Malnourished and psychotic, and found incompetent to stand trial

Ravi R. Patel, MD, Rob Hornstra, MD, Stuart Munro, MD, and Timothy Dellenbaugh, MD

Mr. N, age 48, is arrested for cocaine possession but is declared incompetent to stand trial. He has chronic mental illness and is homeless. How would you proceed with his care?

CASE Psychotic while in jail
Mr. N, age 48, has chronic mental illness and has been in and out of psychiatric hospitals for 30 years, with diagnoses of bipolar disorder, not otherwise specified, without psychotic features and schizophrenia. He often is delusional and disorganized and does not adhere to treatment. Since age 18, his psychiatric care has been sporadic; during his last admission 3 years ago, he refused treatment and left the hospital against medical advice. Mr. N is homeless and often eats out of a dumpster.

Recently, Mr. N was arrested for cocaine possession, for which he was held in custody. His mental status continued to deteriorate while in jail, where he was evaluated by a forensics examiner.

Mr. N was declared incompetent to stand trial and was transferred to a state psychiatric hospital.

In the hospital, the treatment team finds that Mr. N is disorganized and preoccupied with thoughts of "lose control" to the physicians. He shows no evidence of suicidal or homicidal ideation or perceptual disturbance. Mr. N has difficulty grasping concepts, making plans, and following through with them. He has poor insight and impulse control and impaired judgment.

Mr. N’s past and present diagnoses include bipolar disorder without psychotic features, personality disorder, paranoid personality traits, borderline intelligence, cellulitis of both legs, and chronic venous stasis. Although he was arrested for cocaine possession, we are not able to obtain much information about his history of substance abuse because of his poor mental status.

What could be causing Mr. N’s deteriorating mental status?
- a) substance withdrawal
- b) malnutrition
- c) worsening schizophrenia
- d) untreated infection due to cellulitis

HISTORY Sporadic care
Mr. N can provide few details of his early life. He was adopted as a child. He spent time in juvenile detention center. He completed 10th grade but did not graduate from high school. Symptoms of mental illness emerged at age 18. His employment history is consistent with

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chronic mental illness: His longest job, at a grocery store, lasted only 6 months. He has had multiple admissions to psychiatric hospitals. Over the years his treatment has included divalproex sodium, risperidone, paroxetine, chlorpromazine, thioridazine, amitriptyline, methylphenidate, and a multivitamin; however, he often is noncompliant with treatment and was not taking any medications when he arrived at the hospital.

**EVALUATION:** Possible deficiency

The treatment team discusses guardianship, but the public administrator’s office provides little support because of Mr. N’s refusal to stay in one place. He was evicted from his last apartment because of hoarding behavior, which created a fire hazard. He has been homeless most of his adult life, which might have significantly restricted his diet.

A routine laboratory workup—complete blood count, basic metabolic panel, liver function test, thyroid-stimulating hormone, and lipids—is ordered, revealing an absolute neutrophil count (ANC) in the low range at 1,200/μL (normal range, 1,500 to 8,000/μL). Mr. N is offered treatment with a long-acting IM injection of risperidone because of his history of noncompliance, but he refuses the medication. Instead, he is started on oral risperidone, 2 mg/d.

The cellulitis of both lower limbs and chronic venous stasis are of concern; the medical team is consulted. Review of Mr. N’s medical records from an affiliated hospital reveals a history of vitamin B₁₂ deficiency. Further tests show that the vitamin B₁₂ level is low at <50 pg/mL (normal range, 160 to 950 pg/mL). Pernicious anemia had been ruled out after Mr. N tested negative for antibodies to intrinsic factor (a glycoprotein secreted in the stomach that is necessary for absorption of vitamin B₁₂). Suspicion is that vitamin B₁₂ deficiency is caused by Mr. N’s restricted diet in the context of chronic homelessness.

**Clinical Point**

In rare cases, vitamin B₁₂ deficiency presents with psychiatric symptoms such as depression, mania, psychosis, dementia, and catatonia.

**The authors’ observations**

A review of the literature on vitamin B₁₂ deficiency describes tingling or numbness, ataxia, and dementia; however, in rare cases, vitamin B₁₂ deficiency presents with psychiatric symptoms, such as depression, mania, psychosis, dementia, and catatonia.¹⁻¹³

We suspected that Mr. N’s vitamin B₁₂ deficiency could have been affecting his mental status; consequently, we ordered routine laboratory work-up that included a complete blood count with differential and peripheral smear, which showed macrocytic anemia and ovalocytes. We also tested his vitamin B₁₂ level, which was very low at 55 pg/mL. These results, combined with his previously recorded vitamin B₁₂ level (Table 1), suggested deficiency.

**TREATMENT:** Oral medication

Two months after starting risperidone, the medical team recommends IM vitamin B₁₂ as first-line treatment, but Mr. N refuses. We considered guardianship ex parte for involuntary administration of IM B₁₂ injection to prevent life-threatening consequences of a non-healing ulcer on his leg that was related to his cellulitis. Meanwhile, we reviewed the literature on vitamin B₁₂ therapy, including

<table>
<thead>
<tr>
<th>Date</th>
<th>Folate (ng/mL)</th>
<th>Vitamin B₁₂ (pg/mL)</th>
</tr>
</thead>
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<td>36.0</td>
<td>61</td>
</tr>
<tr>
<td>July 2003</td>
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<td>7.9</td>
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<tr>
<td>December 2005</td>
<td>13.3</td>
<td>&lt;100</td>
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<tr>
<td>June 2011</td>
<td>14.8</td>
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<tr>
<td>November 2011</td>
<td>19.9</td>
<td>55</td>
</tr>
<tr>
<td>December 2011</td>
<td>N/A</td>
<td>379</td>
</tr>
</tbody>
</table>

¹-¹³
Mr. N agrees to oral vitamin B$_{12}$, 1,000 µg/d, and we no longer consider guardianship ex parte. Mr. N's vitamin B$_{12}$ level and clinical picture improve 1 month after oral vitamin B$_{12}$ is added to oral risperidone. His thought process is more organized, he is no longer paranoid, and he shows improved insight and judgement. ANC and neutrophil count improve as well (Table 2). Mr. N's ulcer begins to heal despite his non-compliance with wound care.

The forensic examiner sees Mr. N after 3 months of continued therapy. His thought pattern is more organized and he is able to comprehend the criminal charges against him and to work with his attorney. He is determined competent by the forensic examiner; in a court hearing, the judge finds Mr. N competent to stand trial.

**Table 2**

<table>
<thead>
<tr>
<th>Date</th>
<th>Red blood cell count (x 10$^6$/μL)</th>
<th>Absolute neutrophil count (/μL)</th>
<th>Hemoglobin (g/dL)</th>
</tr>
</thead>
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<tr>
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<td>2.29</td>
<td>1,200</td>
<td>9.3</td>
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<td>November 21, 2011</td>
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</tr>
<tr>
<td>November 22, 2011</td>
<td>2.35</td>
<td>2,100</td>
<td>10.0</td>
</tr>
<tr>
<td>December 16, 2011</td>
<td>3.55</td>
<td>3,200</td>
<td>13.1</td>
</tr>
</tbody>
</table>

route, dosage, and outcome. Mr. N agrees to oral vitamin B$_{12}$, 1,000 µg/d, and we no longer consider guardianship ex parte. Mr. N's vitamin B$_{12}$ level and clinical picture improve 1 month after oral vitamin B$_{12}$ is added to oral risperidone. His thought process is more organized, he is no longer paranoid, and he shows improved insight and judgement. ANC and neutrophil count improve as well (Table 2). Mr. N's ulcer begins to heal despite his non-compliance with wound care.

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**Clinical Point**

Oral or sublingual vitamin B$_{12}$ can be given to patients who are disabled, geriatric, or refuse parenteral administration. Only approximately 1% of oral vitamin B$_{12}$ is absorbed in patients who do not have intrinsic factor. The daily requirement of vitamin B$_{12}$ is 1.0 to 2.5 µg/d; large oral dosages of 1,000 to 5,000 µg/d therefore seem to be effective in correcting deficiency, even in the presence of intrinsic factor deficiency. Large oral dosages also benefit other hematological abnormalities, such as a low white blood cell count and neutropenia.

**How vitamin B$_{12}$ deficiency affects neuropsychiatric illness**

Vitamin B$_{12}$ is essential for methylation, a process crucial for the formation of neurotransmitters such as serotonin, dopamine, and epinephrine. A low level of vitamin B$_{12}$ or sublingual vitamin B$_{12}$ can be given to patients who are disabled, geriatric, or refuse parenteral administration.

**The authors’ observations**

Based on our experience treating Mr. N, we think that it is important to establish an association between vitamin B$_{12}$ deficiency and psychosis. Vitamin B$_{12}$ deficiency is uncommon; however, serum levels do not need to be significantly low to produce severe neuropsychiatric morbidity, which has been reported with serum levels ≤457 pg/mL. It is more frequent than the other organic causes of psychosis and Mr. N’s improvement further strengthened the correlation.

Parenteral vitamin B$_{12}$ therapy is the first-line treatment for a deficiency, but oral or sublingual vitamin B$_{12}$ can be given to patients who are disabled, geriatric, or refuse parenteral administration. Only approximately 1% of oral vitamin B$_{12}$ is absorbed in patients who do not have intrinsic factor. The daily requirement of vitamin B$_{12}$ is 1.0 to 2.5 µg/d; large oral dosages of 1,000 to 5,000 µg/d therefore seem to be effective in correcting deficiency, even in the presence of intrinsic factor deficiency. Large oral dosages also benefit other hematological abnormalities, such as a low white blood cell count and neutropenia.

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Mr. D, age 23, presents with new-onset psychosis and catatonia 10 days after taking 2C-B, a hallucinogenic drug. He has no personal or family history of psychiatric illness. How would you treat him?

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can interrupt methylation and cause accumulation of homocysteine and impaired metabolism of serotonin, dopamine, and epinephrine. Hyperhomocysteinemia can contribute to cerebral dysfunction by causing vascular injury.\textsuperscript{26}

Vitamin B\textsubscript{12} also is involved in tetrahydrobiopterin synthesis in the brain, which is pivotal for synthesis of monoamine neurotransmitters. Vitamin B\textsubscript{12} deficiency can lead to accumulation of methyltetrahydrofolate, an excitatory neurotoxin. All of these can contribute to development of psychosis. Therefore, a defect in the methylation process could be responsible for the neuropsychiatric manifestations of vitamin B\textsubscript{12} deficiency.

What did we learn from Mr. N?

In most people, vitamin B\textsubscript{12} levels are normal, however, we recommend that clinicians consider vitamin B\textsubscript{12} deficiency when a patient has new-onset or unresponsive psychosis,\textsuperscript{27} particularly in a homeless person or one who has a restricted diet.\textsuperscript{28} It is important to rule out vitamin B\textsubscript{12} deficiency in a patient with a low serum folate level because folic acid therapy could exacerbate neurologic manifestations of underlying vitamin B\textsubscript{12} deficiency and increase the risk of permanent nerve damage and cognitive decline.

We were intrigued to see improvement in Mr. N after we added vitamin B\textsubscript{12} to his ongoing treatment with an antipsychotic. We did not believe that vitamin B\textsubscript{12} supplementation was the sole reason his mental status improved enough to be found competent to stand trial, although we believe that initiating oral vitamin B\textsubscript{12} was beneficial for Mr. N.

Last, this case supports the need for research to further explore the role of vitamin B\textsubscript{12} in refractory psychosis, depression, and mania.

References

Vitamin B12 deficiency can contribute to psychosis and other psychiatric disorders, especially in patients with a restricted diet, such as those who are homeless. Parenteral vitamin B12 therapy is the first-line treatment, but oral supplementation can be used if the patient refuses therapy. Large oral dosages of 1,000 to 5,000 µg/d seem to be effective in correcting vitamin B12 deficiency.