ORIGINAL ARTICLE

Does deinstitutionalization work? Relationships between psychiatric outpatient and inpatient care provision in a rural German catchment area

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Abstract

Objective: We intended to find out whether an intensification of outpatient care after conclusion of the deinstitutionalization era in the year 2001 had an influence on number of hospitalizations, readmission figures, length of inpatient -stay (LOS), cumulative length of inpatient-stay (cumulative LOS) and coercive measures.

Method: We investigated the development of 17 inpatient and outpatient variables for 2002-10 within a district psychiatric hospital responsible for a rural catchment area of 320,000 inhabitants. The sample consisted of 31,537 inpatient admissions and 35,372 outpatients accounted on an annual basis. Some figures were compared with those at state and federal levels. Associations between aggregated hospitalization and outpatient care variables were assessed by means of robust bivariate Prais-Winsten regression models for time series.

Results: Over the surveyed period, number of admissions, admitted individuals, and hospitalization rates remained stable, contrary to state and federal tendencies. Cumulative LOS and readmission figures decreased, whereas average LOS increased. Number of admissions, cumulative LOS, and readmission figures were negatively associated with number of outpatients treated which increased over the surveyed period. Number of coercive measures decreased, numbers of involuntary admissions under the guardianship law remained lower than at federal and state levels, and ambulatory activity remained three times higher than in the state in which the surveyed catchment area is located.

Conclusions: Community-oriented ambulatory care on the basis of multi-disciplinary assertive teams seems to be able to reduce readmissions and cumulative length of inpatient-stay, while keeping at the same time the number of admissions and coercive measures stable. Economic and clinical effects on real inpatient care, however, cannot be definitively evaluated as long as bed provision does not decrease proportionally with the increase of ambulatory activity.

Key words

1 Introduction

Outpatient clinics have been little evaluated despite their importance as standard components of community mental health systems. Outpatient care projects, which started in the 1960s, have become more important in terms of the deinstitutionalization process of large asylums, resulting in a change from a somewhat custodial to a community-based treatment plan. As in other Western countries, the number of psychiatric beds in psychiatric hospitals as well as psychiatric departments in general hospitals decreased in Germany between 1970 and 1988 from 160 to 113 per 100,000 inhabitants (about 29%) [1]; in the nineties bed rates remained stable [2, 3], whereas between 1999 and 2009 a slight increase can be noticed (81 vs. 92 beds per 100,000 inhabitants) [4] owing to an increase in psychosomatic as well as rehabilitation beds. The mean length of inpatient-stay decreased between 1975 and 2003 by about 54% [2], and between 1998 and 2009 it decreased from 38.4 to 20.4 inpatient days (about 47%), whereas the rate of psychiatric admissions increased in the same period from 94.6 to 140 per 1,000 inhabitants (about 48%) [5].

The German National Health System is built on dichotomous principles: medical and social services, hospital and ambulatory care, rehabilitation and acute treatment are based on different statutory, funding and management structures. Ambulatory care in psychiatry is separate from psychotherapy and psychosomatic care; ambulatory psychiatric care is provided by private practitioners funded by the public, and are rarely networked with hospitals. Owing to the inadequacy of office-based psychiatric assistance in terms of meeting the needs of chronically mentally-ill people, the German federal government decided in 1975 to create multidisciplinary outpatient clinics networked with psychiatric hospitals and psychiatric departments situated in general hospitals as a necessary complement to single-handed private practice (see first representative survey of Federal Joint Commission of Stakeholders of Psychiatric Hospitals [6]). In Germany, up to 90% of outpatient care is provided by office-based psychiatrists, who rarely offer home-based or multidisciplinary intervention. Outpatient clinics (PIAs) have provided since the 1980s wide community-based care for people suffering from severe mental disorders, who often show non-adherence, by fulfilling the tasks of both outpatient clinics and community mental health teams [7].

There is some evidence that outpatient service contracts are based on therapeutic relationships and continuity of care, but community-based teams may be better equipped to ensure attendance at outpatient appointments because of their innovative multidisciplinary interventions [8]. Some studies indicate that outpatient services provided by community mental health teams are more successful [9, 10] owing to their home-based and assertive care principles. German psychiatric care provision, however, does not differentiate between outpatient clinics and community mental health teams, differently from English-speaking or Scandinavian countries.

In this study, we aim to assess the possible influences of outpatient activity on inpatient length of stay and coercive outcomes. The data at the regional and national level would suggest that deinstitutionalization is usually associated with the reduction of acute ward beds, a reduction in mean length of inpatient-stay but with an increase of admissions, readmissions, involuntary admissions and long-term beds [11]. The key question is whether an intensification of ambulatory care could reduce hospitalizations and readmissions and keep mean length of inpatient-stay, cumulative length of stay, and number of coercive measures at a low level.

Evaluation of ambulatory care settings in psychiatry

Investigations of the relationships between ambulatory psychiatric care and readmission risk as well as length of stay in psychiatric wards show disparate results. Drawing boundaries between different ambulatory settings such as assertive community treatment, home-based treatment, day clinics, and care provision by outpatient clinics is difficult. Burns et al. [12] conclude on the basis of a meta-analysis that the evidence for home treatment compared with other community-based services is not strong, although it reduces days spent in hospital compared with inpatient treatment alone. There is evidence that visiting patients at home regularly and taking responsibility for both health and social care can reduce days in hospital [12]. Marshall & Lockwood [13] demonstrate in another meta-analysis that patients receiving assertive community

treatment (ACT) are more likely to remain in contact with services than people receiving standard community care and are significantly less likely to be admitted to hospital than those receiving hospital-based rehabilitation. Therefore, ACT invariably reduces the cost of hospital care, but does not have a clear financial advantage over standard care when other costs are taken into account. According to a review of Marshall et al. [14], there is no evidence that day-treatment programmes are superior to continuing outpatient care in terms of improving psychiatric symptoms, social outcome, or costs. A French prospective and comparative cohort study over a five-year period demonstrated a significant immediate decrease in both number of admissions and duration of hospital stay after the provision of a mobile crisis intervention team [15]. From the second year onwards, however, the use of hospitalization did not seem to be influenced by the type of care initially given to the patient [15]. Furthermore, from a legal perspective, an Israeli study examined the risk of readmission and demonstrated that the probability of readmission of court-ordered and psychiatrist-ordered groups was significantly lower than that of voluntarily admitted patients, possibly related to a longer length of inpatient-stay [16]. Burgess et al. [17] argued that the community treatment orders (CTOs) used in Australia on discharge from first admission to hospital were associated with lower readmission risk. For patients at risk of beginning a career of long-term psychiatric hospitalization, sole reliance on community-initiated orders appeared to prevent additional hospital involvement [18]. Tyrer et al. [19] compared the clinical outcome and costs of care of psychiatric patients in London allocated to community-based multidisciplinary teams or to hospital-based outpatient care programmes after discharge from inpatient care; the clinical outcomes were similar but admission to hospital during follow-up was more likely in the hospital-based care group. In general, lack of 24-hour emergency settings correlates positively with the use of inpatient care alone [20]. It indicates that the extended availability of outpatient services in the community for people in crisis may facilitate the comprehensive utilization of mental health services [8].

2 Description of the catchment area

The catchment area of the regional psychiatric hospital which we surveyed downsized between 1970 and 2000 from 940,000 to 320,000 inhabitants; hospital beds were reduced from 1,180 to 200 (including day-hospital places, excluding forensic beds) in the same period of time. This process was possible on the basis of consecutive decentralization steps taken between 1984 and 1999 as well as the installation of a community-based outpatient clinic. The bed index decreased, however, from 12.5 in 1970 to 5.9 per 10,000 inhabitants thirty-five years later, especially after conclusion of the deinstitutionalization process of long-stay patients (calculation conducted by the authors).

The catchment area in Southern Bavaria shows a rural structure and covers approximately 320,000 inhabitants. The regional hospital in charge consists of three clinics: one for general psychiatry, one for forensic psychiatry and one for neurology. The clinic for general psychiatry is divided into five departments: acute general psychiatry, psychotherapy, geriatrics, substance abuse disorders, comorbidity of mental retardation and general psychiatric disorders. In addition, the hospital has an outpatient clinic consisting of nine specialized teams, including two decentralized care teams. The number of annual hospitalizations amounts to 3,500, corresponding to 2,000 individuals. The hospital provides 5.5 acute beds per 10,000 inhabitants. The deinstitutionalization process was completed in 2001. The outpatient clinic takes care of more than 4,600 individuals per year, all of them suffering from severe mental disorders, and is in addition responsible for psychiatric emergencies. Cooperation with the guardianship courts and judges, local police, legal guardians, the general hospital in the neighborhood, sheltered facilities, ambulatory nurse teams and general practitioners is seen as very effective. Mood disorders are the most frequent diagnosis (approximately 30%) followed by schizophrenia (25%), dementia (18%), substance abuse disorders (12%), and borderline and complex post-traumatic stress disorders. The outpatient clinic staff comprises approximately 50 professionals from seven different professions working in multidisciplinary teams. There are at least two professionals responsible for each patient ('therapeutic case managers') to ensure continuity of relationships. Five clinical conferences are held every week, one of them in cooperation with the acute ward, and continuous education every two weeks improves care quality. The outpatient clinic is embedded in a coordinated regional community network and participates in the decision-making concerning the discharge process.

Several accreditations by specialized agencies have confirmed the excellence of the clinical and organizational tasks performed. Protocols, quarterly and annual reviews and an ambitious supporting intranet portal help to provide balanced support in cooperation with the authorities and the social services in the community.

Table 1. Development of inpatient and outpatient care variables (2002-10).

Census year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of annual admissions	3,582	3,381	3,482	3,464	3,468	3,421	3,589	3,559	3,411
Number of annually admitted individuals	2,031	1,960	1,930	2,038	2,045	2,125	2,233	2,156	2,037
Admission ratio (admissions/individuals)	1.76	1.72	1.80	1.70	1.69	1.61	1.61	1.65	1.67
LOS per admission (days) M (SD)	19.22 (28.62)	19.59 (27.31)	20.18 (29.19)	20.14 (27.25)	20.35 (26.71)	21.48 (28.25)	21.9 (29.18)	21.21 (27.79)	21.54 (27.13)
Average annual cumulative inpatient-LOS per individual (days)	47.74	43.57	47.48	41.37	43.93	41.46	40.63	45.35	39.98
Age M (SD)	42.9 (18.1)	43.1 (18.1)	43.8 (17.6)	44.4 (17.9)	45.5 (18.6)	45.7 (17.9)	45.7 (18.1)	46.6 (18.1)	45.8 (17.6)
Proportion of women (%)	57.8 %	57.6 %	58.1 %	58.0 %	56.9 %	55.5 %	56.9 %	55.9 %	55.1 %
Proportion of admitted individuals in charge of outpatient clinic (%)	-	-	-	48.9 %	53.7 %	51.1 %	49.1 %	49.2 %	52.1 %
Treatment periods at outpatient clinic for whole sample M (SD)	-	-	-	1.11 (1.28)	1.45 (1.63)	1.40 (1.64)	1.30 (1.58)	1.29 (1.57)	1.43 (1.65)
Annual number of outpatients treated	3,736	3,866	3,648	3,838	3,712	4,035	3,924	3,957	4,656
Proportion of readmitted individuals (%)	43 %	42 %	44 %	41 %	41 %	38 %	38 %	39 %	37 %
Average number of readmissions per readmitted individual	2.48	2.22	2.35	2.05	2.15	1.93	1.85	2.14	1.85
Proportion of frequently readmitted individuals (>=3)	26 %	24 %	26 %	22 %	23 %	20 %	18 %	20 %	18 %
Proportion of involuntary admissions under the guardianship law (%)	1.83 %	0.97 %	1.25 %	0.91 %	0.58 %	0.81 %	2.58 %	3.0 %	3.0 %
Number of coercive measures per hospitalization	0.25	0.26	0.29	0.25	0.34	0.24	0.16	0.16	0.19

Percentages for categorical variables; mean (M) and standard deviation (SD) for continuous variables.

2.1 Objectives

The main objective of this study was to investigate possible effects of intensity of outpatient care on inpatient treatment variables in a rural catchment area covering 320,000 inhabitants a decade after completed deinstitutionalization of long-stay patients in the year 2001.

We first describe the development of administrative, clinical, and inpatient as well as outpatient care variables for the period after conclusion of the deinstitutionalization process (2002-10) on the basis of individual data.

Table 2. Distribution of diagnosis-groups according to ICD-10 over survey period (2002-2010) at regional and federal level.

ICD-10 / Census year		F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	Total (annual)
2002	S.A.	114 (3.2%)	1,787 (50%)	537 (15%)	663 (18.5%)	266 (7.4%)	5 (0.14%)	181 (5%)	10 (0.3)	8 (0.2)	5 (0.14%)	3,576
	GER	84,731	366,957	137,027	161,320	137,213	19,513	37,978	6,837	6,857	23,627	986,573
		(8.6%)	(37.2%)	(13.9%)	(16.4%)	(13.9%)	(2.0%)	(3.8%)	(0.7%)	(0.7%)	(2.4%)	(100%)
2003	S.A.	118 (3.5%)	1,719 (51%)	541 (16%)	644 (19%)	210 (6.2%)	2 (0.06%)	132 (3.9%)	6 (0.2%)	5 (0.15%)	3 (0.09%)	3,380
	GER	82,748	368,774	137,882	169,405	137,452	17,987	38,084	6,874	6,289	23,920	993,732
		(8.3%)	(37.1%)	(13.9%)	(17.1%)	(13.8%)	(1.8%)	(3.8%)	(0.7%)	(0.6%)	(2.4%)	(100%)
2004	S.A.	116 (4.8%)	1,700 (48.8%)	550 (15.8%)	680 (19.5%)	187 (5.4%)	14 (0.4%)	182 (5.2%)	0	1 (0.03%)	1 (0.03%)	3,481
	GER	85,096	373,529	138,129	181,141	142,123	17,020	38,759	6,865	5,675	26,193	1,019,154
		(8.4%)	(36.6%)	(13.5%)	(17.8%)	(13.9%)	(1.7%)	(3.8%)	(0.7%)	(0.6%)	(2.6%)	(100%)
2005	S.A.	111 (3.2%)	1,610 (46.5%)	525 (15.2%)	817 (23.6%)	168 (4.8%)	13 (0.4%)	210 (6.1%)	2 (0.06%)	4 (0.12%)	2 (0.06%)	3,462
	GER	88,671	386,470	138,470	191,451	142,931	16,620	39,083	6,855	5,757	26,081	1,046,365
		(8.5%)	(36.9%)	(13.2%)	(18.3%)	(13.7%)	(1.6%)	(3.7%)	(0.6%)	(0.5%)	(2.5%)	(100%)
2006	S.A.	216 (3.2%)	1,533 (44.2%)	477 (13.7%)	854 (24.6%)	151 (4.4%)	5 (0.14%)	228 (6.6%)	2 (0.06)	0	1 (0.03%)	3,467
	GER	89,867	385,147	137,171	200,791	142,704	16,995	40,397	6,795	6,072	27,377	1,057,564
		(8.5%)	(36.4%)	(13.0%)	(19.0%)	(13.5%)	(1.6%)	(3.8%)	(0.6%)	(0.6%)	(2.6%)	(100%)
2007	S.A.	180 (5.3%)	1,338 (39.1%)	489 (14.3%)	944 (27.6%)	214 (6.3%)	15 (0.4%)	227 (6.6%)	7 (0.2%)	2 (0.06%)	2 (0.06%)	3,418
	GER	92,012	404,290	136,523	213,026	144,656	16,565	40,598	7,001	5,939	28,958	1,093,641
		(8.4%)	(37.0%)	(12.5%)	(19.5%)	(13.2%)	(1.5%)	(3.7%)	(0.6%)	(0.5%)	(2.7%)	(100%)
2008	S.A.	201 (5.6%)	1,399 (39%)	491 (13.7%)	999 (27.8 %)	246 (6.8%)	10 (0.3%)	235 (6.5%)	2 (0.06%)	0	4 (0.11%)	3,587
	GER	93,870	424,660	136,246	222,386	145,562	16,400	40,872	7,247	6,713	29,703	1,127,971
		(8.3%)	(37.6%)	(12.1%)	(19.7%)	(12.9%)	(1.5%)	(3.6%)	(0.6%)	(0.6%)	(1.6%)	(100%)
2009	S.A.	315 (8.9%)	1,362 (38.5%)	488 (13.8%)	886 (25.6%)	235 (6.6%)	0	243 (6.9%)	4 (0.1%)	0	2 (0.06%)	3,535
	GER	94,239	431,163	135,713	237,242	147,900	15,976	40,665	7,323	6,726	30,318	1,151,390
		(8.2%)	(37.4%)	(11.3%)	(20.6%)	(12.8%)	(1.4%)	(3.5%)	(0.6%)	(0.6%)	(2.6%)	(100%)
2010	S.A.	276 (8.1%)	1,470 (43.4%)	392 (11.6%)	793 (23.4%)	241 (7.1%)	22 (0.6%)	151 (4,5%)	20 (0.6%)	10 (0.3%)	14 (0.4%)	3,389
	GER	94,950	427,308	131,469	254,455	150,207	16,044	40,193	7,059	6,736	30,632	1,163,613
		(8.2%)	(36.7%)	(11.3%)	(21.9%)	(12.9%)	(1.4%)	(3.5%)	(0.6%)	(0.6%)	(2.6%)	(100%)
Total (Survey Period)	S.A.	1,687	13,918	4,490	7,280	1,918	86	1,789	53	30	34	31,295
		(5.4%)	(44.5%)	(14.4%)	(23.3%)	(6.1%)	(0.3%)	(5.7%)	(0.2%)	(0.1%)	(0.1%)	(100%)
	GER	806,184	3,568,298	1,228,657	1,831,217	1,148,625	153,080	322,353	62,856	56,764	246,809	9,640,003
		(8.4%)	(37%)	(12.7%)	(20%)	(11.9%)	(1.6%)	(3.3%)	(0.6%)	(0.6%)	(2.6%)	(100%)

Absolute figures (percentage). S.A.= Surveyed area; GER= Federal level (Germany).

In a second step, we investigated the association between the number of annually treated outpatients and the mean length of inpatient-stay, considering total number of annual admissions, for the period after the installation of the assessed outpatient clinic (1981-2010).

In a further step, we investigated the development of the annual number of outpatients treated as well as the development of six inpatient variables (number of admissions, average length of inpatient-stay, average annual cumulative length of inpatient-stay per individual, proportion of readmitted individuals, average number of readmissions per readmitted patient, and proportion of frequently readmitted individuals) in the sample as well as for each principal diagnostic group. Finally, we investigated possible associations between the number of outpatients treated and the six mentioned hospitalization variables.

The status of certain variables (admission rates, average length of inpatient-stay, proportion of involuntary admissions under the guardianship law, and rates of treatment periods by outpatient clinic) can be compared with general tendencies in the state in which the catchment area is situated (Bavaria) as well as in Germany by means of figures calculated by the authors.

2.2 Method

This study is based on aggregated data of 31,537 inpatient admissions and 35, 372 outpatients accounted on an annual basis, covering a period of nine years from 2002 to 2010. Data were aggregated on an annual basis by primary ICD-10 diagnostic groups.

We considered 17 variables grouped as follows (see Tables 1 to 3):

(1) Administrative variables: number of annual admissions, number of individuals admitted annually, admission ratio, average length of inpatient-stay, and average annual cumulative length of inpatient-stay per individual.

(2) Socio-demographic variables: age and gender.

(3) Clinical variables: principal diagnostic groups according to the International Classification of Mental Disorders (ICD-10).

(4) Outpatient care variables: annual number of outpatients treated, proportion of admitted individuals in the charge of the surveyed outpatient clinic, annual treatment periods by outpatient clinic, and prevalence of treatment periods by outpatient clinic per 10^3 inhabitants and year.

(5) Inpatient variables: proportion of readmitted individuals, average number of annual readmissions per readmitted individual, and proportion of hospitalized individuals with frequent readmissions (when >=3 readmissions).

(6) Legal variables: proportion or involuntary admissions under the guardianship law, and number of coercive measures per hospitalization.

Table 3. Comparison of administrative and care variables at regional, state and federal level.

Census year		2002	2003	2004	2005	2006	2007	2008	2009	2010
Annual psychiatric admission rates per 10^3 inhabitants										
Germany		11.9	12.0	12.3	12.7	12.8	13.3	13.7	14.1	14.2
Bavaria (BY)		11.6	11.5	11.9	12.1	12.3	13.0	13.5	13.4	14.4
Surveyed catchment area in BY		11.2	10.5	10.8	10.7	10.7	10.6	11.2	11.1	10.6
Average length of inpatient-stay per admission (days)										
Germany		22.7	22.8	21.4	20.8	20.9	20.8	20.3	20.3	20.3
Bavaria (BY)		22.9	23.1	22.0	21.6	22.2	22.0	21.7	21.5	21.4
Surveyed catchment area in BY		19.2	19.6	20.2	20.1	20.3	21.5	21.9	21.2	21.5
Average length of inpatient-stay according to principal diagnostic groups (days)										
Organic mental	S.A.	18.9	18.5	21.5	23.8	19.5	26.3	18.6	18.1	21.1
disorders (F0)	GER	21.0	21.3	19.2	18.5	18.5	18.4	18.0	18.0	17.6
Addictive disorders	S.A.	11.5	11.8	10.9	11.1	11.1	11.3	10.9	11.0	12.1
(F1)	GER	11.2	11.0	10.1	9.6	9.5	9.4	9.0	8.8	8.6
Schizophrenia (F2)	S.A.	31.9	30.5	29.4	29.4	28.1	28.5	28.4	25.5	28.9
	GER	38.5	39.0	36.4	35.2	34.8	34.9	34.0	33.7	33.1
Mood disorders	S.A.	28.4	28.8	31.9	28.4	28.9	28.1	36.1	37.9	34.2
(F3)	GER	35.4	35.4	33.8	33.5	33.6	33.6	33.6	33.7	33.6
Adjustment and	S.A.	13.9	16.9	17.6	17.9	18.0	15.6	16.9	16.7	16.6
stress disorders (F4)	GER	19.2	19.2	17.8	17.4	17.3	17.3	17.2	17.1	17.1
Personality	S.A.	17.0	20.2	23.4	25.4	22.9	22.1	27.3	22.6	23.7
disorders (F6)	GER	29.8	29.7	27.3	26.3	25.5	25.7	25.4	24.8	24.2
Proportion of involuntary admissions under the guardianship law (% admissions)										
Germany		4.37	4.55	4.38	4.40	4.47	4.68	4.72	4.75	4.79
Bavaria (BY)		9.4	10,10	9.75	9.60	8.90	9.30	9.70	10.17	9.34
Surveyed catchment area in BY		1.83	0.97	1.25	0.91	0.58	0.81	2.58	3.0	3.0
Prevalence of annual treatment periods by outpatient clinic per 10^3 inhabitants and year										
Bavaria (BY)		8.2	9.2	10.4	11.3	12.2	13.6	14.7	15.6	16.7
Surveyed catchment area in BY		29.2	31.7	30.4	30.4	31.8	32.1	35.1	38.2	42.5

S.A.= Surveyed area; GER= Federal level (Germany); BY=Federal State of Bavaria.

Individual data up to 2002 about the surveyed hospital were obtained from the IT Department and aggregated data up to 1981 from annual reviews by the outpatient clinic. Routine data for all admissions were grouped by census year, principal diagnosis and individuals. After statistical collapsing, data were treated anonymously.

Tendencies within the surveyed period of time and associations between inpatient and outpatient care variables were investigated for the whole sample as well as for diagnostic groups by means of bivariate Prais-Winsten regression analyses for time series. In regression models, robust regression coefficients were assessed in order to calculate confidence intervals.

Prais-Winsten regression [21, 22] was applied to control for autocorrelation in time series data. Autocorrelation was detected by means of the Durbin-Watson d coefficient [23]. The d coefficient has a value range from zero to four, wherein an autocorrelation is indicated by the deviance of d from the value 2. Prais-Winsten regression models were estimated by the Prais module with STATA 12 [24]. Random effects were not calculated, because data did not show a panel structure.

3 Results

A descriptive assessment of time series indicated that the number of annual admissions as well as annual number admitted individuals remained stable over the surveyed period, but admission ratio decreased about 0.1, and share of readmitted individuals went from 43% down to 37%, a decrease of about 26%. Even average number of readmissions of readmitted individuals decreased from 2.48 to 1.85, a drop of about 25%. Proportion of frequently admitted individuals decreased from 26% to 18%, a drop of about 31%. On the other hand, average length of inpatient-stay increased about 2.3 days; conversely, average annual cumulative length of inpatient-stay per individual decreased from 47.74 to 39.98, a drop of about 16%, within the same period. The sample became on average three years older, and the proportion of women decreased by 3.7%. With regard to outpatient care, the number of annually treated outpatients increased over the survey period as did proportion of admitted individuals in the care of the outpatient clinic and average annual treatment periods per individual.
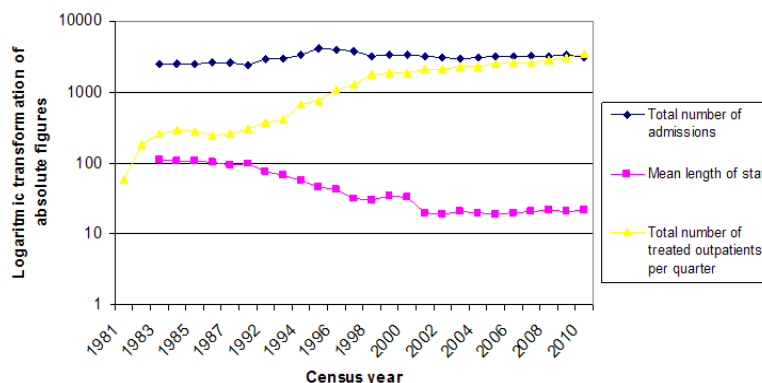
Figure 1. Relationship between admissions, LOS and outpatient activity at District Hospital of Kaufbeuren (1981-2010)

The time series for diagnostic distribution showed that addiction (F1) was the most frequent admission diagnosis, followed by mood disorders (F3), schizophrenia (F2), adjustment and stress disorders (F4), and organic mental disorders (F0). Other diagnostic groups were underrepresented. Some developments are remarkable: adjustment and stress disorders remained stable, mood disorders increased about 26%, organic mental disorders almost tripled, and schizophrenia as well as addictions decreased (see Table 2). Diagnostic distribution showed significant differences over time (Chi-square test for diagnostic distribution (df=72) = 825.55; p=0.000). Average length of inpatient-stay according to diagnosis remained quite stable for organic mental disorders, addictive disorders and adjustment and stress disorders, increased for affective and personality disorders and decreased for patients suffering from schizophrenia (see Table 3).

The investigated association by means of a Prais-Winsten regression model between the average length of inpatient-stay and the annual number of patients in the charge of the outpatient clinic since its launch in 1981 showed a significant negative association between average length of inpatient-stay and number of outpatients treated (b= -0.022; p=0.00012), even when the number of annual admissions was taken into account as control variable (b=-0.018; p=0.00056) (Figure 1).

Table 4. Prais-Winsten regression models for time series (relevant inpatient and outpatient care variables) on the basis of robust regression coefficients for the whole sample and according to principal diagnosis groups with time as regressor.

Diagnosis	Sample		F0		F1		F2		F3		F4		F6	
	b	p	b	p	b	p	p	b	b	p	b	p	b	p
Dependent variable	***Annual number of outpatients treated***													
Regressor: Time	67.31	0.038	46.06	0.000	-32.8	0.001	13.2	0.094	58.4	0.037	11.6	0.125	12.57	0.001
Constant	3,637	0.000	499	0.000	661	0.000	789	0.000	863	0.000	255	0.000	145	0.000
Dependent variable	***Number of annual admissions***													
Regressor: Time	5.23	0.544	28.8	0.000	-39.1	0.045	-15.6	0.000	37.7	0.045	-8.2	0.391	7.7	0.243
Constant	3,462	0.000	65.4	0.013	1,592	0.000	591	0.000	606	0.000	270	0.003	168	0.000
Dependent variable	***Average number of readmissions***													
Regressor: Time	-0.06	0.001	-5e-4	0.929	-0.76	0.009	-0.20	0.410	-0.036	0.001	-0.04	0.021	-0.09	0.145
Constant	2.35	0.000	1.33	0.000	2.81	0.000	2.09	0.000	1.86	0.000	1.69	0.000	3.27	0.000
Dependent variable	***Average length of inpatient-stay per hospitalization***													
Regressor: Time	0.31	0.000	0.04	0.877	-0.01	0.855	-0.55	0.000	0.95	0.017	0.13	0.568	0.64	0.094
Constant	19.4	0.000	20.6	0.000	11.3	0.000	31	0.000	27.6	0.000	16.1	0.000	20.2	0.000
Dependent variable	***Annual cumulative length of inpatient-stay***													
Regressor: Time	-0.55	0.009	0.03	0.933	-0.94	0.022	-1.34	0.039	0.54	0.270	-0.42	0.278	-0.03	0.975
Constant	45.7	0.000	27.4	0.000	32.2	0.000	63.6	0.000	51.5	0.000	26.5	0.000	65	0.000
Dependent variable	***Proportion of readmitted individuals***													
Regressor: Time	-0.008	0.000	0.003	0.366	-0.01	0.005	0.004	0.876	-0.001	0.657	-0.01	0.006	-0.005	0.151
Constant	0.44	0.000	0.21	0.000	0.52	0.000	0.41	0.000	0.34	0.000	0.28	0.000	0.56	0.000
Dependent variable	***Proportion of high-frequently readmitted individuals ($\geq$ 3 readmissions)***													
Regressor: Time	-0.009	0.000	-0.001	0.490	-0.013	0.000	-0.003	0.093	-0.005	0.006	-0.005	0.074	-0.01	0.077
Constant	0.17	0.000	0.02	0.034	0.24	0.000	0.13	0.000	0.10	0.000	0.07	0.000	0.29	0.000

b=regression coefficient; p-value= statistical significance. Constant= b_0 ; *Italics*= level of significance $p<0.05$.

Bivariate regression analyses for annual number of outpatients treated and for six hospitalization variables with time as regressor showed a statistically significant change over the survey period for the majority of assessed variables. Annual number of outpatients treated increased significantly in the survey period for the whole sample (b=67.3; p=0.038), and for patients suffering from organic mental disorders (b=46.1; p=0.000), mood disorders (b=58.4; p=0.037), and personality disorders (b=12.6; p=0.001), whereas the trend for those suffering from addictive disorders was a decreasing one (b=-32.8; p=0.001). Number of annual admissions showed no significant tendencies for the whole sample, but there was a decreasing tendency for patients suffering from addictive disorders (p=0.045) and schizophrenia (p=0.000), contrary to

those suffering from organic mental disorders (p=0.000) and mood disorders (p= 0.045). Average number of readmissions decreased for the whole sample (b=-0.06; p=0.001), especially for patients suffering from addictive (p=0.009), mood (p=0.001) and adjustment and stress disorders (p=0.021). Average length of inpatient-stay increased for the whole sample (b=0.31; p=0.000), but decreased for patients suffering from schizophrenia (p=0.000). On the other hand, annual cumulative length of inpatient-stay decreased over the surveyed period for the whole sample (b=-0.55; p=0.009), especially for patients suffering from addictive disorders (p=0.022) and schizophrenia (p=0.039). Both proportion of readmissions (b=-0.008; p=0.000) and proportion of frequently readmitted patients (b=-0.009; p=0.000) decreased, especially for patients suffering from addictive disorders (see Table 4).

Table 5. Prais-Winsten regression models for time series (relevant inpatient variables) on the basis of robust regression coefficients according to principal diagnosis groups with number of outpatient treated as regressor

Dependent variables	*Number of annual hospitalizations*							*Average number of readmissions per readmitted individual*						
Diagnosis	Sample b (p)	F0 b (p)	F1 b (p)	F2 b (p)	F3 b (p)	F4 b (p)	F6 b (p)	Sample b (p)	F0 b (p)	F1 b (p)	F2 b (p)	F3 b (p)	F4 b (p)	F6 b (p)
Outpatients treated	*-0.09* *(0.041)*	*0.58* *(0.000)*	-0.21 (0.770)	-0.23 (0.126)	0.11 (0.526)	0.06 (0.836)	*0.75* *(0.004)*	*-5e-4* *(0.006)*	-4e-5 (0.751)	0.001 (0.090)	-0.001 (0.125)	*-5e-4* *(0.021)*	*-0.002* *(0.029)*	-0.004 (0.334)
Constant	3,830 (0.000)	-220 (0.001)	1,557 (0.001)	704 (0.000)	627 (0.069)	211 (0.074)	54.4 (0.192)	4.13 (0.000)	1.36 (0.000)	1.79 (0.002)	3.20 (0.003)	2.28 (0.000)	2.08 (0.000)	3.59 (0.002)
N/R^2	9 / -	9 / 0.89	9 / 0.70	9 / 0.88	9 / -	9 / 0.46	9 / 0.86	9 / 0.85	9 / 0.95	9 / 0.27	9 / 0.34	9 / 0.65	9 / 0.32	9 / -
F / Prob> F	6.25 / 0.041	79 / 0.000	0.09 / 0.770	3 / 0.125	0.45 / 0.526	0.05 / 0.836	16.9 / 0.004	14.6 / 0.006	0.11 / 0.750	3.85 / 0.090	3.03 / 0.125	8.82 / 0.021	7.5 / 0.029	1.07 / 0.334
$Rho / D\text{-}W_t$	-0.01 / 1.84	-0.48 / 2.02	0.52 / 1.71	0.83 / 1.48	0.72 / 1.00	0.29 / 1.23	-0.47 / 1.61	0.57 / 1.63	-0.40 / 1.24	-0,38 / 1.83	-0.03 / 1.77	0.06 / 1.63	-0.05 / 1.83	-0.24 / 1.39
	Average length of inpatient-stay							*Average annual cumulative length of inpatient-stay*						
Outpatients treated	9e-4 (0.113)	0.002 (0.627)	9e-4 (0.537)	-5e-3 (0.550)	0.013 (0.065)	-0.002 (0.745)	0.035 (0.109)	*-6e-3* *(0.018)*	*11.9* *(0.000)*	1.04 (0.893)	-4.07 (0.331)	3.81 (0.673)	1.08 (0.699)	*21.22* *(0.042)*
Constant	16.8 (0.000)	19.3 (0.000)	10.8 (0.000)	33.6 (0.003)	17.4 (0.023)	17.3 (0.000)	15.9 (0.005)	67 (0.000)	-4,557 (0.000)	19,972 (0.002)	18,774 (0.006)	19,510 (0.164)	3,439 (0.013)	410 (0.829)
N/R^2	9 / 0.95	9 / 0.83	9 / 0.80	9 / 0.72	9 / 0.34	9 / -	9 / 0.47	9 / 0.16	9 / 0.97	9 / 0.69	9 / 0.85	9 / 0.69	9 / 0.699	9 / 0.38
F / Prob> F	3.3 / 0.133	0.26 / 0.627	0.42 / 0.537	0.39 / 0.549	4.76 / 0.065	0.11 / 0.745	3.38 / 0.108	9.4 / 0.018	219 / 0.000	0.02 / 0.892	1.09 / 0.673	0.19 / 0.673	0.16 / 0.699	6.13 / 0.042
$Rho / D\text{-}W_t$	0.67 / 1.29	-0.20 / 2.00	-0.21 / 1.73	0.19 / 1.88	0.005 / 1.37	0.005 / 1.71	-0.07 / 1.71	-0.12 / 1.67	-0.76 / 2.44	0.52 / 1.71	0.73 / 1.43	0.73 / 1.23	0.43 / 1.43	0.18 / 1.45
	Proportion of readmitted individuals							*Proportion of frequently readmitted patients ($\geq$3 readmissions)*						
Outpatients treated	*-5e-5* *(0.020)*	4e-5 (0.548)	1e-4 (0.395)	1e-4 (0.395)	-7e-5 (0.040)	*-5e-4* *(0.007)*	2e-4 (0.352)	-4e-5 (0.065)	-2e-5 (0.389)	*3e-4* *(0.006)*	-9e-5 (0.243)	*-9e-5* *(0.006)*	2e-4 (0.089)	5e-4 (0.210)
Constant	0.62 (0.000)	0.20 (0.001)	0.54 (0.000)	0.54 (0.000)	0.41 (0.000)	0.38 (0.000)	0.58 (0.000)	0.29 (0.005)	0.03 (0.105)	0.05 (0.123)	0.19 (0.015)	0.17 (0.010)	0.12 (0.010)	0.33 (0.002)
N/R^2	9 / 0.96	9 / 0.89	9 / 0.89	9 / 0.89	9 / 0.82	9 / 0.09	9 / -	9 / 0.80	9 / 0.03	9 / 0.03	9 / 0.13	9 / 0.65	9 / 0.23	9 / 0.13
F / Prob> F	9.9 / 0.020	0.40 / 0.548	0.82 / 0.395	1.14 / 0.322	6.34 / 0.040	13.9 / 0.007	1.0 / 0.352	5.0 / 0.060	0.84 / 0.389	15.6 / 0.005	1.62 / 0.243	15.3 / 0.006	3.9 / 0.089	1.90 / 0.210
$Rho / D\text{-}W_t$	0.63 / 1.44	-0.55 / 1.46	0.74 / 1.67	-0,356 / 2.12	0.31 / 1.36	-0.24 / 1.51	-0.01 / 1.32	0.66 / 1.36	0.09 / 1.79	-0.20 / 1.85	-0.08 / 1.92	-0.29 / 2.24	-0.17 / 1,89	-0.04 / 1.46

b=regression coefficient; p=statistical significance. Constant= b_0; N= Time series. R^2 = fit of regression analysis as degree of explanation effect. F= Value in F-distribution. Rho= Iteration coefficient. D-Wt = transformed Durbin-Watson coefficient d (test on residual correlation time series). *Italics*= statistically significant (p<0.05 level)

Bivariate regression analyses for time series demonstrated a negative association between number of outpatients treated and number of annual admissions (p=0.041), average number of readmissions (p=0.006), annual cumulative length of inpatient-stay (p=0.018), and proportion of readmitted individuals (p=0.020) (see Table 5). Analyses according to diagnostic groups make more distinctions. The number of annual outpatients treated and number of annual admissions were positively associated for patients suffering from organic mental disorders (p=0.000) and personality disorders (p=0.004). Number of outpatients treated was negatively associated with average number of readmissions for individuals suffering from mood disorders (p=0.021) and those suffering from adjustment and stress disorders (p=0.029). There was no significant association for any diagnosis with average length on inpatient-stay but a positive association with annual cumulative length of inpatient-stay for individuals suffering from organic mental disorders (p=0.000) and personality disorders (p=0.042). Number of outpatients treated was negatively associated with proportion of readmitted individuals for patients suffering from mood (p=0.040) and adjustment and stress disorders (p=0.007), whereas proportion of frequently readmitted patients was positively associated for patients suffering from addictive disorders (p=0.006) and negatively associated for those suffering from mood disorders (p=0.006) (see Table 5).

4 Discussion

This German investigation demonstrates that even after conclusion of a deinstitutionalization process, number of admissions and admitted individuals may remain stable, whereas readmission figures, and annual cumulative length of inpatient-stay per individual may decrease depending on the activity of a community-based outpatient clinic. These effects were more accurately demonstrated for patients suffering from addictive disorders. According to the results of other investigations, number of admissions, readmission figures and cumulative length of inpatient-stay do not necessarily increase when the number of beds decreases and admission pressure nationwide increases (overview in [11]). Häfner & Heiden [25] demonstrated for a German cohort of schizophrenic patients that outpatient care had a significant influence on readmission, but no effect on the length of inpatient treatment.

We compared the main results of our investigation with figures for the state (Bavaria) and federal (Germany) levels in order to capture different developments and tendencies. Within the survey period, number of psychiatric admissions increased in Germany [4] from 986,573 to 1,163,613, or about 18%, and in Bavaria from 143,276 to 180,121, or about 26%, whereas in the surveyed catchment area number of admissions remained stable. Admission rates also increased at federal and state level, whereas they even decreased in the catchment area (see Table 3). Average length of inpatient-stay decreased at the beginning of the survey period faster in the catchment area, but increased until 2010 by about two days, putting it on the same level as Germany and Bavaria (see Table 3). There are also striking differences in development of diagnostic distribution in hospitalized patients. Whereas in Germany the proportion of principal psychiatric diagnosis remained stable, organic mental disorders increased and addictive disorders decreased substantially in the surveyed area, mood disorders increased and schizophrenia decreased everywhere; in the surveyed area, there were lower numbers of organic mental disorders as well as adjustment and stress disorders, but higher numbers of addictive and personality disorders than at federal level (see Table 2). Average length of inpatient-stay remained lower in the surveyed area than at federal level for patients suffering from schizophrenia, adjustment and stress disorders as well as personality disorders, contrary to those suffering from organic mental disorders and addictive disorders (see Table 3). Cumulative individual data are not available in German registers. It is remarkable that even involuntary admissions under the guardianship law remain clear under the federal and state levels despite a slight increase in the last three years of the survey period, perhaps because efforts to provide alternatives to coercion are more efficient in rural areas on the basis of personalized networking [26]. The fact that inpatient coercive measures also decreased (see Table 1) may be explained by mediating effects. The hypothesis that intensive community-based outpatient care by an outpatient clinic may control inpatient variables such as number of admissions, readmissions, cumulative length of inpatient-stay and even coercion may be reinforced by the fact that annual prevalence of treatment periods in the surveyed catchment area per 1,000 inhabitants is three times higher than the average figures in the state (Bavaria) in which assessed catchment area is placed (see Table 3).

Bivariate regression analyses for time series referring to the whole surveyed sample demonstrate that annual number of outpatients treated increased, number of admissions remained stable, and annual cumulative length of inpatient-stay as well as readmission figures decreased significantly, contrary to average length of inpatient-stay per hospitalization. As regards principal diagnostic groups, patients suffering from organic mental disorders showed increasing outpatient as well as hospitalization figures, probably because of epidemiological factors related to an ageing population. Individuals suffering from addictive disorders showed decreasing number of admissions and readmissions, perhaps because care continuity by outpatient clinic after discharge improved over time. The reduction of hospitalizations, average length of inpatient-stay and cumulative length of inpatient-stay in patients suffering from schizophrenia demonstrate that after conclusion of the deinstitutionalization process, avoidance of the revolving-door phenomenon is possible when community-based treatment is ensured. The number of patients suffering from mood disorders increased in both inpatient and outpatient settings, whereas readmission figures decreased as a positive effect of continuity of care after discharge. Patients suffering from adjustment and stress disorders only show decreasing readmission figures, whereas all assessed hospitalization variables remain stable for patients suffering from personality disorders. We assume there is a diagnostic

shift from personality as well as adjustment and stress disorders to mood disorders because of a better social acceptance of 'mood disorder' as a psychiatric diagnosis. Valdes-Stauber & Kilian [27] recently demonstrated that patients suffering from personality disorders needed three times as much annual contact time as those suffering from schizophrenia and six times as much as those suffering from affective or adjustment and stress disorders.

Bivariate regression analyses between number of annual outpatients treated and hospitalization variables show that increasing community-based care may reduce the number of admissions, readmissions and cumulative length of inpatient-stay but not average length of inpatient-stay. It seems, however, that an increase in outpatient activity leads to more admissions and to a higher cumulative length of inpatient-stay in patients suffering from addictive and personality disorders, perhaps because a stronger awareness of acute situations leads to more intensive treatment decisions like hospitalization.

The findings of this study suggest that the role of the outpatient clinics in control hospitalization is decisive. Zhang, Harvey & Andrew [28] found that quality of inpatient care does not affect the risk of readmission, but that more active and assertive treatment in the community post-discharge decreases the risk of readmission. A Danish survey [29] demonstrated, however, that a series of negative indicators appeared with the deinstitutionalization process such as increase of suicides, in the number of the criminal mentally disordered, in coercive activities in the wards and in bed occupancy, all related to a dramatic reduction of psychiatric beds. The question of adequate length of inpatient-stay in psychiatric care has been hotly discussed since the late 1990s. Long stays and readmissions seem to be less necessary when well-functioning community-based teams ensure continuity of care [13], but some investigations showed that over-brief hospitalizations risk patients being readmitted [30, 31]. Lieberman et al. [32] point out that improvement during very brief hospitalizations is comparable to that in longer stays in many ways; however, depressed patients discharged more quickly show significantly higher residual levels of depressive symptoms and lower levels of global functioning, which may place them at greater risk of adverse outcomes in the immediate post-hospital period. This risk was also found for schizophrenia [33] and for psychogeriatric patients [34].

The results of this investigation suggest that community-based outpatient activity can reduce readmissions and cumulative length of inpatient-stay as well as control the number of hospitalizations, even after concluding deinstitutionalization and after closing long-stay wards. According to the literature, there is strong evidence that social factors contribute to the duration of the hospital stay and to frequent rehospitalization [35-37] as well as the lack of continuity of care after discharge [38]. In turn, non-adherence is related to an involuntary legal status at discharge or rejection of medical advice, not having an established outpatient clinician, social problems within the primary support group and the number of days between hospital discharge and follow-up appointment [38]. These results indicate the scope of the tasks which need to be completed by outpatient teams in order to avoid the risk of early rehospitalization: continuity of care by avoiding a gap between discharge and first appointment, relieving social burdens, offering assertive care and supporting and advocating relationships for patients with a lack of insight or denial of their illness. Otherwise, the benefits of intensive care management could be marginal in settings that have already achieved low rates of bed use; according to Burns et al. [39], it might not be necessary to apply the full model of assertive community treatment to achieve reductions in hospitalization figures.

According to a previous multivariate analysis, ambulatory assertive treatment is associated with decreasing inpatient restraint measures and even with proportion of involuntary admissions, perhaps because there are intrinsic boundaries in the application of force by medical institutions [40]. It seems that there is a tendency to limit the application of further forceful measures after an involuntary admission. The continuity of care after admission through cooperation with psychiatric wards may reduce distress and fear and consequently reduce the application of force in psychiatry [5]. Monitored data collection related to coercive measures may improve awareness concerning the application of forcible measures; this process could itself reduce such measures in psychiatry. Otherwise, community-based outpatient services are based on a network of balanced statutory and non-statutory stakeholders and authorities. For this reason cooperation

with legal guardians, institutions, authorities and especially judges is a constructive way to decrease admissions and search for alternatives to involuntary admissions. Such cooperation seems to be more difficult within the realm of commitment law, owing to autonomous police work and the emergence of acute situations primarily independent of medical professionals, because of their shift work schedules, different settings and different legal frames and because communication with patients is so difficult [41]. Therefore the avoidance of involuntary admissions by police is a more difficult matter, especially when there is a lack of professionals on duty to assess police and on-site carers [26]. Correlations between coercive measures and hospital characteristics were widely investigated in Germany by Steinert et al. [42] in longitudinal and comparative surveys.

The results of our investigation confirm findings of other investigations which demonstrate that deinstitutionalization does not necessarily lead to increases in number of hospitalizations, cumulative length of inpatient-stay, readmission figures or number of coercive measures [43, 44], contrary to findings that deinstitutionalization leads to more readmissions (revolving-door phenomenon), increasing cumulative length of inpatient-stay and even more involuntary admissions [45]. According to Szmukler & Holloway [11], an increase in involuntary hospitalizations is not an inevitable consequence of reducing psychiatric beds. Community-based ambulatory care by multi-disciplinary teams with a focus on quality of relationship and support for carers seems capable of reducing rehospitalizations and controlling cumulative length of inpatient-stay and frequency of coercion measures.

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