

Which elements influence the success of flexible and integrated treatment? – The impact of diagnoses, precursor contracts and model coverage on integrated care models

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Article

Keywords:

Posted Date: August 12th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10550687/v1>

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Additional Declarations: The authors have declared there is **NO** conflict of interest to disclose

Abstract

Although global effects of flexible and integrated treatment (FIT) in mental health care in Germany have been demonstrated, differences within FIT care remain inadequately addressed. This manuscript investigates the influence of 1) diagnostic groups, 2) precursor contracts and 3) comprehensive versus hybrid model using data from the EVA64-study. To analyze the influence of the diagnosis, we calculated pooled regressions over all 18 FIT hospitals, stratified by the three most common diagnoses at study inclusion. To analyze the influence of precursor contracts and the percentage of FIT from all patients in the hospital (comprehensive vs. hybrid model), we conducted meta-regressions at the hospital level. A total of 69,711 patients (including 6,726 children and adolescents) from 18 FIT hospitals in Germany compared with patients from standard care were included in the analyses. While not always superior overall, FIT treatment's effectiveness depended on diagnosis, reducing inpatient stays for some groups while shifting others from inpatient care to intensive daycare treatment. The presence or absence of a precursor contract before the start of the FIT model did not influence the results under investigation. Comprehensive models revealed a higher duration of daycare treatment in the first year and fewer PIA contacts in both years compared to hybrid models. Our results revealed three things: 1) the effects of FIT care are diagnosis-dependent, 2) pre-existing FIT-like care structures did not affect the outcomes after an initiation phase, and 3) comprehensive models shifted more toward daycare than PIA treatment, underlining the heterogeneity of FIT models.

Registration: This study was registered in the database "Health Services Research Germany" (trial number: VVfD_EVA64_15_003713).

Introduction

Mental health disorders pose a significant and growing public health challenge in Germany. Their increasing (administrative) prevalence highlights the urgent need for accessible and effective mental healthcare (1, 2). The nation's approach to mental health has been shaped by decades of reform, including a significant shift towards community-based care and a reduction in the use of institutional settings (3). Despite having a comprehensive and well-funded system, challenges relating to fragmentation, service coordination, and unmet needs persist, highlighting the complexity of providing mental health services across the country (4–6).

The German healthcare system is primarily funded by statutory health insurance (SHI), which covers approximately 88% of the population (4). The system is organized into distinct sectors, each with its own care and financing structure. Regarding mental healthcare, the following sectors are particularly relevant: inpatient hospital care, daycare at hospitals, intensive and complex outpatient hospital care (PIA, Psychiatrische Institutsambulanz), outpatient care provided by office-based psychiatrists and psychotherapists, rehabilitation services, and complementary regional services, all of which operate under separate financing mechanisms (4, 5, 7). A key peculiarity of the German mental healthcare system is the pronounced separation between inpatient and outpatient care, which are funded and staffed differently (3, 4, 8). This structural divide poses challenges in coordinating care and creating seamless treatment pathways for patients (4). Another significant feature is the process of deinstitutionalization, which began in the 1970s and led to a dramatic reduction in the number of psychiatric beds (3). While this reflects a modern approach

to mental health, the system still overemphasizes inpatient services and has difficulty allocating treatment appropriately based on severity (4).

One approach to overcoming the segmentation was the introduction of flexible and integrated treatment (FIT) in 2012 (§ 64b of the Fifth Book of the Social Code (SGB V)). FIT hospitals, i.e. those hospitals which have introduced FIT care, operate on a Global Treatment Budget (GTB) rather than per-diem rates, as is the case with standard care. A GTB is a capitation-based model in which hospitals receive a fixed total budget for all forms of care provided to their patients, including inpatient, daycare, PIA, and home treatment (8, 9). Some aspects of FIT had already been implemented in previous care structures, such as regional psychiatry budgets (10) and integrated care contracts (11, 12). Consequently, some FIT hospitals began FIT care from such precursor contracts, while others began from standard care. The treatment concept and specific funding are negotiated individually between the hospital and SHI funds. Some FIT hospitals have contracts with all SHI funds (comprehensive model coverage), while others have contracts with only a few (hybrid model). The core objectives of FIT care are shifting from inpatient to outpatient or daycare treatment, enhancing continuity of care, and increasing flexibility and patient autonomy (8, 9, 13).

Evaluations of FIT care have demonstrated its effectiveness in achieving these intended changes (8, 14, 15). Changes could be demonstrated in treatment care (e.g., reduced number of inpatient days while increase in daycare and outpatient care and in treatment continuity (8, 16–22)), treatment processes (e.g., increased FIT implementation grade and flexibility (9, 23–26)) and patient-related outcomes (e.g., increased health-related quality of life and treatment satisfaction (14, 15, 19, 27)). Although the global effects of FIT care have been demonstrated, differences within FIT care remain inadequately addressed.

First, it is unclear whether patients with certain **diagnostic** groups benefit more than others from FIT care. Previous research has shown that the strength of treatment effects for inpatient care and sick leave varies across different diagnostic groups for patients treated within the first year after FIT start (16). However, the effects on other outcomes, such as PIA utilization, outpatient care and treatment continuity, as well as on patients treated beyond the first year, remain unclear.

Second, the influence of **pre-existing** similar care structures (precursor contracts) compared to FIT hospitals that began from standard care is not clear. Initial results from the first year after FIT start suggest stronger results in terms of inpatient and daycare days for precursor contracts (28). However, further analysis did not reveal differences among patients in 12 FIT hospitals over the first three years (8). Therefore, evidence on long-term results and the effects on other outcomes is still unclear.

Third, no study has yet investigated whether FIT hospitals contracting with all SHI funds (**comprehensive model**) or a few (hybrid model) demonstrate different results. Research has shown that the higher the proportion of model care within total care, the higher the degree of FIT implementation (24). Additionally, a two-track care (i.e., the simultaneous operation of standard and FIT care) and cross-setting documentation and coordination, are seen as challenges (25). However, it is unclear whether a high proportion of model care leads to different results compared to a low proportion.

Therefore, our analyses aim to investigate the influence of 1) diagnostic groups, 2) precursor contracts and 3) comprehensive versus hybrid model on the effectiveness of FIT results.

Materials and Methods

Study design

We used data from the EVA64-study, a quasi-experimental controlled cohort study that compared several outcomes in 18 FIT hospitals with standard care in Germany. The study is based on claims data of patients in the 18 FIT hospitals and control clinics insured by participating statutory health insurances. The EVA64 study design (29) and overall outcome results (8, 15) in detail are published elsewhere.

Control group

To compare the results to standard care, we defined a control group (treatment-as-usual) at two levels. First, we selected comparable hospitals. These hospitals were chosen at the beginning of the EVA64 study. Up to 10 hospitals were defined to each FIT hospital using a pre-defined ranking with knockout criteria, such as being in the same region and having an institutionalized structure with specialist departments and PIA. Other criteria included the number of cases per diagnosis with a weighting of 50%, structural hospital features, such as the number of beds or personnel, with a weighting of 25%, and regional factors, such as unemployment rate, with a weighting of 25%. The selection of control hospitals is published elsewhere (30).

Second, we matched patients (1:1) before the analysis exactly according to the following variables: year of study inclusion and mental health diagnosis at study inclusion. Additionally, we applied propensity score matching (nearest neighbor, caliper = 0.25) to the following variables: age at study inclusion, sex, and healthcare utilization before study inclusion (in the area of mental healthcare: amount of inpatient care, day-care, and number of PIA and resident physician contacts). If fewer than 95% of patients from the FIT hospitals could be matched, we performed another matching round, this time by broadening the scope of specific diagnoses to include dummy-coded diagnostic groups. Furthermore, we increased the caliper in the propensity score matching step by step (by 0.01) until at least 95% of the patients from the FIT hospitals found a matching partner.

Data and outcomes

In our present analyses, we included all patients who received treatment at least once in one of the 18 FIT hospitals within the first three years after the start of FIT treatment (Table 1), and who had no pre-existing contact with the clinic within two years before their first contact after FIT start. We examined the results of the first and second year after study inclusion.

Table 1
Outcomes

Outcome	Description	Unit
Duration of inpatient and daycare treatment (<i>primary outcome = duration of inpatient stay</i>)	Duration of inpatient and daycare treatment Denominator: all individuals, regardless of whether they received inpatient treatment	days
Risks of inpatient or daycare treatment	Percentage of individuals who have received at least one inpatient or daycare treatment Denominator: all individuals, regardless of whether they received inpatient treatment	OR
PIA	Number of days with at least one contact in a PIA Denominator: all individuals	Days with contact
Contract physician	Number of patients seen by a contracted psychiatrist or child and adolescent psychiatrist, or by a psychotherapist Denominator: all individuals	contacts
Treatment continuity	Percentage of individuals who had an outpatient psychiatric visit (with a primary care physician, a contracted psychiatrist, a contracted child and adolescent psychiatrist, or a psychotherapist) 30 days after an inpatient stay Denominator: all individuals who were hospitalized and followed up for 30 days	OR
Risk of loss of contact	Percentage of individuals who had no contact with the psychiatric care system (outpatient or inpatient) within 180 days of discharge from inpatient care Denominator: patients with a 180-day follow-up period after initial inpatient discharge and a severe mental disorder, i.e., they must have had at least one of the following diagnoses (ICD-10): F20-F22 (schizophrenia and related disorders), F25 (schizoaffective disorders), F30 (mania), F31 (bipolar affective disorder), F32.2-F32.3 (major depressive episodes), F33 (recurrent depressive disorder), F41 (other anxiety disorders), F42 (obsessive-compulsive disorders), or F60.31 (specific personality disorder of the borderline type); only for adults, as the definition of a severe mental illness applies to adults	OR
Duration of loss of contact	Duration until loss of contact, defined as no contact with the psychiatric care system (outpatient or inpatient) within 180 days of discharge from inpatient care	days
OR = odds ratio		
PIA = Psychiatric Outpatient Clinic		
¹ Diagnoses according to ICD-10: F00, F01, F02, F03, F07, F10, F20-F29, F30-F39, F40-F48, F50, F60.31, F70-F79, F84, F90-F98		

Outcome	Description	Unit
	Denominator: patients with a 180-day follow-up period after initial inpatient discharge and a severe mental disorder, i.e., they must have had at least one of the following diagnoses (ICD-10): F20-F22 (schizophrenia and related disorders), F25 (schizoaffective disorders), F30 (mania), F31 (bipolar affective disorder), F32.2-F32.3 (major depressive episodes), F33 (recurrent depressive disorder), F41 (other anxiety disorders), F42 (obsessive-compulsive disorders), or F60.31 (specific personality disorder of the borderline type); only for adults, as the definition of a severe mental illness applies to adults	
Episodes sick leave	Number of sick leave episodes due to one of the defined mental health conditions included in the study ¹ Denominator: Individuals with the insurance status "Member"; adults only, as the denominator is skewed for children and adolescents	episodes
Duration of sick leave (<i>primary outcome</i>)	Number of days on sick leave due to one of the defined mental health conditions included in the study ¹ Denominator: Individuals with the insurance status "Member"; adults only, as the denominator is skewed for children and adolescents	days
Risk of re-hospitalization	Percentage of individuals readmitted for inpatient care in a psychiatric or psychosomatic department within 12 months of their first inpatient stay Denominator: Individuals who have had at least one inpatient stay in a psychiatric or psychosomatic department and a follow-up period of at least 12 months following that inpatient stay	OR
Disease progression A	Risk of developing a major depressive episode (ICD-10: F32.2 or F32.3) within two years Denominator: Individuals with a mild or moderate depressive episode (ICD-10: F32.0 or F32.1)	OR
Disease progression B	Risk of developing recurrent depressive disorder (ICD-10: F33) within two years Denominator: Individuals experiencing a depressive episode (ICD-10: F32)	OR
Disease progression C	Risk of developing a substance use disorder (ICD-10: F10-F19) within two years Denominator: Individuals without a substance use disorder (ICD-10: F10-F19)	OR
OR = odds ratio		
PIA = Psychiatric Outpatient Clinic		
¹ Diagnoses according to ICD-10: F00, F01, F02, F03, F07, F10, F20-F29, F30-F39, F40-F48, F50, F60.31, F70-F79, F84, F90-F98		

Outcome	Description	Unit
Direct costs of psychiatric care	Costs for inpatient and daycare psychiatric hospital treatment, PIA treatment, treatment at social pediatric centers, psychiatric treatment at university outpatient clinics, psychiatric treatment provided by contract physicians, psychotropic medications, and medications with psychiatric indications from the perspective of statutory health insurance Denominator: all individuals	Euro
Hospital costs	Costs for inpatient and daycare psychiatric hospital treatment as well as PIA treatment from the perspective of statutory health insurance Denominator: all individuals	Euro
OR = odds ratio		
PIA = Psychiatric Outpatient Clinic		
¹ Diagnoses according to ICD-10: F00, F01, F02, F03, F07, F10, F20-F29, F30-F39, F40-F48, F50, F60.31, F70-F79, F84, F90-F98		

We analyzed all patients in all FIT hospitals together for “diagnosis”, “precursor contract” and “comprehensive vs. hybrid model”. The definition of the outcomes is described below (Table 1).

For the analyses by **diagnosis**, we used the three most common diagnoses at the time of study inclusion. Information on whether or not a FIT hospital had a **precursor contract** before the start of FIT care and the percentage of hospital’s model structure (as a proxy for **comprehensive versus hybrid model**) can be found in Table 2.

Table 2
List of FIT hospitals

Model ¹	FIT start ²	Federal state	Precursor ³	% FIT care ⁴	Number of patients ⁵
A	12/2014	North Rhine-Westphalia	Yes, IV	26%	3,344
B	01/2014	Brandenburg	Yes, IV	25%	1,278
C	09/2013	Hesse	Yes, IV	100%	3,473
D	01/2013	Schleswig-Holstein	Yes, RPB	97%	2,575
E	01/2013	Schleswig-Holstein	Yes, RPB	100%	1,967
F	01/2013	Schleswig-Holstein	Yes, RPB	100%	2,439
G	01/2014	Schleswig-Holstein	Yes, RPB	100%	1,424
H	01/2013	Schleswig-Holstein	Yes, RPB	100%	2,159
I	01/2014	North Rhine-Westphalia	No	100%	3,482
J	01/2014	Lower Saxony	No	33%	2,075
K	01/2014	Saxony	No	98%	1,182
K AP				99.7%	930
K CAP					
L	01/2014	Saxony	No	100%	2,142
M	01/2014	Thuringia	Yes, RPB	100%	1,280
M AP					978
M CAP					
N	01/2016	Berlin	No	8%	2,775
N AP					133
N CAP					
O	01/2016	Hesse	No	100%	2,471
P	01/2016	Hesse	Yes, IV (only CAP)	100%	5,615
P AP					3,785
P CAP					
Q	01/2017 [#]	Baden-Wuerttemberg	No	100%	1,726

Model ¹	FIT start ²	Federal state	Precursor ³	% FIT care ⁴	Number of patients ⁵
R	01/2017 #	North Rhine-Westphalia	No	45%	5,141
R AP					588
R CAP					
¹ AP = adult psychiatry; CAP = child and adolescent psychiatry; a distinction was only made if CAP was also part of the FIT care. otherwise the FIT hospital only included adults (age ≥ 18 years)					
² month and year of the start of the FIT care (mm/yyyy)					
³ Yes = precursor FIT-like contracts existed before FIT start; No = no such precursor contracts existed. i.e. the FIT hospital started from standard care; RPB = regional psychiatry budget; IV = integrated care contract					
⁴ estimated proportion of patients covered by FIT care out of all patients in the clinic, as estimated by representatives of the FIT hospital					
⁵ all patients who received treatment at least once within the first three years after the start of FIT treatment and who had no pre-existing contact with the clinic within two years before their first contact after FIT start					

Analysis

We analyzed the **overall** outcomes using a meta-analysis (a multivariate multilevel approach), comparing the year before with the first or second year after study inclusion, as well as the group (FIT hospital versus standard care) (31, 32). Therefore, the overall results indicate an interaction term of group x time. Since the FIT hospitals have different designs and varying contextual conditions, we used a random-effects model for the meta-analyses with the R package “metaphor” (31). We calculated odds ratios (OR) for the risk of inpatient or daycare treatment, treatment continuity, risk of loss of contact, risk of re-hospitalization, and disease progression.

To analyze the influence of the **diagnosis**, we calculated pooled regressions over all 18 FIT hospitals, stratified by the three most common diagnoses at study inclusion. The diagnosis groups can be found in Table 3. We investigated the influence of diagnoses only for the primary outcomes (inpatient and daycare treatment and costs). As the most prevalent diagnoses differed between adults and children/adolescents, we conducted separate analyses for both groups.

Table 3
Study population at the time of study inclusion

Model	AP ¹		CAP ¹	
group	FIT ²	TAU ²	FIT ²	TAU ²
total (n)	31 548	31 437	3 363	3 363
Diagnosis				
• F 00 (Dementia)	1.5%	1.3%	0.0%	0.0%
• F 01 (Vascular dementia)	2.2%	2.0%	0.0%	0.0%
• F 02 (Dementia, diseases classified elsewhere)	0.3%	0.2%	0.0%	0.0%
• F 03 (Unspecified dementia)	3.7%	3.6%	0.0%	0.0%
• F 07 (Personality and behavioral disorders ... of the brain)	1.1%	1.1%	0.7%	0.1%
• F 10 (Mental and behavioral disorders due to alcohol)	20.9%	20.8%	0.6%	0.7%
• F 20–29 (Schizophrenia, schizophrenic and delusional disorders)	7.9%	7.8%	0.9%	0.7%
• F 30–39 (Affective disorders)	45.0%	45.1%	21.5%	23.1%
• F 43 (Severe stress and adjustment disorders)	20.3%	20.0%	13.3%	13.0%
• F 45 (Somatoform disorders)	3.9%	3.9%	1.6%	1.6%
• F 40–48 (Neurotic. stress and somatoform disorders) ³	13.2%	13.4%	6.8%	7.1%
• F 50 (Eating disorders)	1.6%	1.4%	2.6%	2.9%
• F 60.31 (Specific personality disorder. borderline)	2.7%	2.6%	0.8%	0.3%
• F 70–79 (Intelligence disorder)	1.8%	1.5%	2.5%	2.4%
• F 84 (Profound developmental disorders)	0.2%	0.2%	2.8%	2.7%
• F 90–98 (Behavioral and emotional disorders, childhood/adolescence)	1.2%	1.1%	62.4%	61.8%
¹ AP = adult psychiatry; CAP = child and adolescent psychiatry				
² FIT = intervention group (FIT hospital); TAU = control group (treatment-as-usual)				
³ without ICD-10 F43 and F45				
⁴ Presence of at least one of the following diagnoses/diagnosis groups: F20-F22, F25, F30, F32.2-F32.3, F33, F41, F42, F60.31, from the reference date and two years prior to that date; not valid for children and adolescent (under age 18 years)				

Model	AP ¹		CAP ¹	
Age				
• Mean	49.3	49.2	12.5	12.6
Sex				
• Female	56.1%	55.8%	46.7%	47.1%
• Male	43.9%	44.2%	53.3%	52.9%
Setting at study inclusion				
• Inpatient or daycare	50.6%	58.0%	30.2%	27.2%
• PIA	49.4%	42.0%	69.8%	72.8%
Highest school education				
• No school leaving certificate	1.2%	1.0%	0.7%	0.1%
• Elementary/primary school leaving certificate	7.0%	7.1%	2.3%	1.7%
• High school diploma or equivalent qualification	11.6%	10.9%	3.5%	3.3%
• High school diploma/vocational diploma	6.3%	6.8%	4.5%	4.2%
• Qualification unknown	10.2%	10.2%	2.6%	2.8%
• missing	63.6%	64.0%	86.4%	87.8%
Highest professional qualification				
• Without vocational training qualification	5.9%	5.3%	3.6%	2.4%
• Recognized vocational training qualification	19.3%	19.4%	4.6%	4.3%
• Master craftsman/technician. equivalent technical college qualification	1.0%	1.1%	0.4%	0.7%
• Bachelor's degree	0.4%	0.4%	0.2%	0.1%
• Diploma/Master's degree/State examination	2.2%	2.3%	2.5%	2.3%
• Doctorate	0.1%	0.1%	0.3%	0.1%
• Qualification unknown	7.4%	7.4%	1.9%	2.1%
¹ AP = adult psychiatry; CAP = child and adolescent psychiatry				
² FIT = intervention group (FIT hospital); TAU = control group (treatment-as-usual)				
³ without ICD-10 F43 and F45				
⁴ Presence of at least one of the following diagnoses/diagnosis groups: F20-F22, F25, F30, F32.2-F32.3, F33, F41, F42, F60.31, from the reference date and two years prior to that date; not valid for children and adolescent (under age 18 years)				

Model	AP ¹		CAP ¹	
• missing	63.6%	64.0%	86.4%	87.8%
Care level				
• Yes	12.1%	11.9%	5.9%	5.2%
• No	69.5%	71.0%	61.3%	71.0%
• missing	18.5%	17.1%	32.8%	23.8%
Severe mental illness ⁴				
• Yes	26.8%	27.3%	-	-
• No	73.2%	72.7%	-	-
Insurance status				
• Member	58.0%	59.1%	11.2%	11.3%
• Family member covered by insurance	6.1%	5.6%	82.9%	82.7%
• Pensioners and their family members	33.0%	32.2%	4.9%	4.0%
• missing	3.0%	3.1%	1.0%	2.0%
¹ AP = adult psychiatry; CAP = child and adolescent psychiatry				
² FIT = intervention group (FIT hospital); TAU = control group (treatment-as-usual)				
³ without ICD-10 F43 and F45				
⁴ Presence of at least one of the following diagnoses/diagnosis groups: F20-F22, F25, F30, F32.2-F32.3, F33, F41, F42, F60.31, from the reference date and two years prior to that date; not valid for children and adolescent (under age 18 years)				

To analyze the influence of **precursor contracts** and the percentage of FIT from all patients in the hospital (**comprehensive vs. hybrid model**), we conducted meta-regressions at the hospital level for all outcomes except costs. A beta value of less than 1 indicates a reducing effect on the outcome under investigation, while a value greater than 1 indicates an increasing effect. When presenting proportions, such as the proportion of inpatient or daycare treatment, treatment continuity, readmission, or disease progression, the reference value is “0”.

The overall analyses were confirmatory and the analyses by diagnostic groups, precursor contracts and comprehensive vs. hybrid model were exploratory (29).

We applied a 5% level of significance and conducted all statistical analyses using the statistical software R, version 3.3.2 (33). As all analyzed data were anonymous, the ethical committee of the University of Magdeburg confirmed that no ethical approval and no informed consent were necessary (ethics approval waiver according to § 16 (5) of the general terms and conditions of contract for Magdeburg University

Hospital). Data were handled, analyzed and reported according to the Good Epidemiological Practice (GEP) (34), the Good Practice of Secondary Data Analysis (GPS) (35), and the German Reporting Standard for Secondary Data Analyses, Version 2 (STROSA 2) (36).

Results

Baseline characteristics

We analyzed 18 FIT hospitals, five of which also included children and adolescents (Table 2). These hospitals started FIT care between 2014 and 2017 and were located in nine out of sixteen different German federal states. Ten FIT hospitals had FIT-like precursor contracts before the start of the FIT program. Thirteen hospitals had a comprehensive model, meaning that at least 95% of patients were covered by FIT care, and five had a hybrid model, meaning that less than 95% of patients were covered by FIT care.

A total of 69,711 patients were included in the analyses, 6,726 of whom were children or adolescents (Table 3). The three most prevalent diagnostic groups for adults were F30-F39 (affective disorders), F10 (mental and behavioral disorders due to alcohol) and F43 (reactions to severe stress and adjustment disorders), and for children and adolescents F90-98 (behavioral and emotional disorders with onset in childhood and adolescence), F30-F39 and F43. Due to the matching algorithm, the variables diagnosis, age, and sex were comparable between the two groups. Since the FIT hospitals focused less on inpatient care than the comparison group (TAU, treatment-as-usual) (8, 16, 28), fewer patients from an inpatient (or daycare) setting were included in the FIT than in the TAU group. All other characteristics were comparable between the two groups.

Overall effects and diagnoses

Adults

The overall outcomes revealed significant reductions of inpatient treatment days in FIT hospitals compared to standard care in the first and second patient year for adults (Table 4). Further statistically significant differences were not detected. However, the effect of FIT care differs by diagnosis.

Table 4

Overall effects and influence of diagnoses on treatment effects and costs, adults and children/adolescents
(sick leave: adults only)

(sick leave: adults only)						
Outcome	Diagnosis (ICD-10)*	Year	DID ²	p-value	conf.low ³	conf.high ⁴
Adults						
% inpatient treatment						
Overall	All	1st	0.9	0.443	0.7	1.2
		2nd	1.0	1.000	0.9	1.1
By diagnosis at study inclusion	F10	1st	0.976	0.814	0.798	1.194
		2nd	1.243	0.015	1.044	1.479
	F30-F39	1st	0.662	< 0.001	0.572	0.766
		2nd	0.883	0.146	0.747	1.044
	F43	1st	0.709	0.034	0.516	0.974
		2nd	1.032	0.870	0.711	1.496
% daycare treatment						
Overall	All	1st	6.6	0.216	-3.0	16.3
		2nd	2.4	0.480	1.0	3.9
By diagnosis at study inclusion	F10	1st	9.040	0.001	2.514	32.502
		2nd	9.753	0.001	2.627	36.200
	F30-F39	1st	1.377	0.080	0.963	1.970
		2nd	1.190	0.371	0.813	1.742
	F43	1st	4.057	0.009	1.415	11.634
		2nd	2.877	0.059	0.959	8.628
Duration inpatient treatment, days						
Overall	All	1st	-4.5	< 0.001	-6.8	-2.3
		2nd	-0.9	0.003	-1.5	-0.3
By diagnosis at study inclusion	F10	1st	-1,710	0.001	-2.720	-0.700
		2nd	-0.375	0.466	-1.385	0.635
	F30-F39	1st	-6.841	< 0.001	-7.756	-5.925
		2nd	-0.586	0.210	-1.501	0.330
	F43	1st	-1.085	0.010	-1.910	-0.260

Outcome	Diagnosis (ICD-10)*	Year	DID ²	p-value	conf.low ³	conf.high ⁴
		2nd	-0.529	0.209	-1.354	0.296
Duration daycare treatment, days						
Overall	All	1st	2.0	0.058	-0.1	4.1
		2nd	0.1	0.622	-0.2	0.4
By diagnosis at study inclusion	F10	1st	1.080	< 0.001	0.734	1.426
		2nd	0.496	0.005	0.150	0.843
	F30-F39	1st	2.252	< 0.001	1.610	2.894
		2nd	0.117	0.722	-0.526	0.759
	F43	1st	1.900	< 0.001	1.221	2.578
		2nd	0.247	0.475	-0.431	0.926
Sick leave, episodes						
Overall	All	1st	-0.0	0.999	-0.1	0.0
		2nd	-0.0	0.999	-0.1	0.1
By diagnosis at study inclusion	F10	1st	-0.018	0.700	-0.108	0.073
		2nd	0.021	0.653	-0.07	0.111
	F30-F39	1st	-0.027	0.219	-0.071	0.016
		2nd	-0.011	0.630	-0.054	0.033
	F43	1st	-0.022	0.458	-0.079	0.036
		2nd	-0.015	0.616	-0.072	0.043
Sick leave, duration, days						
Overall	All	1st	-1.2	0.697	-7.2	4.9
		2nd	-1.7	0.582	-7.7	4.4
By diagnosis at study inclusion	F10	1st	3.739	0.095	-0.647	8.125
		2nd	1.162	0.604	-3.224	5.548
	F30-F39	1st	-1.192	0.600	-5.647	3.262
		2nd	1.002	0.659	-3.453	5.456
	F43	1st	6.852	0.005	2.051	11.653
		2nd	1.292	0.598	-3.509	6.093
Total costs, Euro						

Outcome	Diagnosis (ICD-10)*	Year	DID ²	p-value	conf.low ³	conf.high ⁴
Overall	All	1st	53.61	0.928	-1,109.66	1,216.87
		2nd	-62.39	0.916	-1,225.65	1,100.88
By diagnosis at study inclusion	F10	1st	360.11	0.020	57.82	662.4
		2nd	217.27	0.163	-87.76	522.29
	F30-F39	1st	-287.01	0.021	-529.7	-44.32
		2nd	-121.41	0.330	-365.65	122.83
	F43	1st	210.39	0.155	-79.53	500.3
		2nd	-125.99	0.396	-417.22	165.24
Model costs ¹ , Euro						
Overall	All	1st	-15.43	0.979	-1,180.36	1,149.50
		2nd	-74.37	0.900	-1,239.30	1,090.55
By diagnosis at study inclusion	F10	1st	353.29	0.019	59.19	647.39
		2nd	223.24	0.140	-73.53	520.00
	F30-F39	1st	-340.02	0.004	-572.82	-107.22
		2nd	-111.46	0.351	-345.74	122.83
	F43	1st	177.44	0.206	-97.47	452.36
		2nd	-112.1	0.426	-388.26	164.06
Children & adolescents						
% inpatient treatment						
Overall	All	1st	0.7	0.282	0.3	1.1
		2nd	0.7	0.282	0.3	1.1
By diagnosis at study inclusion	F30-F39	1st	0.518	0.118	0.227	1.181
		2nd	0.575	0.204	0.245	1.350
	F43	1st	0.784	0.600	0.316	1.948
		2nd	1.074	0.892	0.385	3.000
	F90-F98	1st	0.740	0.175	0.479	1.143
		2nd	0.780	0.320	0.478	1.273
% daycare treatment						

Outcome	Diagnosis (ICD-10)*	Year	DID ²	p-value	conf.low ³	conf.high ⁴
Overall	All	1st	0.9	0.327	-0.9	2.7
		2nd	1.0	0.350	-1.1	3.1
By diagnosis at study inclusion	F30-F39	1st	qcs			
		2nd	qcs			
	F43	1st	qcs			
		2nd	qcs			
	F90-F98	1st	1.827	0.255	0.647	5.162
		2nd	1.374	0.565	0.465	4.060
Duration inpatient treatment, days						
Overall	All	1st	-2.5	0.461	-9.3	4.2
		2nd	-1.3	0.261	-3.5	0.9
By diagnosis at study inclusion	F30-F39	1st	-0.939	0.745	-6.595	4.718
		2nd	0.049	0.986	-5.607	5.705
	F43	1st	2.503	0.246	-1.726	6.733
		2nd	2.260	0.295	-1.970	6.489
	F90-F98	1st	-4.141	< 0.001	-5.932	-2.351
		2nd	-1.100	0.229	-2.891	0.691
Duration daycare treatment, days						
Overall	All	1st	-0.8	0.312	-2.3	0.8
		2nd	0.7	0.36	-0.8	2.2
By diagnosis at study inclusion	F30-F39	1st	-1.191	0.495	-4.611	2.228
		2nd	-0.363	0.835	-3.783	3.057
	F43	1st	1.191	0.502	-2.290	4.673
		2nd	0.284	0.873	-3.197	3.765
	F90-F98	1st	1.207	0.172	-0.526	2.940
		2nd	0.644	0.466	-1.089	2.378
Total costs, Euro						
Overall	All	1st	1,455.38	0.550	-3,374.53	6,285.29

Outcome	Diagnosis (ICD-10)*	Year	DID ²	p-value	conf.low ³	conf.high ⁴
		2nd	626.74	0.800	-4,203.18	5,456.65
By diagnosis at study inclusion	F30-F39	1st	2,191.69	0.102	-439.04	4,822.42
		2nd	433.35	0.747	-2,197.38	3,064.07
	F43	1st	37.83	0.971	-1,980.98	2,056.65
		2nd	118.49	0.908	-1,900.84	2,137.83
	F90-F98	1st	546.19	0.219	-325.16	1,417.54
		2nd	96.11	0.829	-775.29	967.50
Model costs ¹ , Euro						
Overall	All	1st	1,410.65	0.560	-3,356.56	6,177.86
		2nd	540.53	0.830	-4,226.68	5,307.74
By diagnosis at study inclusion	F30-F39	1st	2,180.86	0.102	-436.93	4,798.65
		2nd	308.78	0.817	-2,309.01	2,926.56
	F43	1st	121.29	0.905	-1,881.55	2,124.13
		2nd	131.56	0.898	-1,871.79	2,134.92
	F90-F98	1st	541.84	0.219	-322.30	1,405.97
		2nd	62.05	0.888	-802.14	926.23
¹ model costs include the costs for inpatient and daycare treatment as well as PIA costs						
² DID = difference-in-difference effect (time x group)						
³ conf.low = lower 95% confidence interval						
⁴ conf.high = upper 95% confidence interval						
* F10 = mental and behavioral disorders due to alcohol; F30-F39 = affective disorders; F43 = severe stress and adjustment disorders; F90-F98 = behavioral and emotional disorders, childhood/adolescence						
qsc = quasi-complete separation; due to quasi-complete separation of the model coefficients not results were returned						

Adults with F10 had a significantly higher **risk of inpatient treatment** in the FIT than in the TAU group in the second year. On the other hand, adults with F30-39 or F43 showed a significantly lower risk in the first year. Adults with F10 and F43 showed a significantly higher **risk of daycare treatment** in the FIT than in the TAU group (F10: both years; F43: first year only). This difference was particularly high for adults with F10.

While the number of **inpatient days** significantly decreased in the FIT group for adults with F10, F30-39 and F43 in the first year, which is in line with the overall effect, the number of **days of daycare treatment** significantly increased for all three diagnostic groups in the first year and for adults with F10 also in the second year.

Stratified analyses of **sick leave episodes** by diagnosis group did not reveal any significant or relevant differences between both groups. However, the duration of **sick leave days** significantly increased for patients with F43 in the FIT group compared to TAU in the first year.

Total direct costs of psychiatric care, as well as the **model costs**, were significantly higher in the FIT group for adults with F10, and lower for adults with F30-F39 in the first year.

Children and adolescents

For children and adolescents no overall outcome was significantly different between FIT and TAU. Also, most analyses by diagnoses did not show significant differences. However, young patients with a diagnosis of F90-F98 revealed significantly lower **inpatient days** in the FIT compared to the TAU group.

Precursor contracts

The presence or absence of a precursor contract before the start of the FIT model did not influence the results under investigation. No differences were revealed between those FIT hospitals with and those without a precursor contract (Table 5).

Table 5
Influence of precursor contracts on treatment effects

Outcome	Influence of precursor contract			
	Year 1		Year 2	
	Beta	p - value	Beta	p - value
% inpatient treatment	0	0.993	-0.1	0.546
Duration inpatient treatment, days	-1.6	0.469	-0.36	0.537
% daycare treatment	6.9	0.434	0.9	0.523
Duration daycare treatment, days	-1.9	0.259	-0.4	0.12
PIA contact	0.6	0.499	0.1	0.724
Contacts outpatient care	0.2	0.583	0.3	0.337
Treatment continuity, 30 days psych. sector	0.1	0.415	0.2	0.25
Loss of contact, 180 days	0	0.936		
Duration of loss of contact, days	-26.4	0.193		
Sick leave, episodes	0	0.822	0	0.547
Sick leave, duration, days	-8.8	0.374	-0.1	0.993
Readmission rate	-0.1	0.172		
Progression A	0.1	0.569		
Progression B	0.6	0.545		
Progression C	0	0.868		

Comprehensive model vs. hybrid model

Those FIT hospitals that contracted for (almost) all SHI funds and could include all patients in the model care (comprehensive model) revealed a higher duration of daycare treatment in the first year and fewer PIA contacts in both years compared to those FIT hospitals that contracted for fewer SHI funds and, therefore, had to maintain a two-track healthcare system (Table 6).

Table 6
Influence of FIT scope on treatment effects (comprehensive vs. hybrid)

Outcome	Influence of FIT scope			
	Year 1		Year 2	
	Beta	p - value	Beta	p - value
% inpatient treatment	0.1	0.823	-0.1	0.603
Duration inpatient treatment, days	-1.6	0.525	-0.87	0.184
% daycare treatment	4.8	0.615	0.6	0.686
Duration daycare treatment, days	6	0.001	0.4	0.192
PIA contact	-2	0.041	-1.2	0.002
Contacts outpatient care	-0.4	0.321	-0.2	0.583
Treatment continuity, 30 days psych. sector	-0.2	0.072	-0.2	0.5
Loss of contact, 180 days	0	0.27		
Duration of loss of contact, days	0.1	0.995		
Sick leave, episodes	0	0.585	0	0.525
Sick leave, duration, days	-2.7	0.797	5.8	0.583
Readmission rate	0.1	0.284		
Progression A	-0.1	0.461		
Progression B	0.4	0.724		
Progression C	0	0.985		

Discussion

The study highlights three key findings: FIT care efficacy is diagnosis-dependent, long-term outcomes are independent of pre-existing care structures, and the transition from inpatient care exhibits significant site-specific heterogeneity in implementation models.

Overall effects

Our analyses showed that adult patients in FIT hospitals had lower inpatient treatment days compared to standard care. Another analysis showed fewer inpatient days, a stronger increase in PIA and/or daycare, and increased treatment continuity for patients in FIT hospitals (15). The focus of the analyses presented here was not on the overall results, but rather on the stratified results and the influence of model components. When the data is stratified, a more detailed picture emerges. The reasoning that a "one size fits all" approach for a broad spectrum of psychiatric diagnoses does not necessarily lead to significant improvements in overall outcomes is also supported by another investigation on German integrated care models (37). The

benefits of FIT are most evident when analyzing specific subgroups, which supports our analyses' focus on stratified results.

Diagnoses

Our analysis reveals that while FIT care did not produce a statistically significant overall effect on the outcomes besides inpatient treatment days for adults compared to standard care, a granular analysis of diagnostic subgroups uncovers critical differences in treatment outcomes.

Our results indicate a particularly strong benefit of FIT for **adults** with affective disorders. This group experienced a lower risk of inpatient treatment in the first year and the most pronounced reduction in the duration of inpatient stays compared to all other diagnostic groups. Furthermore, costs were significantly lower and daycare treatment days higher for this patient group. This is a significant finding, as it suggests that the proactive, continuous care inherent in the FIT model may be especially effective at stabilizing patients with mood disorders and preventing the need for prolonged hospitalizations. While much of the literature on FIT focuses on broad populations with severe mental illness, our finding is consistent with the general aim of these models to reduce inpatient care (15, 16, 38, 39). For instance, studies have shown that FACT, one possible item of FIT treatment, can significantly reduce involuntary admissions, involuntary inpatient days, and total inpatient days, and the costs of total inpatient days and involuntary inpatient days (38). The pronounced effect in the affective disorder group in our study suggests that these patients may be particularly responsive to the structured, yet flexible, support that FIT provides, allowing for earlier discharge and more effective community-based and daycare management as well as lower costs.

For adult patients with severe stress reactions and adjustment disorders, the FIT model appeared to facilitate a shift in the care setting. While the risk and length of inpatient treatment was lower in the first year, these patients had a significantly higher risk and length of daycare treatment. This pattern underscores the FIT philosophy: to substitute restrictive and costly inpatient care with less intensive, community-based alternatives or daycare care whenever possible. This finding is also consistent with research showing that FACT models lead to an increase in outpatient contacts (40) as well as daycare in hospital outpatient care (15). The higher utilization of daycare services, alongside an observed increase in sick leave days for this group, suggests that FIT enables patients to receive structured, intensive treatment in a less restrictive setting that is compatible with a period of recovery outside of a hospital.

The most complex pattern of results was observed in patients with mental and behavioral disorders due to alcohol use. This group had a higher risk of both inpatient (second year only) and daycare treatment and incurred higher total and model costs. Similar to the other two diagnostic groups, however, inpatient treatment days decreased (in the first year) and daycare treatment increased. While all patients showed this shift from inpatient to daycare treatment, the strongest effect was visible for patients with affective disorders. This is also supported by another study (16). Therefore, the higher costs for patients with mental and behavioral disorders due to alcohol use are not completely explained by different inpatient or daycare use. In addition, it is also important to consider findings from other studies where FACT was associated with an increase in emergency department visits without a corresponding decrease in inpatient days, highlighting that increased service contact does not always prevent acute care use (41). Still, an increase in re-hospitalization could not be found in FIT care in Germany (15).

For **children** and adolescents, no significant overall effect of FIT was observed. However, our analyses revealed a targeted benefit for children and adolescents with behavioral and emotional disorders. These patients experienced a significant reduction in inpatient treatment days during the first year compared to standard treatment. This finding suggests that the principles of FIT—such as providing integrated, flexible, and community-oriented care—may be particularly effective for this population. By offering enhanced support to families and schools, the FIT care may be better equipped to prevent crises that would otherwise necessitate hospitalization. Our observation of diagnosis-specific outcomes is consistent with other research on FIT care among children and adolescents. For instance, one study of FIT care also found varying effectiveness across different pediatric diagnoses. In that study, inpatient stays were reduced for patients with stress-related, somatoform, social behavior and emotional disorders, but were actually higher for patients with eating disorder (42). This underscores that even within advanced care models like FIT, a "one-size-fits-all" approach is insufficient. The effectiveness of the intervention appears to be highly dependent on the specific clinical characteristics of the patient group.

Precursor contracts

Having a precursor contract (i.e., an agreement similar to those of FIT hospitals prior to the start of FIT care) did not impact the effectiveness of the outcomes. However, another study that considered only the "first" FIT hospitals (those launched in 2013 and 2014) and patients treated during the first year after the start of FIT care observed differences in the duration of inpatient and outpatient treatment between FIT hospitals with and without a preliminary contract (28). Our analyses, however, included more FIT hospitals and patients treated within the first three years after the start of FIT care. Our results are similar to those found in another analysis (8). A transition period of two to three years to establish new healthcare structures is reasonable.

Although the effects of outcomes differ based on experiences with FIT structures during the first year, FIT structures can become well-established within three years. Therefore, FIT models function as learning systems with an introductory phase followed by process reorganization (14). Our results highlight the importance of considering a longer timeframe following complex structural changes, as observed with the introduction of FIT. While a precursor contract can provide an initial advantage in implementing FIT, this benefit is temporary. Over about three years, other hospitals catch up, and the long-term effectiveness of the FIT model is ultimately not determined by whether a precursor contract was in place. This underscores the necessity of using longer evaluation periods to accurately assess the impact of such complex healthcare interventions.

Comprehensive model vs. hybrid model

We could demonstrate that comprehensive models, i.e., FIT hospitals in which more than 95% of patients are treated in FIT structures, exhibited significantly greater increases in daycare treatment days and greater decreases in PIA contacts than hybrid models. Therefore, the overall shift away from inpatient care appears to have occurred differently for comprehensive and hybrid models. Other research has also found that the degree of FIT implementation increases significantly with contract share; that is, hospitals that include more insurers are able to implement the structural components of FIT more thoroughly (24). Further research showed that hybrid models enable changes primarily with respect to selected aspects of care, such as the introduction of home treatment or various forms of acute outpatient care; more comprehensive and far-

reaching changes appear to be facilitated by the implementation of a comprehensive model involving all SHI funds represented in a region (43).

However, the direction of this association remains unclear. Were FIT hospitals that were more inclined to shift toward daycare treatment more likely to contract with all SHI funds? Or did contracting with all SHI funds facilitate the shift toward daycare treatment? Further research suggests that key changes in staff attitudes and hospital structures are "more likely achieved when the majority of patients receive model care, rather than limiting it to those insured by individual SHI funds" (14, 26). Operating a hybrid model, in which staff must continuously switch between FIT and standard care depending on a patient's insurer, creates both logistical and cultural barriers. Staff may find it difficult to fully adopt more flexible workflows when a substantial proportion of patients must still be treated under the conventional, more rigid system. Consequently, transitioning to a comprehensive model by contracting with all or nearly all SHI funds appears to be a key enabling factor. It eliminates the inefficiencies associated with parallel care models and allows hospitals to reorganize resources and clinical pathways across the entire patient population. This comprehensive implementation therefore appears to drive the observed shift toward daycare treatment, rather than reflecting a pre-existing preference for daycare care that subsequently led hospitals to expand their contractual arrangements. This interpretation is supported by the recommendations of the German Government Commission on Hospital Care, which proposed that all SHI funds should be required to participate in established model care programs to ensure consistent regional implementation (44).

Strengths and limitations

The presented analyses include a large number of FIT hospitals and patients from a wide range of SHI funds. This enhances the generalizability of the findings. A significant strength of the study is its use of a large dataset covering three years post-implementation with a two-year follow-up. This extended timeframe is crucial because research shows that the effects of FIT models can change over time. Selection bias was minimal because we included all patients treated in the respective hospitals within the chosen timeframe (45). This is a hallmark strength of using administrative claims data. This is the first analysis of comprehensive models in FIT care. While several studies have examined global changes in care (e.g. from inpatient to outpatient/daycare) across multiple FIT hospitals, our analyses provide evidence on the differences between FIT hospitals and the patient group that benefits the most from FIT care. This approach avoids the selection bias that can occur in studies requiring explicit patient consent for participation, where less severely ill patients may be more likely to enroll (45). Analyzing the entire treated population provides a more realistic picture of the intervention's effect in a real-world setting.

In the presented study the effects of successful model care were only measured using SHI claims data, which lacks information from the patient's perspective. This is why complementary studies like the PsychCare study were initiated: to capture patient-reported outcomes (PROs), such as health-related quality of life and treatment satisfaction, as well as patient-reported experience measures (PREMs). As an additional limitation, we only used the diagnosis at study inclusion and for adults and children/adolescents together. Mental health disorders are complex, involving high rates of comorbidity and changes in diagnostic status over time. Furthermore, claims data may also have issues with diagnostic validity, particularly for outpatient data. Relying on a single baseline diagnosis may oversimplify the patient's clinical reality and

obscure the effects of the intervention on the course of illness or comorbid conditions. The advantages and disadvantages of using SHI funds data are discussed in detail elsewhere (45). Given the exploratory nature of these analyses and the lack of formal power calculations, our reliance on statistical significance may be overly restrictive. Furthermore, limited sample sizes within strata, mainly among children and adolescents, may have resulted in insufficient power to detect true effects, while also increasing the risk of multiple testing issues.

Conclusion

Our results yield three principal findings: First, the effectiveness of FIT care is highly dependent on the patient's diagnosis, underscoring the need for a tailored approach to care. Second, the presence of pre-existing FIT-like care structures did not appear to influence long-term outcomes, suggesting that new models can be successfully implemented regardless of prior systems after an initial adaptation period. Third, the shift away from inpatient care is characterized by significant site-specific heterogeneity, such as comprehensive vs. hybrid models—ranging from increased daycare to expanded PIA contacts—to compensate for reduced inpatient days. This research highlights the inherent heterogeneity of FIT models themselves and underscores the need for future studies to identify the specific components that drive successful outcomes. While there is no "one-size-fits-all" solution, a critical next step is to determine which elements of these complex interventions are most effective for specific patient populations and desired outcomes.

Declarations

Conflict of Interest

The TUD Dresden University of Technology, the University of Magdeburg and WIG2 received funding for this study. This funding was provided by a cooperation of 84 statutory health insurance funds. The funding bodies collected and provided the raw claims data, which were later processed and aggregated by the authors. This funding did not have any influence on the design, methods and evaluation of the study.

Authors' contributions

AN wrote the manuscript, coordinated the study and defined the outcome parameters.

RK contributed substantially to the economic outcomes and patient-individual matching.

MS contributed substantially to data handling, selection of control hospitals and evaluation of outcome parameters.

FC contributed to the design of the cost- and cost-effectiveness analysis.

ES is responsible for data management.

JS is principle investigator and responsible for the conceptualization of the study design and effectivity estimation.

FB conceptualized and conducted the statistical analyses.

All authors have read and commented on the manuscript. All authors read and approved the final version of the manuscript.

Acknowledgements

The EVA64 study group acknowledges the contribution of Katrin Arnold, Dennis Häckl, Nils Kossack, Denise Küster, Stefanie March, Thomas Petzold, Andrea Pfennig, Ines Weinhold and Jessika Weiß to the conception of the study.

Open Access funding enabled and organized by Projekt DEAL.

Ethics approval

The ethical committee of the University of Magdeburg has been notified. The ethical committee stated in April 2016 that no vote is necessary, as the EVA64-study is an analysis of anonymous data.

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