


Medication Discontinuation in Patients After Discharge From a Psychiatric Hospital

Annals of Pharmacotherapy
2015, Vol. 49(10) 1085–1095
© The Author(s) 2015
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1060028015593763
aop.sagepub.com


Heshu Abdullah-Koolmees, PhD^{1,2,3}, Helga Gardarsdottir, PhD^{1,4},
Dilek Yazir, BSc¹, Lennart J. Stoker, PharmD², Judith Vuyk, MD⁵,
Toine C. G. Egberts, PhD^{1,4}, and Eibert R. Heerdink, PhD^{1,4,5}

Abstract

Background: Patients discharged from psychiatric hospitals may be at risk for intentional or unintentional discontinuation of their medication. **Objective:** To describe and assess the discontinuation of, and changes to, psychiatric and/or somatic medication in patients after discharge from psychiatric hospitals. **Methods:** A retrospective follow-up study was conducted in patients discharged from 4 psychiatric hospitals in The Netherlands between 2006 and 2009. Patients' medication use during the last 2 days of hospitalization was compared with medication dispensed during the 3 months following discharge. Changes in psychiatric and somatic medication were investigated and defined as medication discontinuation, start, or switch. Patients were classified as continuing users, when there were no changes to the medication after discharge. Relative risks with 95% confidence intervals to measure differences in discontinuation were estimated using Cox regression analysis. **Results:** This study included 1324 patients, 69.8% of whom discontinued medication, and 9.7% switched one or more medications. Nearly half (47.4%) of all patients started a medication other than that dispensed during the last 2 days of hospitalization, and 13.7% of all patients experienced no changes to their medication regimen. Approximately 40% of the patients discontinued one or more medications for chronic conditions. From these, 68% discontinued psychiatric medications and 49.4% discontinued somatic medications. A quarter (25.2%) of the 644 patients discontinued using antipsychotics. More than a quarter (28.4%) of the 292 patients using medications for cardiovascular problems discontinued. Patients using as-needed medication prior to discharge were more likely to discontinue their medication (relative risk = 1.85; 95% confidence interval = 1.55-2.20). **Conclusions:** Discharge from a psychiatric hospital led to medication discontinuation in approximately 70% of all patients. Approximately 40% of the patients discontinued medications for chronic conditions. Discontinuation of somatic medication was more frequent than discontinuation of psychiatric medication, and risk of discontinuation was lower for patients with depressive and anxiety disorders. Although medication discontinuation can be deliberate it is alarming that a quarter of our patients using antipsychotics and cardiovascular medications discontinued their use, both of which are meant for chronic conditions.

Keywords

discontinuation, change of setting, discharge, changes, psychiatry, medication, psychiatric hospital, continuation of care

Introduction

Hospital admission and discharge is often accompanied with changes to patients' medication regimens.¹⁻⁶ Studies have shown that after discharge from a general hospital, 40% to 98% of patients have one or more medications changed, such as stopping a medication or initiating a new one.^{2,6} Medication discontinuation can be intentional as well as unintentional. Intentional medication discontinuation may result from hospital medication review prompted by the patients' poor health condition. Unintentional medication discontinuation can occur due to problems in communication between health care providers at primary and secondary

care levels, unclear prescribing responsibilities, and associated administrative errors.^{7,8} In addition, once patients are

¹Utrecht University, Utrecht, The Netherlands

²Broceaf Ziekenhuisfarmacie, Den Dolder, The Netherlands

³Diakonessenhuis, Utrecht, The Netherlands

⁴University Medical Center Utrecht, Utrecht, The Netherlands

⁵Altrecht Institute for Mental Health Care, Utrecht, The Netherlands

Corresponding Author:

Eibert R. Heerdink, Department of Pharmacoepidemiology & Clinical Pharmacology, Utrecht Institute for Pharmaceutical Sciences, David de Wied Building, PO Box 80082, 3508 TB Utrecht, The Netherlands.
Email: e.r.heerdink@uu.nl

discharged, the responsibility for medication management shifts from health care professionals to the patient. Patients may decide not to refill medication or not to take medication as prescribed and thus become nonadherent.⁸⁻¹²

Patients discharged from psychiatric hospitals can experience discontinuation of psychiatric and/or somatic medication. Medications indicated to treat psychiatric condition(s) are categorized as psychiatric medications. Somatic medications include all medications used to treat nonpsychiatric diseases.^{3,13-33} In 2 previous studies we have shown that psychiatric hospitalization is associated with the discontinuation of somatic medication, such as anticoagulants and cardiovascular medication.^{1,34} Medication discontinuation—be it of psychiatric or somatic medications—can affect patients' health.¹² To date, the majority of studies investigating medication discontinuation at transition of care focused on general hospital settings; thus, little is known about medication discontinuation in patients after discharge from a psychiatric hospital. Therefore, the aim of this study was to describe and assess changes to, and discontinuation of, psychiatric and somatic medication in patients discharged from psychiatric hospitals.

Methods

Setting

The Psychiatric Case Register Middle Netherlands (PCR-MN) encompasses the inpatient and outpatient care population of psychiatric services in the province of Utrecht, a central region of The Netherlands.³⁵ The setting of our study was Altrecht Institute for Mental Health Care, a conglomeration of 4 psychiatric hospitals within PCR-MN that serves about 800 000 inhabitants in Utrecht.³⁶ In 2013, these hospitals had a total of 746 beds, treating patients with a wide range of mental diseases and providing both inpatient and outpatient care. Inpatients' medication was provided by the hospital pharmacy in Altrecht. These hospital pharmacy files included information such as patient numbers, gender, birth date, type of care (inpatient and outpatient), start and end dates, type and dosage of medication used, and admission and discharge dates from 2006 onward. Medication was categorized according to the World Health Organization Anatomical Therapeutic Chemical and the Defined Daily Dose (ATC/DDD) coding systems.³⁷ Information on outpatient medication use was available through the Achmea Health Database, but only for patients who had private health insurance from Achmea (the largest insurance company in the region).³⁸ The study's protocol was reviewed and approved by the institution's scientific board and performed in compliance with the Code of Conduct for the use of data in Health Research of the Federation of Dutch Medical Scientific Societies.

Design and Study Population

A retrospective follow-up study was conducted in psychiatric patients (spanning all ages) who had been admitted to 1 of the 4 psychiatric hospitals for at least 7 days and were discharged between January 1, 2006, and December 31, 2009. The day of discharge was defined as the index date. Hospitalizations of less than 7 days between discharge and the following admission were considered to be one hospitalization. In order for patients to be selected, information on their outpatient medication use had to be available for at least 3 months after psychiatric discharge. This 3-month follow-up period is based on the most common prescription duration in The Netherlands. The study period included psychiatric hospitalization and the 3 months after discharge, or until rehospitalization, whichever took place first (Figure 1).

Medication was divided into 2 classes, namely, "any somatic medication" and "any psychiatric medication" (see the appendix). Furthermore, frequently used somatic and psychiatric medications were classified by their indication (see the appendix).¹⁴ Somatic medication was classified as follows: cardiovascular medications, laxatives, acid- and bowel-related medications, anticholinergic medications, asthma and COPD (chronic obstructive pulmonary disease) medications, lipid-lowering medications, vitamins, analgesics, antidiabetics, dermatologicals, thyroid medications, and antibiotics and antifungals. Psychiatric medication was classified as antipsychotics, antidepressants, mood stabilizers, anxiolytics and sedatives, and other psychotropics. Prescriptions for over-the-counter medications such as contraceptives, dermatologicals, and other preparations without an active substance were excluded.

Outcomes

The main outcome of this study was the discontinuation of psychiatric and somatic medications after discharge from a psychiatric hospital. *Discontinuation* took place when medication used during the last 2 days of hospitalization was not dispensed during the 3 months after discharge. Additionally, we investigated whether the discontinued medication had been dispensed during the 3 months preceding hospitalization using the ATC code level 4. This information was retrievable for patients whose medication history was available for the 3 months prior to psychiatric admission. Other medication changes occurring after discharge were defined as start, switch, add-on, and continuation. Changes to medication were identified by comparing the drugs' ATC 4 levels. The ATC 4 classification system categorizes medications into groups, either according to the organ or system they act on, or to the medication's chemical, pharmacological, and therapeutic properties.³⁷ Patients were considered starters if they were dispensed a medication after leaving the hospital, which was not used during the last 2 days of hospitalization.

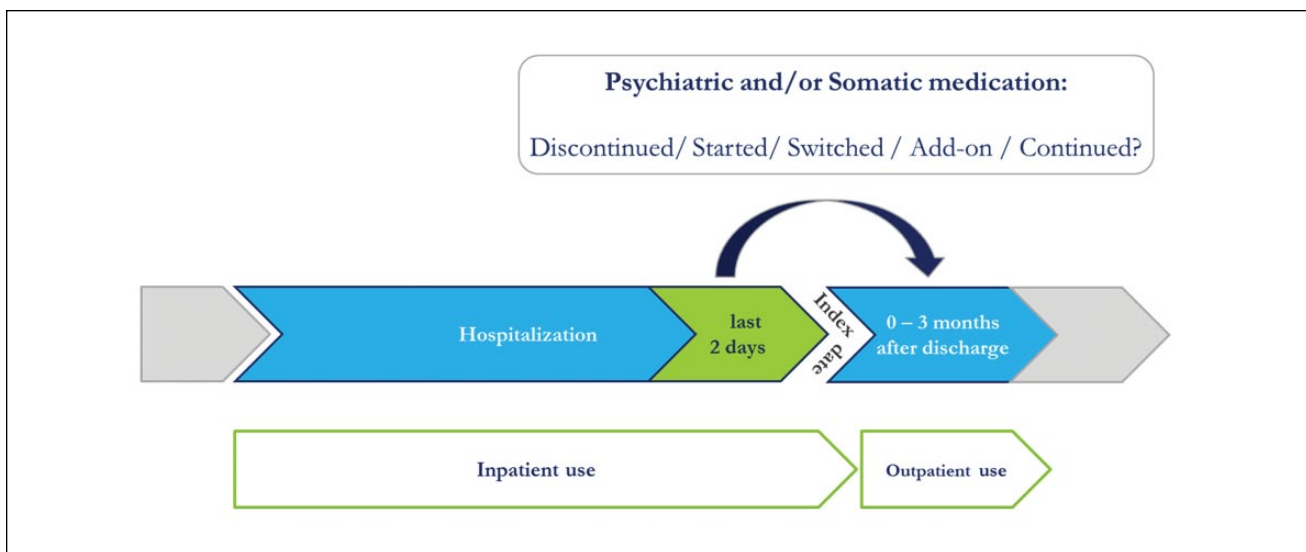


Figure 1. Time of follow-up. The medication dispensed during the 3 months after discharge was compared with the medication used during the last 2 days of hospitalization.

To investigate whether they might be *restarters*, we checked whether they had been prescribed any medications in the 3 months prior to admission, and compared using ATC code level 4. If patients were dispensed a medication within the same therapeutic group (same ATC level 4 code, for instance, changing from haloperidol to quetiapine) they were classified as *switchers*. When patients were dispensed 2 medications after discharge that matched the ATC code level 4 of medications used during the last 2 days at the hospital, then the medication closest to the index date was selected to define the category of use. Patients were considered to belong to the *add-on* category when, after discharge, the same medications as those used at the hospital were dispensed in conjunction with other medications from the same therapeutic group (same ATC level 4 code, for instance, olanzapine with haloperidol). When the medications being used during the last 2 days of hospitalization continued to be dispensed in the 3 months after discharge, patients were considered to be *continuing users* (*continuers*).

Data Analysis

Incidences of discontinuation, start, switch, add-on, and continuation of medication use after discharge from a psychiatric hospital were calculated for 2 main medication groups: all medications and medications for chronic/long-term use. Medication for chronic use included all medications, which were regularly prescribed by a physician.

Patient characteristics likely to be associated with medication discontinuation were investigated. These included gender; age (<45 years, 45-59 years, >60 years); duration of

hospitalization (categorized in tertiles to obtain 3 equally divided groups: 7-36 days, 37-96 days, ≥ 97 days); diagnosis at discharge according to *DSM-IV-TR* (*Diagnostic and Statistical Manual of Mental Disorders, Text Revision*); type of ward at discharge; Global Assessment of Functioning (GAF) score; and use of as-needed medication before discharge.

DSM diagnoses were classified as schizophrenia and psychotic disorders; bipolar disorders; depressive and anxiety disorders; delirium, dementia, amnesic and other cognitive disorders (cognitive disorders); substance-related disorders; and other diagnosis and unknown diagnosis.^{1,34}

The admission ward was classified as either psychogeriatric (specialized wards for patients ≥ 60 years) or nonpsychogeriatric (patients under 60 years).

Cox proportional hazards regression was conducted to estimate the relative risks (RRs) of discontinuation for each patient characteristic with 95% confidence intervals (CIs). Statistical significance was determined at $P < 0.05$. Time was considered a constant. The data analysis was performed using IBM Software package SPSS 20.0 for Windows released in 2011 (Armonk, NY).

Results

This study included 1324 patients. Their mean age was 44.8 years (standard deviation [SD] 18.8 years); 664 (50.2%) were male and the mean patients' GAF score was 48.6 (SD 11.9) (Table 1).

The most common diagnoses were schizophrenia and other psychotic disorders (35.9%), depressive and anxiety disorders (28.9%), and substance-related disorders (20.4%).

Table 1. Characteristics of the Study Population.

Characteristics	N = 1324	%/SD/Range
Gender (%)		
Male	664	50.2
Mean age in years (SD)	44.8	18.8
<45 years	707	53.4
45-59 years	319	24.1
≥60 years	298	22.5
Median duration of hospitalization (range)	63.0	7-1424
7-36 days	445	33.6
37-96 days	437	33.0
≥97 days	442	33.4
Mean GAF score (SD)	48.6	11.9
0-25	42	3.2
26-50	658	49.7
51-100	439	33.2
Unknown	185	14.0
Time to rehospitalization (%)		
7 days to <1 month after discharge	98	7.4
1 to <2 months after discharge	58	4.4
2 to <3 months after discharge	60	4.5
≥3 months or no rehospitalization	1108	83.7
Diagnosis at discharge (%) ^a		
Schizophrenia and other psychotropic disorders	475	35.9
Depressive and anxiety disorders	382	28.9
Substance-related disorders	270	20.4
Cognitive disorders	122	9.2
Bipolar disorders	118	8.9
Other diagnosis	365	27.6
Unknown	96	7.3
Type of ward at discharge (%)		
Nonpsychogeriatric	1047	79.1
Psychogeriatric	277	20.9
Year of discharge (%)		
2006	249	18.8
2007	354	26.7
2008	405	30.6
2009	316	23.9

^aTotal exceeds 100% because of multiple diagnoses.

Median duration of hospitalization was 63 days (range 7-1424 days), with 1047 (79.1%) of the patients being discharged from nonpsychogeriatric wards. The majority of the patients (81.3%) used at least one medication during their last 2 days of hospitalization. From these, 83.6% used psychiatric medication.

The most commonly used psychiatric therapeutic classes were anxiolytics and sedatives (64.2%), followed by antipsychotics (48.6%), antidepressants (34.8%), and mood stabilizers (15.6%).

More than half (58.5%) of the patients using medication used at least one somatic medication. From these, 22.1%

took cardiovascular medications, 15.9% took laxatives, and 15.4% took acid and bowel medications (Table 2).

Of the 1077 patients, 69.8% (752) discontinued at least one medication after discharge (Table 2). From the 1029 patients using psychiatric medications, 47.2% discontinued at least one psychiatric medication. There were 850 patients that used anxiolytics and sedatives; from these, 52.1% discontinued their use. Of the 71 patients using other psychiatric medication, 35.2% also discontinued, followed by 25.2% of 644 antipsychotic users, 14.6% of 206 mood stabilizer users, and 13.9% of 461 antidepressant users.

Somatic medication was discontinued in 48.8% of the 774 patients. Frequently discontinued somatic medications meant for long-term use were cardiovascular medication (28.4% of 292 patients), acid- and bowel-related medication (24.5% of 204 patients), antidiabetics (22.6% of 84 patients), and lipid-lowering medication (15.8% of 114 patients).

When looking only into long-term use medication (excluding vitamins, antifungals and antibiotics, dermatologicals, and as-needed medication), 39.7% of 1067 patients had at least one medication discontinued, 24.3% (of 1029) discontinued psychiatric medication, and 47.5% (of 600) discontinued somatic medication. A 3-month medication history prior to hospitalization was available for an overwhelming majority of patients experiencing medication discontinuation at discharge (92.2%; 693 of 752). Nearly half (44.4%) of these patients were dispensed their discontinued medication before being admitted. Approximately half (47.4%) of the patients started a new medication (during follow-up) that was not used during the 2 days prior to discharge. One out of 5 (21.7%) started psychiatric medication, and 37.8% started somatic medication. For almost half (46.6%) of the patients, the medication initiated after discharge had already been dispensed in the 3 months prior to hospital admission.

Almost 2 out of 20 patients (9.7%) switched medication after discharge (Table 3). About 4.5% of patients switched a psychiatric medication, most frequently for anxiolytics and sedatives (3.1%) and antipsychotics (2.8%). Nearly 6% of the patients switched somatic medication after discharge, with the most frequent switches being acid- and bowel-related medications (9.3%) and analgesics (5.6%).

An add-on medication was dispensed for 1.8% of the patients after discharge. From these, 0.9% of the patients were classified as add-on for a psychiatric medication and 0.9% were classified as add-on for a somatic medication.

From the 1077 patients, 148 (13.7%) continued all their medications after discharge. More than a quarter (27.5%) of the 1077 patients continued all medication after discharge without switching or discontinuing, but added-on, starting a medication that was not used during hospitalization (see Figure 1 and Table 2). Half (50.1%) of the 1029 users of psychiatric medication continued to use their psychiatric

Table 2. Medication Use in 1324 Patients on the Last 2 Days of Hospitalization and the Proportion of Medication: Discontinued, Started, Switched, and Continued (Without Any Medication Switched or Discontinued)^a.

Medication Use in the Last 2 Days of Hospitalization	N	% of 1324	Discontinued (%)	% ^b of Discontinuers				Starters (% of 1324)	Restarters (% of Starters)
				Used Before Hospitalization	Switched (%)	Continued (%)			
Any medication	1077	81.3	69.8	40.8	9.7	27.5	47.4	42.6	
Any psychiatric medication	1029	77.7	49.4	29.6	4.8	50.1	21.7	51.9	
Anxiolytics and sedatives	850	64.2	52.1	41.4	3.1	46.4	14.2	52.1	
Antipsychotics	644	48.6	25.2	54.7	2.8	72.4	8.2	44.2	
Antidepressants	461	34.8	13.9	46.7	1.7	84.4	8.5	50.0	
Mood stabilizers	206	15.6	14.6	14.0	0.5	85.4	2.5	45.5	
Other psychiatric medication	71	5.4	35.2	12.0	0.0	64.8	1.7	40.9	
Any somatic medication	774	58.5	68.0	31.0	7.8	31.4	37.8	32.4	
Cardiovascular medications	292	22.1	28.4	60.2	5.1	69.5	5.5	28.8	
Laxatives	210	15.9	57.6	24.0	2.9	40.0	3.0	15.0	
Acid- and bowel-related medications	204	15.4	24.5	52.0	9.3	66.2	3.9	39.2	
Anticholinergic medications	179	13.5	50.8	11.0	0.6	48.6	2.7	16.7	
Asthma and COPD medications	119	9.0	62.2	35.1	1.7	37.8	3.3	29.5	
Lipid-lowering medications	114	8.6	15.8	88.9	2.6	81.6	1.9	56.0	
Vitamins	110	8.3	93.6	1.0	0.0	6.4	0.2	50.0	
Analgesics	89	6.7	51.7	32.6	5.6	42.7	7.6	32.0	
Antidiabetics	84	6.3	22.6	78.9	0.0	77.4	1.5	50.0	
Dermatologicals	77	5.8	79.2	11.5	2.6	19.5	7.9	18.1	
Thyroid medications	49	3.7	93.9	8.7	0.0	6.1	0.7	55.6	
Antibiotics and antifungals	33	2.5	69.7	34.8	0.0	30.3	9.5	17.5	

Abbreviation: COPD, chronic obstructive pulmonary disease.

^aThe proportions are shown for any medication and stratified for different medication classes after discharge from a psychiatric hospital.

^bProportion of medication discontinued that were dispensed during 3 months prior to hospitalization.

medication, whereas 31.4% of the 774 patients using somatic medications continued use after discharge. Most commonly continued medications were mood stabilizers (85.4%), followed by antidepressants (84.4%) and antipsychotics (72.4%).

Males (RR = 1.15; 95% CI = 0.99-1.33) and patients with schizophrenia and other psychotic disorders (RR = 1.10; 95% CI = 0.95-1.28) had a slightly higher risk of medication discontinuation after discharge, although this was not statistically significant. Patients <45 years and 45 to 59 years had lower risk of medication discontinuation when compared with patients ≥60 years with RR = 0.86 (95% CI = 0.72-1.02) and RR = 0.91 (95% CI = 0.75-1.11), respectively. However, those RRs were not statistically significant. Patients with shorter hospital admissions (7-36 days) had a lower risk of discontinuation (RR = 0.88; 95% CI = 0.74-1.05) than patients with lengthier hospitalizations (≥97 days). Patients discharged from nonpsychogeriatric wards had an RR of 0.88 (95% CI = 0.75-1.04) compared with patients discharged from psychogeriatric wards. No significant difference in risk of discontinuation was found for the year of discharge. Patients using as-needed medication before discharge had a higher risk of discontinuing medication in general (RR = 1.85; 95% CI = 1.55-2.20). Risk of discontinuation was 0.85

times lower for patients with depressive and anxiety disorders (95% CI = 0.72-0.99; Table 3).

Discussion

In this study, we have shown that discharge from a psychiatric hospital was accompanied with medication discontinuation in approximately 70% of our patients. Most notably, 40% of the patients discontinued use of long-term medication. Discontinuation of somatic medication was more frequent than discontinuation of psychiatric medication. Almost half of the patients started a new medication after discharge, which had not been used during their last 2 days of hospitalization.

Our study is in line with results from earlier studies on medication discontinuation for patients being discharged from general hospitals or experiencing a change of setting.^{1-6,34} Grimmsmann et al found in their follow-up study that 57% of the 2426 patients discharged from a general hospital had a discontinuation and that 55% started a new medication.⁶ Overall, nearly 98% of the patients experienced at least one medication change. Karapinar-Çarkit and colleagues performed a before-after study to measure the effect of an intervention consisting

Table 3. Relative Risks for Patients' Medication to Be Discontinued After Discharge From a Psychiatric Hospital.

Characteristics	N	Discontinuation	%	Crude RR (95% CI)
Overall	1077	752	69.8	
Gender (%)				
Male	529	396	74.9	1.15 (0.99-1.33)
Female	548	356	65.0	Reference
Age groups				
<45 years	539	356	66.0	0.86 (0.72-1.02)
45-59 years	269	189	70.3	0.91 (0.75-1.11)
≥60 years	269	207	77.0	Reference
Duration of hospitalization				
7-36 days	346	227	65.6	0.88 (0.74-1.05)
37-96 days	369	256	71.9	0.93 (0.79-1.11)
≥97 days	362	269	74.3	Reference
Diagnosis at discharge				
Schizophrenia and other psychotic disorders	409	303	74.1	1.10 (0.95-1.28)
Patients without schizophrenia and other psychotic disorders	668	449	67.2	Reference
Depressive and anxiety disorders	307	190	61.9	0.85 (0.72-1.00)*
Patients without depressive and anxiety disorders	770	562	73.0	Reference
Substance-related disorders	232	172	74.1	1.08 (0.91-1.28)
Patients without substance-related disorders	845	580	68.6	Reference
Type of ward at discharge				
Nonpsychogeriatric	822	556	67.6	0.88 (0.75-1.04)
Psychogeriatric	255	196	76.9	Reference
Year of discharge (%)				
2006	179	114	63.7	0.84 (0.67-1.06)
2007	290	190	65.5	0.87 (0.71-1.06)
2008	344	248	72.1	0.95 (0.79-1.15)
2009	264	200	75.8	Reference
Having an as-needed medication				
Yes	732	599	81.8	1.85 (1.55-2.20)*
No	345	153	44.3	Reference

Abbreviations: RR, relative risk; CI, confidence interval.

* $P < 0.05$.

of instructions for documentation of discharge information.³⁹ They found that 47% of the 112 patients discharged from a general hospital started, 6.8% switched, and 15.2% discontinued a medication in the before study.^{1-6,39} The most frequently discontinued classes of psychiatric medication in our study were anxiolytics and sedatives. Anxiolytics and sedatives are often used as-needed and only during hospitalization or unstable periods; thus, it is commonplace for these to be discontinued after discharge.

Furthermore, medication reconciliation around discharge could also have resulted in intentional discontinuation of some medication. Health care providers might decide to discontinue or change a medication due to various reasons, such as lack of need, inappropriateness, drug–drug interactions, side effects, or inappropriate polypharmacy.^{40,41} However, in our study, discontinuation and other changes due to medication reconciliation are unlikely, since guidelines for medication reconciliation and for transfer of information on medication at hospitalization and discharge were only made available after the study period

(from January 2011 onwards).^{34,42} Another reason contributing to medication discontinuation might be that patients do not refill medication that they might already have available at home. However, medication used long term is refilled regularly. Patients' noncompliance, which has been reported to be approximately 50% among psychiatric patients, can also result in not refilling prescriptions regularly, resulting in observed discontinuation in our study.^{10-12,33} Medication changes can also have occurred unintentionally. Patients' medication can be discontinued or changed unintentionally after discharge due to insufficient communication between health care providers of primary and secondary care, or insufficient communication between patients and health care providers.

All patients are required to have health insurance in The Netherlands. Patients without outpatient information in the database used for this study were insured by other health insurance companies. The study population was insured by one of the biggest health insurance companies and was comparable to patients insured by other health insurance companies.

Patients receive medication from secondary care when they are hospitalized, while at discharge, medication is dispensed from primary care. Nonhospitalized patients get prescriptions for their medication and have to refill their medication themselves. Medications are reimbursed by the health insurance company. Patients take their contraceptives with them when they are hospitalized, meaning that contraceptives are usually not dispensed from the hospital pharmacy. Discontinuation of somatic medication can occur due to late or nonarrival of information during transition from secondary care to primary, due to administrative errors. Discontinuation of somatic medication can also occur if general practitioners (GPs) are not informed about changes in the pharmacotherapy on discharge. GPs are often responsible for prescribing somatic medication after discharge, and patients are responsible for the continuation of their health care. If the GP does not prescribe medication then patients need to take action to get a prescription or continue the medication as it was administered during their hospitalization. The GP does not have an overview of the patients discharged from a hospital nor does he or she monitor the continuity of medication in the current health care system. On discharge, patients have to monitor their medication use with their primary health care providers, such as GPs and the ambulatory psychiatrists. Patients need to communicate with different health care providers to achieve continuity of their medication. Some patients might find this difficult and may not succeed in organizing their health care, thus lessening their chances in getting a prescription for their medication. The ambulatory psychiatrist treating outpatients is responsible for psychiatric pharmacotherapy. Secondary care psychiatrists prescribe only the first round of psychiatric medication, which are dispensed after discharge. Discontinuation of psychiatric as well as somatic medications, whether intentional or unintentional, may affect patients' health, positively or negatively.¹² It is unknown whether patients and health care providers know if a medication was discontinued or changed after discharge, and whether it was intentional or not. Earlier studies in patients discharged from general hospitals have shown that medication changes are documented in less than 50% of patients.^{5,39}

Medication discontinuation might have clinical consequences. We found that 28.4% of the patients discontinued cardiovascular medications, 15.8% discontinued lipid-lowering medications, and 22.6% discontinued antidiabetics, which is reason for concern. Cardiovascular medications, lipid-lowering medications, and antidiabetics are examples of medications that are often used long term. Discontinuing these medications can lead to destabilization of hypertension, cholesterol, and blood glucose control. On the other hand, discontinuation of some medication might be warranted, such as discontinuing medication that is no longer appropriate, like anxiolytics and sedatives. It is therefore important that discontinuation in patients' medication

should be well documented and transferred between health care providers when patients are discharged, in order to prevent medication errors and possible related harm.³⁹

In our study, start of a medication after discharge was investigated, particularly if patients got medications dispensed that were prescribed prior to hospitalization. Almost 4 out of 5 patients started a medication that was also used prior to psychiatric hospitalization. We did not have information on the reason for starting these medications. Different scenarios for starting are possible, such as having to be used again after discharge, or because they were temporary or unintentionally discontinued during the psychiatric hospitalization, or they were unintentionally started again after discharge.⁴⁰ For example, among the antipsychotics (44.2%) and antidepressants (50%), around half of the starters were restarters. This means that the medication was used before admission, but was not used during the last 2 days of hospitalization. During psychiatric hospitalization, treatment of psychiatric diseases is evaluated, and changed if needed, until the patient's disease and symptoms are stabilized. If antipsychotics and antidepressants are not part of the treatment then they are discontinued before discharge and patients are switched to another medication if necessary. Of the somatic medications, cardiovascular medication (28.8%) was most often restarted after discharge. Cardiovascular medication is usually used long term. The reason for not using these medications during hospitalization might be intentional—they may not be needed, they may be inappropriate given the patient's situation—or unintentional.

After discharge from a psychiatric hospital, 9.7% of the patients switched a medication, mainly somatic medication (Figure 2). The proportion of patients that switched a medication after discharge was smaller than at hospitalization, as reported in our earlier study (27%).¹ At hospitalization hospital formularies may play a role for the switch of a medication. Whereas switch at discharge can occur because patients are switching back to a medication, which was dispensed before psychiatric hospitalization, or due to a medical doctor order, or an error. On the other hand, for the patients, a switch of medication is yet another change in their medication and might be alarming. Patients need to be informed about the switch and need to be persuaded to use the new medication.

To the best of our knowledge, this is the first study investigating the discontinuation of psychiatric and somatic medication after a psychiatric hospital discharge. We were able to study a large number of discharged patients, within a study period spanning several years, for which primary and secondary data were combined. A limitation of our study is that we did not know whether medication discontinuations were intentional or unintentional. In addition, when patients got their medication dispensed after discharge, we assumed they were using it. However, noncompliance to medication is very common and getting medication dispensed does not mean that

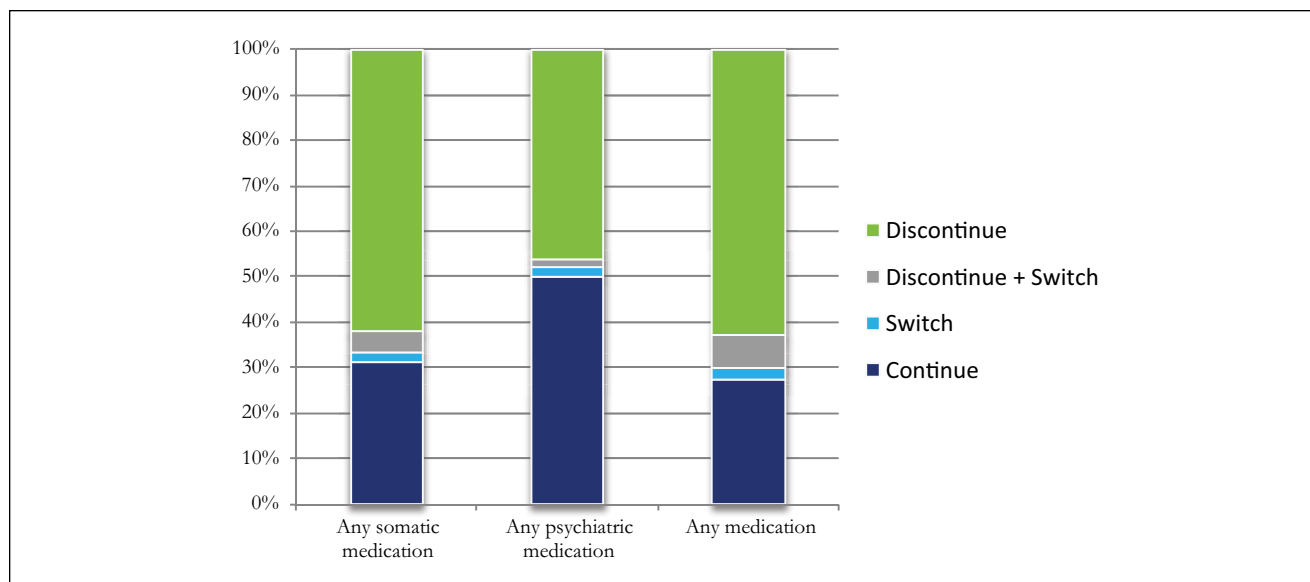


Figure 2. Proportion of patients discontinued, discontinued and switched, switched, and continued (without any medication switched or discontinued) any psychiatric and somatic medication after discharge from a psychiatric hospital.

patients are using the medication.³³ In our study, only dispensed medication was included. We had no information on the medication patients might still have at home, which could lead to a delayed refill of the medication. However, medication used long-term needs to be used as prescribed and refilled regularly. Another limitation is that a portion of the study population had a follow-up time of 7 days to 1 month after discharge due to rehospitalization. These patients had a shorter follow-up compared with other patients who had a longer follow-up period and thus had more time to refill their medication. However, only a small portion of these patients had a short follow-up (7.4%). The majority of the patients (83.7%) had a follow-up of at least 3 months after discharge. Another limitation of our study could be the lack of information on hospitalization at other hospitals, although we consider this unlikely for the majority of the patients.

Discontinuation was higher in somatic medication than psychiatric medication. This might be partially explained by temporary indications or specific hospital guideline/practices such as for use of vitamins, dermatologicals, antibiotics and antifungals, laxatives, and analgesics. Observing more cases of discontinuation after discharge is more likely for some types of medication, as during hospitalization all medication use is registered. This would explain the high discontinuation rates of analgesics (nonsteroidal anti-inflammatory drugs), as this can be purchased over the counter without a prescription after discharge. Also, in the case of as-needed medications, such as asthma and COPD medications, these might not be refilled regularly every 3 months.

The last 2 days before discharge, including the day of discharge and the day before discharge, were used as a reference period. These 2 days were included because patients might be

discharged early in the morning on the day of discharge, meaning there was no medication used in the hospital on the day of discharge. We expect that little to no changes occurred in the last 2 days before discharge. There was no information about prescriptions for over-the-counter medication after discharge. Therefore, over-the-counter medications were excluded because patients can refill these medications without a prescription. Virtually all medications are regularly used and dispensed once per 1 to 3 months. Only a small number of medications, such as denosumab, are used once per 6 months. If the first refill of these prescriptions was after 3 months post-discharge, then proportion of medication discontinuation can be overestimated. However, we think that this had little to no influence on our results because the prevalence of these kinds of medications is expected to be low. Furthermore, contraceptives were not included in our study due to lack of information about use since they are usually not dispensed by the hospital pharmacy during hospitalization.

Change of a psychiatric patient's status, drug–drug interactions, or inappropriate prescribing can lead to discontinuation or other changes of the medication. We could not assess in how many patients medication discontinuation or change was intentional because it was not recorded in the database. All patients are required to have health insurance in The Netherlands. The patients without outpatient information in the database used for this study were insured by other health insurances. Insurance is not linked to specific patient characteristics.

Health care providers need to be aware of the risk of medication discontinuation and other medication changes after discharge. Change in setting puts patients at a higher risk for discontinuation of medication. Therefore, medication

reconciliation and transition of information are important between health care providers of both primary and secondary care, respectively, and patients. Clinical pharmacists should get involved in patients' treatment in the psychiatric hospital to help prevent adverse drug reactions and drug-drug interactions. Also, clinical pharmacists should inform patients about how to continue their medication after discharge.^{5,40,43-46} For example, patients can get a tailored-to-them pharmaceutical consult. In such consults, the manner in which pharmaceutical care should be continued can be discussed, which includes any change or discontinuation of treatment. The consultation can be performed by a pharmaceutical consultant, who can contact the clinical pharmacist when needed. Another option is that clinical pharmacists inform health care providers such as the community pharmacist and the GP about patients' medication at discharge. When health care providers decide to discontinue a

medication, the date and the reason for the discontinuation needs to be recorded in patient files. Treatment of both somatic and psychiatric diseases is important for the patient's overall health.⁴⁷ Future research is needed to assess to what extent discontinuation of and changes to medication at discharge are intentional or unintentional.

In conclusion, discharge from a psychiatric hospital led to medication discontinuation in approximately 70% of the patients, while long-term medication discontinuation was found in 40% of the patients. Somatic medication was discontinued more often and started after discharge more often than psychiatric medication, and risk of discontinuation was lower for patients with depressive and anxiety disorders. Although medication discontinuation can be deliberate it is alarming that a quarter of our patients using antipsychotics and cardiovascular medications discontinued their use, both of which are meant for chronic conditions.

Appendix

Medication Classes and Anatomical Therapeutic Chemical (ATC) Code(s).³⁷

Medication Classes	ATC Code(s)
Somatic (with fixed dose)	
Acid- and bowel-related medications	A02B and A03A
Laxatives	A06A
Antidiabetics	A10A and A10B
Cardiovascular medications	B01A, B02B, C01, C02A, C02C, C02K, C02N, C03, C04A, C07A, C08C, C08D, and C09
Lipid-lowering medications	C10A and C10B
Asthma and COPD medications	R03A and R03B
Antihistamines	R06A, excluding R06AE03, R06AD02, and R06AX26
Thyroid medications	H03A and H03B
Antifungals and antibiotics	J01A, J01C, J01E, J01F, J01M, J01X, and J02A
Analgesics and antirheumatics	N02A, N02B, and M01A, excluding N02BE01 and N02BE51
Vitamins	A11C, A11D, A11G, A11H, and B03B, excluding A11GA01, A11HA03, A11HA02 and B03BB01
Dermatologicals	D except D01AC09, D01AC01, D01AC02, D10AE01, D01AE15, D1AF, D11AX01, D02A A-E/X, D04AB07, D06BB03, and D06BB06
Anticholinergic medications	N04A
Any somatic medication	All ATC codes excluding A11GA01, A11HA03, A11HA02, B03BB01, D01AC09, D01AC01, D01AC02, D10AE01, D01AE15, D1AF, D11AX01, D02A A-E/X, D04AB07, D06BB03 and D06BB06, G02B, G03A, N05, N06, N07B, N02BE01, N02BE51, N03AF01, N03AG01, N03AX09 R06AE03, R06AD02, and R06AD02
Psychiatric	
Antipsychotics (excluding lithium)	N05A excl. N05AN
Mood stabilizers (lithium, carbamazepine, valproic acid, and lamotrigine)	N05AN, N03AF01, N03AG01, and N03AX09
Anxiolytics and sedatives (including promethazine)	N05B, N05C, and R06AD02
Antidepressants	N06A
Other psychotropics	N06B, N07B, N03AX11, and N03AE01
Any psychiatric medication	N05A, N03AF01, N03AG01 and N03AX09, N05B, N05C, R06AD02, N06A, N06B, N07B, N03AX11, and N03AE01

Abbreviation: COPD, chronic obstructive pulmonary disease.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Abdullah-Koolmees H, Gardarsdottir H, Stoker LJ, Vuyk J, Egberts TC, Heerdink ER. Discontinuation of somatic medication during psychiatric hospitalization. *Ann Pharmacother*. 2014;48:1415-1425. doi:10.1177/1060028014544897.
2. Stuffken R, Egberts TC. Discontinuities in drug use upon hospital discharge. *Pharm World Sci*. 2004;26:268-270.
3. Stuffken R, Heerdink ER, de Koning FH, Souverein PC, Egberts AC. Association between hospitalization and discontinuity of medication therapy used in the community setting in the Netherlands. *Ann Pharmacother*. 2008;42:933-939. doi:10.1345/aph.1L062.
4. Tam VC, Knowles SR, Cornish PL, Fine N, Marchesano R, Etchells EE. Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. *CMAJ*. 2005;173:510-515. doi:10.1503/cmaj.045311.
5. Karapinar F, van den Bemt PM, Zoer J, Nijpels G, Borgsteede SD. Informational needs of general practitioners regarding discharge medication: content, timing and pharmacotherapeutic advice. *Pharm World Sci*. 2010;32:172-178. doi:10.1007/s11096-009-9363-3.
6. Grimmsmann T, Schwabe U, Himmel W. The influence of hospitalisation on drug prescription in primary care—a large-scale follow-up study. *Eur J Clin Pharmacol*. 2007;63:783-790. doi:10.1007/s00228-007-0325-1.
7. Corry M, Bonner G, McEntee S, Dugan J, MacAuley D. Hospitals do not inform GPs about medication that should be monitored. *Fam Pract*. 2000;17:268-271.
8. Himmel W, Kochen MM, Sorns U, Hummers-Pradier E. Drug changes at the interface between primary and secondary care. *Int J Clin Pharmacol Ther*. 2004;42:103-109.
9. Bolas H, Brookes K, Scott M, McElnay J. Evaluation of a hospital-based community liaison pharmacy service in Northern Ireland. *Pharm World Sci*. 2004;26:114-120.
10. Zhou Y, Rosenheck RA, Mohamed S, Fan N, Ning Y, He H. Retrospective assessment of factors associated with readmission in a large psychiatric hospital in Guangzhou, China. *Shanghai Arch Psychiatry*. 2014;26:138-148. doi:10.3969/j.issn.1002-0829.2014.03.005.
11. Tomko JR, Ahmed N, Mukherjee K, Roma RS, Dilucente D, Orchowski K. Evaluation of a discharge medication service on an acute psychiatric unit. *Hosp Pharm*. 2013;48:314-320. doi:10.1310/hpj4804-314.test.
12. Vigod SN, Kurdyak PA, Dennis CL, et al. Transitional interventions to reduce early psychiatric readmissions in adults: systematic review. *Br J Psychiatry*. 2013;202:187-194. doi:10.1192/bjp.bp.112.115030.
13. De Hert M, van Winkel R, Silic A, Van Eyck D, Peuskens J. Physical health management in psychiatric settings. *Eur Psychiatry*. 2010;25(suppl 2):S22-S28. doi:10.1016/S0924-9338(10)71702-8.
14. Abdullah-Koolmees H, Gardarsdottir H, Stoker LJ, Vuyk J, Egberts TC, Heerdink ER. Prevalence of medication use for somatic disease in institutionalized psychiatric patients. *Pharmacopsychiatry*. 2013;46:274-280. doi:10.1055/s-0033-1354405.
15. American Diabetes Association; American Psychiatric Association; American Association of Clinical Endocrinologists; North American Association for the Study of Obesity. Consensus development conference on antipsychotic drugs and obesity and diabetes. *Diabetes Care*. 2004;27:596-601.
16. De Hert M, Vancampfort D, Correll CU, et al. Guidelines for screening and monitoring of cardiometabolic risk in schizophrenia: systematic evaluation. *Br J Psychiatry*. 2011;199:99-105. doi:10.1192/bjp.bp.110.084665.
17. Iacovides A, Siamouli M. Comorbid mental and somatic disorders: an epidemiological perspective. *Curr Opin Psychiatry*. 2008;21:417-421. doi:10.1097/YCO.0b013e328303ba42.
18. Dixon L, Postrado L, Delahanty J, Fischer PJ, Lehman A. The association of medical comorbidity in schizophrenia with poor physical and mental health. *J Nerv Ment Dis*. 1999;187:496-502.
19. Miller BJ, Paschall CB 3rd, Svendsen DP. Mortality and medical comorbidity among patients with serious mental illness. *Psychiatr Serv*. 2006;57:1482-1487. doi:10.1176/appi.ps.57.10.1482.
20. Mookhoek EJ, Van De Kerkhof PC, Hovens JE, Brouwers JR, Loonen AJ. Skin disorders in chronic psychiatric illness. *J Eur Acad Dermatol Venereol*. 2010;24:1151-1156. doi:10.1111/j.1468-3083.2010.03609.x.
21. Katsamanis M, Lehrer PM, Escobar JI, Gara MA, Kotay A, Liu R. Psychophysiological treatment for patients with medically unexplained symptoms: a randomized controlled trial. *Psychosomatics*. 2011;52:218-229. doi:10.1016/j.psym.2011.01.015.
22. Simon GE, VonKorff M. Somatization and psychiatric disorder in the NIMH Epidemiologic Catchment Area study. *Am J Psychiatry*. 1991;148:1494-1500.
23. Walker EA, Roy-Byrne PP, Katon WJ. Irritable bowel syndrome and psychiatric illness. *Am J Psychiatry*. 1990;147:565-572.
24. Walker EA, Roy-Byrne PP, Katon WJ, Li L, Amos D, Jiranek G. Psychiatric illness and irritable bowel syndrome: a comparison with inflammatory bowel disease. *Am J Psychiatry*. 1990;147:1656-1661.
25. Andreski P, Chilcoat H, Breslau N. Post-traumatic stress disorder and somatization symptoms: a prospective study. *Psychiatry Res*. 1998;79:131-138.
26. Engel CC Jr, Liu X, McCarthy BD, Miller RF, Ursano R. Relationship of physical symptoms to posttraumatic stress disorder among veterans seeking care for Gulf War-related health concerns. *Psychosom Med*. 2000;62:739-745.
27. Deary IJ. A taxonomy of medically unexplained symptoms. *J Psychosom Res*. 1999;47:51-59.

28. Maayan L, Correll CU. Weight gain and metabolic risks associated with antipsychotic medications in children and adolescents. *J Child Adolesc Psychopharmacol*. 2011;21:517-535. doi:10.1089/cap.2011.0015.
29. Stoklosa J, Ongur D. Rational antipsychotic choice: weighing the risk of tardive dyskinesia and metabolic syndrome. *Harv Rev Psychiatry*. 2011;19:271-276. doi:10.3109/10673229.2011.614100.
30. Hill KD, Wee R. Psychotropic drug-induced falls in older people: a review of interventions aimed at reducing the problem. *Drugs Aging*. 2012;29:15-30. doi:10.2165/11598420-000000000-00000.
31. Sylvestre MP, Abrahamowicz M, Capek R, Tamblyn R. Assessing the cumulative effects of exposure to selected benzodiazepines on the risk of fall-related injuries in the elderly. *Int Psychogeriatr*. 2012;24:577-586. doi:10.1017/S1041610211002031.
32. Cohen D, Bonnot O, Bodeau N, Consoli A, Laurent C. Adverse effects of second-generation antipsychotics in children and adolescents: a Bayesian meta-analysis. *J Clin Psychopharmacol*. 2012;32:309-316. doi:10.1097/JCP.0b013e3182549259.
33. Jonsdottir H, Friis S, Horne R, Pettersen KI, Reikvam A, Andreassen OA. Beliefs about medications: measurement and relationship to adherence in patients with severe mental disorders. *Acta Psychiatr Scand*. 2009;119:78-84. doi:10.1111/j.1600-0447.2008.01279.x.
34. Abdullah-Koolmees H, Gerbranda T, Deneer VH, et al. Discontinuation of anticoagulant care during admission to a psychiatric hospital. *Eur J Clin Pharmacol*. 2012;69:1025-1029. doi:10.1007/s00228-012-1398-z.
35. Laan W, Does Y, Sezgi B, et al. Low treatment adherence with antipsychotics is associated with relapse in psychotic disorders within six months after discharge. *Pharmacopsychiatry*. 2010;43:221-224. doi:10.1055/s-0030-1254090.
36. Altrecht MHC, 2013. Annual Report 2013 of Altrecht/Jaarverslag; 2013:19-94.
37. World Health Organization. WHO/DDD Index 2015. http://www.whocc.no/atc_ddd_index/. Accessed April 19, 2015.
38. Smeets HM, Laan W, Engelhard IM, Boks MP, Geerlings MI, de Wit NJ. The psychiatric case register middle Netherlands. *BMC Psychiatry*. 2011;11:106. doi:10.1186/1471-244X-11-106.
39. Karapinar-Çarkit F, van Breukelen BR, Borgsteede SD, Janssen MJ, Egberts AC, van den Bemt PM. Completeness of patient records in community pharmacies post-discharge after in-patient medication reconciliation: a before-after study. *Int J Clin Pharm*. 2014;36:807-814. doi:10.1007/s11096-014-9965-2.
40. Prins MC, Drenth-van Maanen AC, Kok RM, Jansen PA. Use of a structured medication history to establish medication use at admission to an old age psychiatric clinic: a prospective observational study. *CNS Drugs*. 2013;27:963-969. doi:10.1007/s40263-013-0103-9.
41. Mann E, Haastert B, Bohmdorfer B, et al. Prevalence and associations of potentially inappropriate prescriptions in Austrian nursing home residents: secondary analysis of a cross-sectional study. *Wien Klin Wochenschr*. 2013;125:180-188. doi:10.1007/s00508-013-0342-2.
42. Policy Document: transfer of information on medication [in Dutch]. 2012. <http://www.medicatieoverdracht.nl/>. Accessed July 17, 2014.
43. Holland DM. Interdisciplinary collaboration in the provision of a pharmacist-led discharge medication reconciliation service at an Irish teaching hospital. *Int J Clin Pharm*. 2015;37:310-319. doi:10.1007/s11096-014-0059-y.
44. Tedesco GW, McConaha JL, Skomo ML, Higginbotham SK. A pharmacist's impact on 30-day readmission rates when compared to the current standard of care within a patient-centered medical home: a pilot study [published online January 8, 2015]. *J Pharm Pract*. doi:10.1177/0897190014568671.
45. Stuhc M, Alisky J, Malesic I. Mirtazapine associated with drug-related thrombocytopenia: a case report. *J Clin Psychopharmacol*. 2014;34:662-664. doi:10.1097/JCP.0000000000000201.
46. Stuhc M. Trimethoprim-sulfamethoxazole-related hallucinations. *Gen Hosp Psychiatry*. 2014;36:230.e7-230.e8. doi:10.1016/j.genhosppsy.2013.10.016.
47. Mitchell AJ, Lord O, Malone D. Differences in the prescribing of medication for physical disorders in individuals with v. without mental illness: meta-analysis. *Br J Psychiatry*. 2012;201:435-443. doi:10.1192/bjp.bp.111.094532.