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**Table DS13** Associations between different treatments and psychiatric hospitalization estimated applying a 3 day cut-off for in-patient care instead of a 1 day cut-off (main analysis).

## Supplemental tables

**Table DS1.** Main ICD-10 diagnoses at hospital discharge.

		Frequency	Percent
F00-09 Organic, including symptomatic, mental disorders		309	1.34
F10-19 Mental and behavioral disorders due to psychoactive substance use		1609	6.98
F20-29 Schizophrenia, schizotypal and delusional disorders		860	3.73
F30-39 Mood disorders			
	F30 Manic episode	468	2.03
	F31 Bipolar affective disorder	13237	57.43
	F32 Depressive episode	1159	5.03
	F33 Recurrent depressive disorder	1333	5.78
	F34 Persistent mood disorders	104	0.45
	F38 Other mood disorders	10	0.04
	F39 Unspecified mood disorder	55	0.24
F40-48 Neurotic, stress-related and somatoform disorders		1606	6.97
F50-59 Behavioral syndromes associated with physiological disturbances and physical factors		80	0.35
F60-69 Disorders of adult personality and behaviour		1547	6.71
F70-F79 Mental retardation		151	0.66
F80-89 Disorders of psychological development		214	0.93
F90-99 Behavioural and emotional disorders with onset usually occurring in childhood and adolescence and unspecified mental disorder		308	1.34

Missing main diagnosis, n=333

**Table DS2.** Post-estimation comparisons of associations between treatment and psychiatric hospitalizations for mania (within-individual analysis). The table displays hazard ratios and 95% CI. A value below 1.0 indicates that the column treatment is superior to the row treatment.

Medication	Lithium	Valproate	Carbamazepine	Lamotrigine	Quetiapine	Olanzapine
Lithium						
Valproate	0.87 (0.68, 1.12)					
Carbamazepine	1.13 (0.64, 1.97)	1.3 (0.73, 2.29)				
Lamotrigine	<b>0.56</b> <b>(0.42, 0.75)</b>	<b>0.64</b> <b>(0.47, 0.88)</b>	0.5 (0.28, 0.9)			
Quetiapine	0.76 (0.58, 1.01)	0.88 (0.64, 1.21)	0.68 (0.38, 1.22)	1.36 (0.96, 1.93)		
Olanzapine	1.01 (0.79, 1.27)	1.16 (0.88, 1.52)	0.9 (0.51, 1.58)	<b>1.8</b> <b>(1.32, 2.46)</b>	1.31 (0.99, 1.75)	

Results marked in bold are significant after False Discovery Rate p-value adjustment for multiple testing.

**Table DS3.** Post-estimation comparisons of associations between treatment and psychiatric hospitalizations for depression (within-individual analysis). The table displays hazard ratios and 95% CI. A value below 1.0 indicates that the column treatment is superior to the row treatment.

Medication	Lithium	Valproate	Carbamazepine	Lamotrigine	Quetiapine	Olanzapine
Lithium						
Valproate	0.84 (0.66, 1.06)					
Carbamazepine	0.63 (0.4, 0.97)	0.75 (0.47, 1.19)				
Lamotrigine	0.84 (0.69, 1.01)	1 (0.78, 1.28)	1.34 (0.86, 2.08)			
Quetiapine	0.92 (0.73, 1.19)	1.11 (0.84, 1.48)	1.48 (0.93, 2.36)	1.11 (0.86, 1.43)		
Olanzapine	0.76 (0.63, 0.93)	0.91 (0.7, 1.19)	1.22 (0.78, 1.92)	0.91 (0.73, 1.14)	0.83 (0.64, 1.05)	

Results marked in bold are significant after False Discovery Rate p-value adjustment for multiple testing.

**Table DS4.** Post-estimation comparisons of associations between treatment and psychiatric hospitalizations for mixed episodes (within-individual analysis). The table displays hazard ratios and 95% CI. A value below 1.0 indicates that the column treatment is superior to the row treatment.

Medication	Lithium	Valproate	Carbamazepine	Lamotrigine	Quetiapine	Olanzapine
Lithium						
Valproate	0.84 (0.51, 1.39)					
Carbamazepine	0.34 (0.12, 0.97)	0.4 (0.13, 1.2)				
Lamotrigine	0.68 (0.38, 1.21)	0.8 (0.44, 1.46)	2.01 (0.67, 6.11)			
Quetiapine	0.6 (0.34, 1.06)	0.71 (0.4, 1.27)	1.79 (0.58, 5.53)	0.89 (0.47, 1.65)		
Olanzapine	0.72 (0.41, 1.25)	0.84 (0.47, 1.54)	2.12 (0.69, 6.55)	1.05 (0.58, 1.92)	1.19 (0.68, 2.08)	

Results marked in bold are significant after False Discovery Rate p-value adjustment for multiple testing.

**Table DS5.** Associations between different treatments and psychiatric hospitalization estimated using between-individual models (n=35,022).

	<b>Hazard Ratio (95% CI)</b>			
	<b>All psychiatric hospitalizations</b>	<b>Manic episodes</b>	<b>Depressive episodes</b>	<b>Mixed episodes</b>
Lithium	0.83*	0.97	0.86*	1.11
	(0.79, 0.87)	(0.88, 1.08)	(0.78, 0.93)	(0.91, 1.37)
Valproate	1.01	1.21*	1.00	1.54*
	(0.95, 1.09)	(1.07, 1.38)	(0.88, 1.14)	(1.07, 2.21)
Carbamazepine	0.96	0.70	0.66*	1.36
	(0.83, 1.11)	(0.49, 1.01)	(0.51, 0.87)	(0.82, 2.25)
Lamotrigine	1.24*	0.85*	1.73*	1.47*
	(1.16, 1.32)	(0.73, 0.99)	(1.57, 1.91)	(1.16, 1.88)
Quetiapine	1.61*	1.90*	1.66*	3.23*
	(1.50, 1.73)	(1.60, 2.27)	(1.46, 1.89)	(2.46, 4.24)
Olanzapine	1.18*	1.14*	1.27*	1.87*
	(1.11, 1.26)	(1.00, 1.29)	(1.14, 1.41)	(1.36, 2.57)
Num. events	23383	4363	6637	973

\* 1 outside the confidence interval

All models adjusted for previous time spent in psychiatric inpatient care, sex, use of any of the six medications, and age.

**Table DS6.** Associations between different treatments and psychiatric hospitalization estimated using between-individual models where patients that were never medicated during the study period have been excluded (n=25,330).

	<b>Hazard Ratio (95% CI)</b>			
	<b>All psychiatric hospitalizations</b>	<b>Manic episodes</b>	<b>Depressive episodes</b>	<b>Mixed episodes</b>
Lithium	0.69*	0.72*	0.68*	0.86
	(0.65, 0.72)	(0.65, 0.80)	(0.62, 0.74)	(0.70, 1.06)
Valproate	0.86*	0.95	0.82*	1.23
	(0.80, 0.93)	(0.83, 1.08)	(0.72, 0.94)	(0.86, 1.77)
Carbamazepine	0.81*	0.54*	0.54*	1.09
	(0.69, 0.94)	(0.38, 0.78)	(0.41, 0.71)	(0.66, 1.81)
Lamotrigine	1.06	0.69*	1.44*	1.18
	(0.99, 1.12)	(0.59, 0.80)	(1.30, 1.59)	(0.92, 1.50)
Quetiapine	1.43*	1.58*	1.44*	2.69*
	(1.33, 1.53)	(1.33, 1.88)	(1.27, 1.64)	(2.06, 3.51)
Olanzapine	1.02	0.91	1.05	1.52*
	(0.95, 1.09)	(0.80, 1.03)	(0.94, 1.17)	(1.11, 2.09)
Num. events	20679	4019	5839	937

\* 1 outside the confidence interval

All models adjusted for previous time spent in psychiatric inpatient care, sex, use of any of the six medications, and age.

**Table DS7.** Sensitivity analyses where each medication is analyzed separately, periods with other medications were removed (within-individual analyses).

	Hazard Ratio (95% CI)					
	Lithium	Valproate	Lamotrigine	Carbamazepine	Olanzapine	Quetiapine
Lithium	0.61*					
	(0.55, 0.66)					
Valproate		0.75*				
		(0.65, 0.86)				
Lamotrigine			0.72*			
			(0.64, 0.80)			
Carbamazepine				0.92		
				(0.69, 1.23)		
Olanzapine					0.75*	
					(0.67, 0.85)	
Quetiapine						0.85*
						(0.73, 0.99)
Num. events	7707	3355	4627	755	4333	3044
Num. individuals	13356	4060	7362	926	4462	2772

\* 1 outside the confidence interval

All models adjusted for previous time spent in psychiatric inpatient care and age.



**Table DS8.** Sensitivity analysis testing the robustness of the association between treatment and psychiatric hospitalization with regard to the sequence of lithium treatment in within-individual models. In all analyses, individuals had lithium therapy before the drug where either added or later switched to.

	Hazard Ratio (95% CI)			
	Lithium before valproate	Lithium before lamotrigine	Lithium before olanzapine	Lithium before quetiapine
Lithium	0.74*	0.74*	0.69*	0.76*
	(0.64, 0.86)	(0.65, 0.85)	(0.60, 0.78)	(0.68, 0.86)
Valproate	0.71*	0.74*	0.65*	0.90
	(0.60, 0.83)	(0.57, 0.96)	(0.52, 0.82)	(0.75, 1.09)
Carbamazepine	1.12	0.88	0.91	1.08
	(0.66, 1.91)	(0.54, 1.43)	(0.53, 1.58)	(0.75, 1.55)
Lamotrigine	0.96	0.69*	0.74*	0.77*
	(0.76, 1.21)	(0.60, 0.79)	(0.61, 0.91)	(0.66, 0.91)
Quetiapine	0.77*	0.80*	0.66*	0.76*
	(0.62, 0.95)	(0.64, 1.00)	(0.51, 0.85)	(0.66, 0.87)
Olanzapine	0.65*	0.91	0.66*	0.76*
	(0.52, 0.82)	(0.76, 1.11)	(0.57, 0.77)	(0.64, 0.90)
Num. events	2023	2551	2649	3262
Num. individuals	951	1621	1412	1458

\* 1 outside the confidence interval

All models adjusted for previous time spent in psychiatric inpatient care, use of any of the six medications, and age.

**Table DS9.** Sensitivity analyses were the patient started the observation time either on or off medication, both are within-individual analyses with the outcome psychiatric hospitalization.

	<b>Hazard Ratio (95% CI)</b>	
	<b>First a period with no medication</b>	<b>First a period with medication</b>
Lithium	0.65*	0.64*
	(0.59, 0.71)	(0.59, 0.71)
Valproate	0.79*	0.64*
	(0.70, 0.89)	(0.56, 0.73)
Carbamazepine	0.86	0.91
	(0.66, 1.13)	(0.68, 1.21)
Lamotrigine	0.76*	0.80*
	(0.68, 0.85)	(0.72, 0.90)
Quetiapine	0.81*	0.77*
	(0.71, 0.92)	(0.67, 0.87)
Olanzapine	0.81*	0.73*
	(0.72, 0.90)	(0.65, 0.82)
Num. events	10753	7162
Num. individuals	12880	9195

\* 1 outside the confidence interval

All models adjusted for previous time spent in psychiatric inpatient care, use of any of the six medications, and age.

**Table DS10.** Associations between different treatments and psychiatric hospitalization estimated using 4 months between dispense dates as cut-off for discontinuation.

	Hazard Ratio (95% CI)		
	Within individual	Between individual	Between individual - excluding those never medicated
Lithium	0.64 <sup>*</sup> (0.60, 0.68)	0.72 <sup>*</sup> (0.69, 0.75)	0.56 <sup>*</sup> (0.54, 0.57)
Valproate	0.69 <sup>*</sup> (0.63, 0.75)	0.94 (0.88, 1.01)	0.76 <sup>*</sup> (0.73, 0.80)
Carbamazepine	0.83 <sup>*</sup> (0.70, 0.99)	0.90 (0.78, 1.04)	0.72 <sup>*</sup> (0.66, 0.78)
Lamotrigine	0.79 <sup>*</sup> (0.73, 0.85)	1.23 <sup>*</sup> (1.16, 1.31)	1.01 (0.97, 1.05)
Quetiapine	0.80 <sup>*</sup> (0.73, 0.87)	1.64 <sup>*</sup> (1.53, 1.76)	1.41 <sup>*</sup> (1.35, 1.48)
Olanzapine	0.80 <sup>*</sup> (0.75, 0.86)	1.24 <sup>*</sup> (1.17, 1.32)	1.03 (0.99, 1.07)
Num. events	23383	23383	20804
Num. individuals	35022	35022	25656

\* 1 outside the confidence interval

Models adjusted for age, sex (only between individual models), use of any of the six medications, and previous time spent in psychiatric inpatient care.

**Table DS11.** Associations between different treatments and psychiatric hospitalization estimated using 6 months between dispense dates as cut-off for discontinuation.

	Hazard Ratio (95% CI)		
	Within individual	Between individual	Between individual - excluding those never medicated
Lithium	0.65*	0.73*	0.54*
	(0.61, 0.70)	(0.70, 0.77)	(0.51, 0.57)
Valproate	0.69*	0.96	0.75*
	(0.64, 0.75)	(0.90, 1.02)	(0.70, 0.81)
Carbamazepine	0.86	0.88	0.68*
	(0.72, 1.02)	(0.77, 1.01)	(0.59, 0.78)
Lamotrigine	0.80*	1.26*	1.01
	(0.74, 0.86)	(1.19, 1.33)	(0.95, 1.07)
Quetiapine	0.84*	1.72*	1.46*
	(0.78, 0.91)	(1.61, 1.84)	(1.37, 1.56)
Olanzapine	0.84*	1.29*	1.05
	(0.78, 0.90)	(1.22, 1.37)	(0.99, 1.12)
Num. events	23383	23383	20865
Num. individuals	35022	35022	25822

\* 1 outside the confidence interval

Adjusted for age, sex (only between individual models), use of any of the six medications, and previous time spent in psychiatric inpatient care.

**Table DS12.** Associations between different treatments and psychiatric hospitalization estimated with 3 months between dispense dates as cut-off for discontinuation and adding an extra 30 days after the last dispense date as medicated time.

	Hazard Ratio (95% CI)		
	Within individual	Between individual	Between individual - excluding those never medicated
Lithium	0.72* (0.68, 0.76)	0.82* (0.78, 0.86)	0.68* (0.65, 0.71)
Valproate	0.82* (0.76, 0.89)	1.07* (1.00, 1.14)	0.92* (0.86, 0.98)
Carbamazepine	1.01 (0.87, 1.18)	1.05 (0.92, 1.19)	0.88 (0.78, 1.00)
Lamotrigine	0.89* (0.83, 0.95)	1.33* (1.26, 1.41)	1.15* (1.08, 1.21)
Quetiapine	0.93 (0.87, 1.01)	1.74* (1.64, 1.86)	1.56* (1.46, 1.66)
Olanzapine	0.97 (0.91, 1.04)	1.38* (1.31, 1.46)	1.20* (1.13, 1.27)
Num. events	23383	23383	21623
Num. individuals	35022	35022	27091

\* 1 outside the confidence interval

Adjusted for age, sex (only between individual models), use of any of the six medications, and previous time spent in psychiatric inpatient care.

**Table DS13.** Associations between different treatments and psychiatric hospitalization estimated applying a 3 day cut-off for in-patient care instead of a 1 day cut-off (main analysis).

	<b>Hazard Ratio (95% CI)</b>		
	<b>Within individual</b>	<b>Between individual</b>	<b>Between individual - excluding those never medicated</b>
Lithium	0.63*	0.84*	0.68*
	(0.59, 0.68)	(0.80, 0.88)	(0.65, 0.72)
Valproate	0.69*	0.99	0.84*
	(0.63, 0.76)	(0.93, 1.07)	(0.78, 0.90)
Carbamazepine	0.81*	0.94	0.78*
	(0.66, 0.99)	(0.80, 1.10)	(0.67, 0.91)
Lamotrigine	0.75*	1.21*	1.02
	(0.69, 0.81)	(1.14, 1.28)	(0.96, 1.09)
Quetiapine	0.79*	1.63*	1.43*
	(0.72, 0.87)	(1.52, 1.76)	(1.34, 1.54)
Olanzapine	0.75*	1.17*	0.99
	(0.69, 0.81)	(1.10, 1.24)	(0.93, 1.06)
Num. events	19673	19673	17472
Num. individuals	35022	35022	25330

\* 1 outside the confidence interval

Adjusted for age, sex (only between individual models), use of any of the six medications, and previous time spent in psychiatric inpatient care.