382) was identified as "other." Just under 18% of subjects were identified as having a substance use disorder (N = 6,508). Less than one quarter of subjects (N = 8,436) was hospitalized during the baseline period.

Propensity score. Table 2 shows results from the propensity-based regression. Results indicate that subjects with a baseline arrest were less likely to be prescribed an SGA (odds ratio [OR] = 0.81, $P < .001$), as were those with any indication of substance use (OR = 0.53, $P < .001$). These results were output and used to weight the longitudinal data. Individual 2-way analysis of variance models for each covariate, with a stratified propensity quintile variable added as a control factor,

Table 3. Multivariable Survival Analysis Results for Any Arrest[a]

Characteristic	Any Arrest HR	95% CI	*P* Value
Dispositional factors			
Age	0.98	(0.98–0.98)	<.001
Sex, male	1.51	(1.39–1.65)	<.001
Race			
White (reference)	…	…	…
African American	1.42	(1.28–1.57)	<.001
Hispanic	1.11	(1.00–1.24)	<.05
Other	0.95	(0.82–1.11)	NS
Medication type			
FGA (reference)	…	…	…
SGA	0.91	(0.81–1.02)	NS
Number of medication episodes	1.10	(1.08–1.11)	<.001
Polypharmacy episode	0.72	(0.66–0.79)	<.001
Clinical factors			
Bipolar disorder (reference)	…	…	…
Schizophrenia	0.71	(0.65–0.78)	<.001
Substance use	1.83	(1.67–2.01)	<.001
Service factors			
At least 80% of 30 day periods during episode with outpatient visit	0.98	(0.91–1.06)	NS
Any inpatient admission during episode	1.53	(1.41–1.67)	<.001
Coinsurance status, Medicare	1.04	(0.95–1.13)	NS
History of arrest	7.61	(6.97–8.32)	<.001

[a]Model is weighted on the basis of propensity to possess SGA prescription.
Abbreviations: FGA = first-generation antipsychotic, HR = hazard ratio, NS = not significant, SGA = second-generation antipsychotic.
Symbol: … = not applicable.

showed no significant differences between the FGA and SGA treatment conditions across the covariates.

Prevalence of arrest. During the baseline period, 13.1% (N = 4,790) of subjects experienced at least 1 arrest. Over the 4 years of observation used for the survival analyses there were a total of 4,390 arrests: 2,721 individuals had 1 arrest; 493 had 2 arrests, 152 had 3 arrests, 36 had 4 arrests, 10 had 5 arrests, 2 had 6 arrests, and 3 had 7 arrests.

Longitudinal analysis of medication class, outpatient treatment, and arrest. Table 3 presents the results of the survival analysis.

Results indicate that neither the main effect for receipt of an SGA compared to an FGA (HR = 0.91, *P* = .11) nor the main effect for having at least 80% of the 30-day periods of a medication episode covered by an outpatient behavioral health visit compared to those episodes with a lower outpatient services ratio (HR = 0.98, *P* = .57) were significantly related to reduced arrest. However, the following 6 factors were significantly associated with an increased risk of arrest: male sex (HR = 1.51, *P* < .001), African American race (HR = 1.42, *P* < .001), decreased refill compliance (HR = 1.10, *P* < .001), substance use (HR = 1.83, *P* < .001), inpatient admission during the episode (HR = 1.53, *P* < .001), and a baseline arrest (HR = 7.61, *P* < .001). The following 3 factors were significantly associated with a decreased risk of arrest: older age (HR = 0.98, *P* < .001), polypharmacy (HR = 0.72, *P* < .001), and a psychotic disorder (HR = 0.71, *P* < .001).

We next ran a model that contained interaction terms representing medication class and outpatient services (Table 4). Controlling for the medication and outpatient services main effects, the interaction between SGA medication class

Table 4. Multivariable Interaction Survival Analysis Results for Any Arrest[a]

Medication Type by Outpatient Services	Any Arrest Hazard Ratio	95% CI	*P* Value
FGA with less than 80% of 30-day periods during episode with outpatient visit (reference)	…	…	…
FGA with at least 80% of 30-day periods during episode with outpatient visit	0.81	(0.60–1.10)	NS
SGA with less than 80% of 30-day periods during episode with outpatient visit (reference)	…	…	…
SGA with at least 80% of 30-day periods during episode with outpatient visit	0.68	(0.50–0.93)	<.05

[a]Model is weighted on the basis of baseline propensity to possess SGA prescription, and it controls for all covariates found in Table 3.
Abbreviations: FGA = first-generation antipsychotic, SGA = second-generation antipsychotic.
Symbol: … = not applicable.

and having at least 80% of the episodes' 30-day periods contain at least one outpatient visit was associated with reduced arrests (HR = 0.68, *P* = .02). The effect for FGA medication class and outpatient services was not significantly associated with reduced arrests (HR = 0.81, *P* = .18). Outcomes for other covariates from the main effects model (Table 3) remained consistent in the interaction model (full results not shown).

Given the significant effect for the combination of SGAs and monthly outpatient treatment, we also undertook descriptive post hoc analyses of individual SGAs. For these analyses we eliminated all polypharmacy episodes. We then assessed the monotherapy episodes for the proportion of months that contained an outpatient visit and the frequency of arrests associated with each episode. Risperidone long-acting therapy (68%) and clozapine (63%) had the highest proportion of 30-day periods per treatment episode with at least one outpatient visit; RLAT also had the highest proportion of episodes that contained an arrest (7.5%), whereas clozapine episodes were associated with the lowest percentage of arrests (0.08%). It is worth noting, however, that both RLAT and clozapine contained the largest (18.23%) and smallest proportions of (2.54%) baseline arrests of all SGAs, respectively. The remaining episodes had between one-third and two-fifths of their 30-day periods associated with at least 1 outpatient visit per month (aripiprazole, 35%; olanzapine, 33%; paliperidone, 38%; quetiapine, 35%; risperidone, 37%; and ziprasidone, 41%) and the rates of arrest associated with each episode ranged between 3.7% and 6.4% (aripiprazole, 3.7%; olanzapine, 4.7%; paliperidone, 5.1%; quetiapine, 6.4%; risperidone, 4.2%; and ziprasidone, 4.8%).

DISCUSSION

We report findings from a longitudinal analysis comparing treatment with SGAs, FGAs, and the additive influence of monthly outpatient services in reducing arrest risk for adults with psychotic or bipolar disorders enrolled in Florida's Medicaid program.

Two findings related to pharmacotherapy and outpatient services are noteworthy. First, the use of SGAs did not significantly reduce the likelihood of arrest compared to FGAs. The same null finding was present for the main effect of attending at least 1 outpatient treatment session during 80% or more of the 30-day intervals of the medication episode compared to those with a lower proportion of outpatient visits. Second, the interaction between SGAs and outpatient treatment did significantly reduce arrest, yet the interaction between FGAs and outpatient treatment did not.

Our identification of the combined effectiveness of outpatient services and receipt of SGAs represents a unique finding in the context of criminal justice involvement for adults with serious mental illness. Most prior studies of treatment, mental disorder, and criminal justice outcomes have focused on either pharmacologic interventions[14,40] or outpatient behavioral health services[15–17,41–45]; few have examined the combined effects of these over time. The notion, however, that the effectiveness of pharmacologic interventions may be augmented by behavioral health services is not new. Outside of the criminal justice system, combined pharmacotherapy and psychosocial interventions has been shown to enhance treatment outcomes for adults with mental disorder.[46]

Beyond the significant interaction between outpatient services and receipt of SGAs, there are 2 additional findings of note: Both poor refill compliance and substance use increased arrest risk over time. These effects are consistent with past research demonstrating the close association between medication noncompliance, decompensation, and institutional readmission as well as between substance use, medication noncompliance, and criminal behavior.[47–49] Given the high prevalence of cooccurring mental and substance use disorders in criminal justice settings,[50–52] integrated dual disorder treatment approaches may increase medication compliance, which in turn may reduce arrests among adults with serious mental illness.[53–57]

This study is not without limitations. Our reliance on Medicaid claims data as the primary source of both outpatient treatment and pharmacy data very likely reflects neither the experiences of consumers not enrolled in Medicaid nor their experiences during periods of ineligibility. There also are limitations associated with relying on administrative data to assess treatment and arrest outcomes, including underestimation of (re)offense rates[58] and substance use[59] and an inability to differentiate subjects by premorbid conditions, such as childhood conduct problems,[5] for example, which have been shown to affect outcomes.

Although the presence of monthly routine outpatient services, along with the use of SGAs, was significantly associated with reduced arrests, our outpatient service construct deserves comment on 3 levels. First, prior research has found that criminal justice–involved adults with mental disorder are unlikely to receive adequate doses of outpatient treatment.[15] Inadequate levels of outpatient services were also present in the current study. Across SGA medication episodes, all medications except clozapine and RLAT had less than half of their 30-day periods contain an outpatient visit; only 43% of 30-day periods associated with FGA episodes contained an outpatient visit. Because of this, our conceptualization of outpatient services is not as stringent as guidelines that recommend monthly outpatient visits, in addition to medication management, for those with psychotic or bipolar disorders.[60,61] Still, our use of an 80% criterion for 30-day periods of a medication episode that were covered concurrently by an outpatient visit is congruent with research that has found that rate of medication compliance (or similar measures) to be associated with decreased hospitalization in mentally ill populations.[62–65] It is also worthwhile to note that the interaction for outpatient services and FGAs was associated with fewer arrests than that for those in the same medication class but with an outpatient ratio less than 80%. The effect, however, was not statistically significant (HR = 0.81; 95% CI, 0.60–1.10; $P = .18$). This might be attributed partly to the reduced number of FGA episodes available in the Florida Medicaid data.

Second, it is important that future data provide the ability to conceptualize community-based outpatient treatment as something more specific than "average" treatment, "treatment as usual,"[32] or in the case of the current research, "routine" treatment. We were unable to assess specific treatment modalities, as the frequency for any given service was low. However, given that a small number of studies have examined potential protective effects associated with outpatient treatment for adults with serious mental illness,[66] either alone or in combination with psychopharmacologic interventions, it is essential to increase the frequency of such research while also improving its quality. An important next step is to identify specific modalities of outpatient care that may be more effective, alone or in combination with psychopharmacologic interventions for justice-involved adults with mental disorder.

Third, and finally, although our results emphasize the importance of both pharmacologic and routine outpatient services, we are not implying that a principal causal link exists between mental illness and arrests and that treatment will eliminate this link for adults with psychotic or bipolar disorders.[67–70] Although adults with mental disorder are disproportionately arrested and incarcerated,[71] many risk factors[72] often either explain the mental disorder-arrest link in large part or reduce its significance. Additionally, public mental health clients and the subsample that ends up in jail or prison tend to reside in the poorest and most disadvantaged areas of society. Risks for arrest in such environments[73] certainly affect the likelihood of arrest beyond mental disorder alone. In this context we are referring specifically to the importance of individual and environmental criminogenic factors.

CONCLUSION

Many mentally ill offenders demonstrate marginal community adjustment when released from correctional settings.[74] They are likely to (re)turn to substance use[75] and may drift into dangerous environments where violence and

crime are commonplace. Arrest often begets future arrest, and approximately half of individuals with a mental disorder in prison for violent crimes are repeat offenders.[76]

Such cycling through the criminal justice system may be partly attributable to difficulties in arranging continuity of care between correctional facilities and the community. However, as we have shown, the concurrent receipt of outpatient services with an SGA is significantly associated with a reduction in arrests for patients with psychotic and bipolar disorders. Consequently, treatment should focus on enhancing consistent receipt of optimal pharmacotherapy and integrating outpatient services, including services designed to address substance use issues.

***Drug names*:** aripiprazole (Abilify), clozapine (Clozaril, FazaClo, and others), olanzapine (Zyprexa), paliperidone (Invega), quetiapine (Seroquel), risperidone (Risperdal and others), ziprasidone (Geodon).

Author affiliations: Department of Mental Health Law & Policy, Florida Mental Health Institute (Drs Van Dorn, Boaz, and Desmarais and Ms Chandler), School of Aging Studies (Dr Andel), Department of Aging & Mental Health Disparities, Florida Mental Health Institute (Dr Becker), College of Behavioral & Community Sciences, University of South Florida, Tampa and Ortho-McNeil Janssen Scientific Affairs, Titusville, New Jersey (Dr Howe).

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