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Inpatient Care of Parkinson's Disease in Germany: A Study of Costs and Length of Stay With Particular Reference to an Interdisciplinary Approach

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Abstract

This article describes outcomes of the complex therapy of Parkinson's disease according to Operation and Procedure Code 8-97d, an interdisciplinary approach to the treatment of Morbus Parkinson established in Germany. The code defines mandatory minimum requirements for the organizational structures and processes of hospital treatment. The aim of the study was to analyze profession-related treatment costs, accompanying diseases and hospitalization times for inpatient Parkinson therapy and to compare these for interdisciplinary versus conventional approaches. A structured procedure analysis was carried out. Indication-based cost calculations and an analysis of secondary diagnoses were performed. In addition to the primary diagnosis of Parkinson's disease, all patients surveyed are suffering from further diseases in Major Diagnostic Category (MDC) 1, 5, 6, 10, 11, and 23. Among the patients surveyed who were receiving complex therapy, secondary diagnoses falling into MDC 8 dominated. The average hospitalization time for those patients receiving interdisciplinary treatment for Parkinson's disease was 18.16 days, significantly longer than the 12.01 days for the comparison group. Analysis of the costs revealed significant differences in the total costs of medical service and in the personnel and operating costs of nonmedical infrastructure. The high standards demanded of the hospital structure for the provision of interdisciplinary services, together with a prescribed therapy density including quality assurance assessments, result in patients being hospitalized for longer; this is reflected in higher costs. Treatment of Parkinson's patients should not only include the primary disease but also any accompanying diseases. For this, appropriate reimbursement higher than for the conventional Parkinson's diagnosis-related group (DRG) is needed.

Keywords

Parkinson's disease, interdisciplinary therapy, length of stay, cost, diagnosis-related groups, economic evaluation

Introduction

Parkinson's disease is one of the most frequent diseases of the central nervous system and is currently incurable (Stam, 2014).

This highly complex neurodegenerative disease with motor and nonmotor symptoms does not respond satisfactorily to drug therapy alone (Chaudhuri & Odin, 2010; Post, Speelman, & de Haan, 2008). The idiopathic Parkinson syndrome is one of the most common neurological diseases in Germany with a prevalence of 100 to 200 per 100,000 inhabitants. Among the above 65 year olds, the prevalence is 1,800 per 100,000 (Eggert, Deuschl, & Gasser, 2005). Changes in the age distribution of the population, progressive industrialization, and improving diagnostic capabilities mean that the number of patients is likely to increase in the future (Dorsey et al., 2007).

The Parkinson's syndrome is associated with various accompanying symptoms. In addition to sleep disturbances

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(Chaudhuri & Schapira, 2009; Ludin, Steiger, & Ludin, 1987), dementia (Aarsland, Tandberg, Larsen, & Cummings, 1996), and speech disorders (Darley, Aronson, & Brown, 1975; Ho, Iansek, Marigliani, Bradshaw, & Gates, 1998), pain and mental disturbances frequently occur (Goetz et al., 2007) and the risk of falling is also considerably greater in Parkinson's patients (Goetz et al., 1987; Pickering et al., 2007).

Studies have already evaluated the economic burden related to caring for people with Morbus Parkinson (M. Parkinson; Kowal, Dall, Chakrabarti, Storm, & Jain, 2013; Mateus & Coloma, 2013). Moreover, there are specific economic evaluations, for example, regarding the direct medical and nonmedical cost per person with PD, costs of health programs, and calculations concerning the societal burden (Kaltenboeck et al., 2012; Olesen, Gustavsson, Svensson, Wittchen, & Jönsson, 2012; Tamás et al., 2014). However, it has been lamented that there is no standardized and validated instrument to calculate costs resulting from Parkinson's disease (Bovolenta et al., 2017).

The purpose of this study, therefore, was to calculate and analyze the costs of inpatient treatment of M. Parkinson using standardized cost accounting and to also analyze secondary diagnoses and their costs. This was done using on a broad data base of 200 hospitals. The further added value of this investigation is the comparison given between conventional and interdisciplinary therapy.

First of all, complex care and its elements are described, plus the difference to conventional approaches highlighted.

Background

Conventional therapy for Parkinson's disease is, just as interdisciplinary therapy, customized for the type and stage of the illness. For this, guidelines based on evidence were established that all forms of therapy draw from. However, in conventional therapy, the amount and degree of integrating diverse approaches is not fixed, and the options to do so are rather limited in nonspecialized hospitals. Moreover, they might find receiving payment for a diverse treatment approach from insurances more difficult as the payment for the (accepted) diagnosed type of Parkinson's is fixed per year, just as the therapeutic measures taken into account.

Interdisciplinary Therapy for Parkinson's Disease

To ensure that interdisciplinary care for Parkinson's patients *was* available, the possibility of "multimodal complex therapy in Parkinson's disease" was introduced in Germany in the year 2008. The terms *interdisciplinary* and *complex* are used interchangeably. From the scope of the therapeutic areas (see below), it quickly becomes clear that only hospitals with appropriate structures have the possibility of offering interdisciplinary care. Structural characteristics are necessary to provide good care and to have a positive influence on the provision of care and on patients' health. These hospitals have the option of billing a Parkinson's treatment using a special daily tariff to be negotiated with the health insurance bodies.

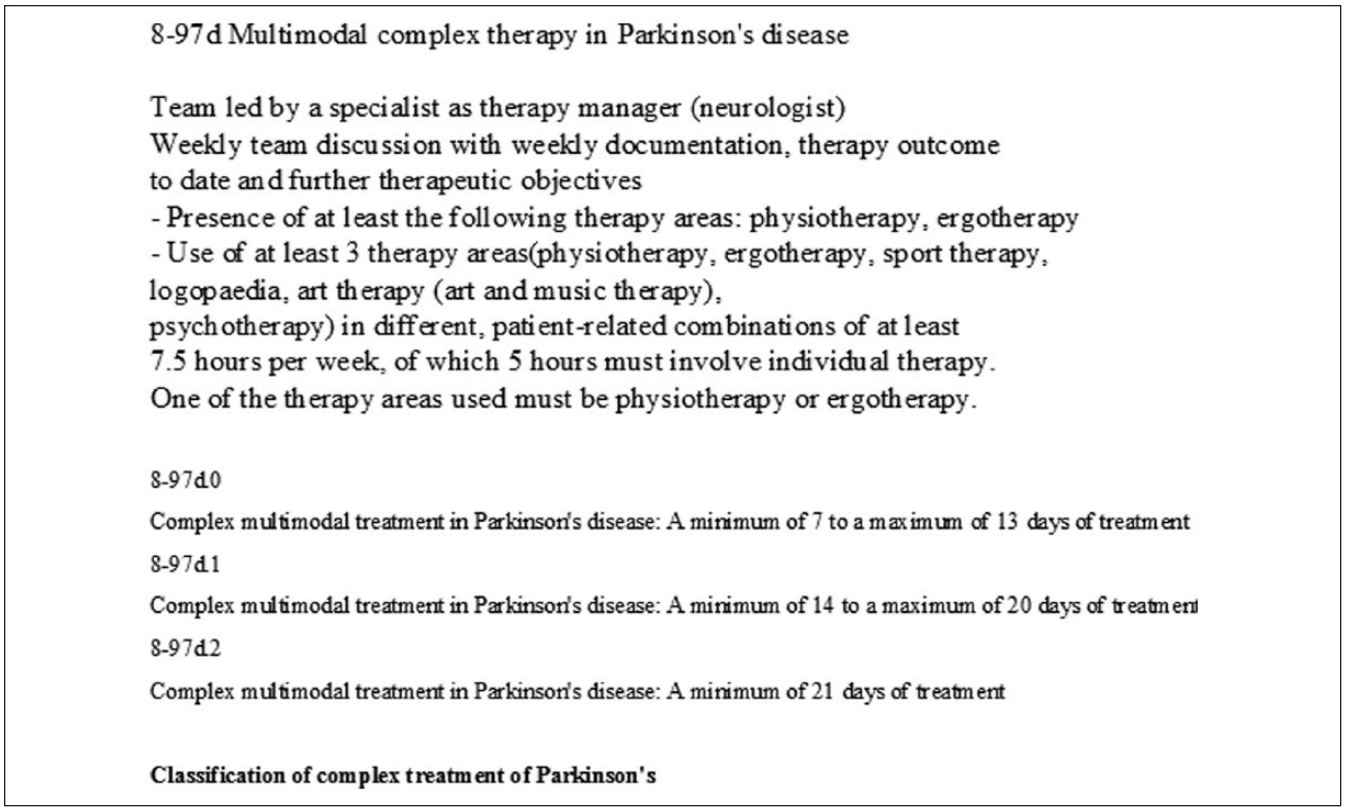
Patients in every phase of Parkinson's disease can be included in this special complex therapy (OPS Code 8-97d). However, it is important to note that persons with health insurance are entitled to full inpatient hospital treatment only if the therapeutic objective cannot be achieved by means of partial inpatient, pre- and post-inpatient, or outpatient treatment, including home nursing (§ 39 Para. 1 *SGB* (Social Security Code) V). The Operations and Procedures Catalog defines minimum criteria for the provision of multimodal complex therapy for Parkinson's disease (Figure 1). This includes, for example, an extended inpatient stay due to more interventions. The number of treatment days includes all the days (also weekends and public holidays) from the documented start of the patient's therapy until the end of this therapy. The start of treatment is on the day on which any of the therapies (physiotherapy, sport therapy, speech therapy, art therapy [art and music therapy], psychotherapy, or occupational therapy) is used for the first time. These and how they are combined are described in more detail in the next section.

Traditional Parkinson's therapy, as mentioned above, does not set these minimum requirements.

M. Parkinson Complex Therapy: Physiotherapeutic Interventions

To provide complex or interdisciplinary therapy for Parkinson's disease (OPS 8-97), the hospital as service provider must have a department of physiotherapy and occupational therapy integrated in its structure. The organization and performance of physiotherapeutic and/or occupational therapy procedures are mandatory in Procedure Code 8-97d. The efficacy of this type of therapy for the treatment of Parkinson's disease has been described in numerous studies (Keus, Munneke, Nijkrake, Kwakkel, & Bloem, 2009).

The therapeutic target of physiotherapy is to improve, or at least maintain, the active or passive mobility of the joints, and to contribute toward improving general movement and walking. In pursuing this aim, special emphasis should be put on exercises for preventing secondary complications such as myasthenia or osteoporosis (Smidt et al., 2005). As Parkinson patients are very prone to falls due to balance problems (Robinson et al., 2005), the therapy plan should also include preventing or improving balance problems (Ashburn et al., 2007; Hirsch, Toole, Maitland, & Rider, 2003). For the latter, methods of testing static and dynamic balance enable the measurement of parameters that lead to loss of balance. Posturography has been found to be very effective in this. It is suggested as an objective, standardized biomechanical procedure for the analysis and quantification of posture, coordination, and balance control. Using force


8-97d Multimodal complex therapy in Parkinson's disease

Team led by a specialist as therapy manager (neurologist)
Weekly team discussion with weekly documentation, therapy outcome
to date and further therapeutic objectives
- Presence of at least the following therapy areas: physiotherapy, ergotherapy
- Use of at least 3 therapy areas(physiotherapy, ergotherapy, sport therapy,
logopaedia, art therapy (art and music therapy),
psychotherapy) in different, patient-related combinations of at least
7.5 hours per week, of which 5 hours must involve individual therapy.
One of the therapy areas used must be physiotherapy or ergotherapy.

8-97d0
Complex multimodal treatment in Parkinson's disease: A minimum of 7 to a maximum of 13 days of treatment
8-97d1
Complex multimodal treatment in Parkinson's disease: A minimum of 14 to a maximum of 20 days of treatment
8-97d2
Complex multimodal treatment in Parkinson's disease: A minimum of 21 days of treatment

Classification of complex treatment of Parkinson's

Figure 1. Multimodal complex therapy in Parkinson's disease, OPS-97d.

plates and kinematic or electromyographic methods of measurement, it contributes toward the analysis of the pathophysiology of balance disorders. Moreover, static and dynamic aspects can be differentiate and treated. The aim of dynamic posturography is to simulate different everyday situations on a movable plate (Nashner, 2001). The estimation and evaluation of the parameters needed for balance plus tracking improvements increase the patient's confidence in their own balance control (Dibble, Christensen, Ballard, & Foreman, 2008).

M. Parkinson Complex Therapy: Occupational Therapy

Hypokinesis, rigor, and tremor limit the fine motor skills of the patient to a considerable extent. The aim of the occupational therapy is to strengthen the patients' ability to perform activities in all areas of everyday life: self-sufficiency, work and leisure.

As part of the inpatient services, therapy targets are defined which are intended to compensate for lost functions, and to improve and maintain activity-oriented coordination and strength, together with flexibility, mobility, and locomotion.

The therapy focuses on stretching and relaxation exercises for the hands, complemented by dexterity exercises and practising rapidly repeated finger and hand movements. Various aids can also be used for these exercises, for example, picking up and shaking out a cloth, rapid turning movements with a hedgehog massage ball, exercises with a rope, and so on.

M. Parkinson Complex Therapy: Sports Therapy

The scope of sports therapy within the complex therapy of Parkinson's disease depends on the patient's ability to take part in sports and on the stage of the disease.

The general therapeutic targets are the prevention of immobility, improving rigor and pathologic posture, and enhancing fine motor skills. In further detail, the aims of sports therapy are the improvement of flexibility, balance, muscular strength, and coordination (Viliani et al., 1999). The adoption of goal accomplishment strategies and learning compensation mechanisms for everyday life plus the improvement of body awareness should be defined as cognitive therapeutic targets. At the psychosocial level, sports therapy is intended to contribute to feelings of self-esteem and self-assurance, and to promote communication and social interaction.

M. Parkinson Complex Therapy: Arts Therapy

Depending on the patient, music therapy can also be included as an integral component of interdisciplinary therapy for

Parkinson's disease. Music therapy can exert a positive influence on various everyday activities (Bernatzky, Bernatzky, Hesse, Staffen, & Ladurner, 2004) and also on the patients' emotional state and quality of life. It is suspected that the emotional components of enjoying music can result favorably impact processes in the central nervous system, in particular, the motor functions. As provider of an external rhythm, music can also stabilize the formation of an inner rhythm and thus counteract bradykinesia (Pacchetti et al., 2000).

M. Parkinson Complex Therapy: Speech Therapy

Articulatory, respiratory, and prosodic impairment lead to communication disorders and social isolation during the progression of Parkinson's disease. Speech therapy is thus a required component in the interdisciplinary therapy of Parkinson's disease. Since the 1980s, there has been a growing number of evidence-based studies dealing with speech therapy in Parkinson's disease (Pinto et al., 2004; Ramig, Countryman, Thompson, & Horii, 1995; Rubow & Swift, 1985). The basic principles set out by Darley et al. (1975; Darley, Aronson, & Brown, 1969), which include starting the therapy early, creating motivation for the treatment, implementing the principles of motor learning, and attacking the key disorders, are still valid.

M. Parkinson Complex Therapy: Complementary Methods

Dietetics. Parkinson's patients must often cope with a large number of nonmotor symptoms. As a result, doctors and therapists are frequently confronted with digestion problems, in particular, with constipation and swallowing disorders. To include appropriate treatment strategies in the therapy plan, the side effects of medication, nausea, and loss of weight should also be paid attention to in the anamnesis and in progression monitoring. This is vital as nutritional disturbances exert a long-term negative influence on the progression of the disease. A reduction and/or imbalance in nutritional intake can result in (specific) undernourishment with instability of the vitamin and electrolyte balance.

Due to the danger of constipation, the nutrition plan should place special emphasis on the inclusion of dietary fiber. Foods rich in dietary fiber include potatoes, legumes, and cereal products. The switchover from formerly different habits should take place in stages and the fluid intake should be (increased to) approximately 2.5 to 3 L per day. In an inpatient setting, the process should be monitored and controlled by specially trained dieticians and nutritionists. The interaction of the methods applied within the provision of interdisciplinary services, for example, between nutritional changes and interventions of physiotherapy or sports medicine, can reactivate the digestive processes.

M. Parkinson Complex Therapy: Team Meetings

The basis for effective interdisciplinary team meetings monitoring therapy progress are (a) the therapeutic targets that were defined at the beginning of the patient's hospitalization time and (b) the exact documentation of the physical condition of the patient (Romeyke & Stummer, 2011). The general therapeutic targets that must be evaluated in the team meetings are the results regarding improvement of the disease symptoms, prevention, and treatment of therapy complications and side effects; maintenance of autonomy in the activities of everyday life; avoidance of secondary accompanying diseases; the reduction of the necessary level of nursing care; and the maintenance and recovery of the patient's quality of life. The Unified Parkinson's Disease Rating Scale (UPDRS) should be used as a suitable assessment instrument (Goetz et al., 2007). This is divided into the areas of cognitive functions, behavior and mood, activities of daily life (ADL), and motor examination.

In the next section, we report the methods employed for analyzing costs of interdisciplinary versus conventional care for Parkinson's disease.

Method

The data of 28,600 hospitalized patients in Germany were analyzed (hospitalization time in 2008-2014), who were all suffering from Parkinson's disease. No binding requirements were attached to the treatment process for this group. Due to billing issues, it can thus be assumed as a rule that no cross-specialization interdisciplinary treatment took place. Moreover, as the standard approaches for treating impairment of the musculoskeletal system are medication and physical therapy, these are supposed to have formed the major treatment areas.

A differentiated costs calculation was performed analogously to the Cost Accounting Manual Version 3.0 (Institute for the Hospital Remuneration System; InEK). The starting point for the costs calculation comprised the lists of totals and balances from the financial accounting used for preparing the annual accounts. It was necessary to compare the cost type accounting (in the financial accounting) with the cost center accounting. After excluding individual costs not attributed to cost centers, the total for the items listed in the cost center accounting must correspond to the total for the items listed in the corresponding accounts of the financial accounting (InEK *Calculation Manual* 2007; Inek, 2007). Patient age plus secondary diagnoses were also recorded and taken into account for differentiating between groups.

Moreover, we analyzed a data set of patients with Parkinson's disease who received complex therapy. This was done in an interdisciplinary hospital specializing in M. Parkinson.

The costs listed below were analyzed for both patient sets:

- Total costs of medical service (TCMS)
- Total costs of the nursing service (TCNS)

Table 1. MDC of German Diagnosis-Related Groups.

MDC	Description
1	Nervous system
5	Circulatory system
6	Digestive system
8	Musculoskeletal system and connective tissue
10	Endocrine, nutritional and metabolic system
11	Kidney and urinary tract
19	Mental diseases and disorders
23	Factors influencing health status

Note. MDC = Major Diagnostic Category.

- Total costs of the function and of medical and technical service (TCFMTS)
- Material costs for drugs (MCD)
- Material costs of the care setting requirements (without drugs, implants, transplants) (MCCSR) and material costs of the care setting requirements (direct costs, no drugs, implants, transplants) (MCCSRd)
- Personnel and operating costs of the medical infrastructure (POCMI)
- Personnel and operating costs of non-medical infrastructure (POCNMI)

Attribution of the secondary diagnoses was done according to the Major Diagnostic Category (MDC) classification (see Table 1) to prevent inferences being drawn about individual patients. The MDC describes how the German DRG (diagnosis-related group) Catalog is divided into sections and categorizes the DRGs according to the organ system or according to the cause of the disease.

Results

In the following subsections, the results for patients receiving conventional versus complex therapy are presented. DRG B49Z and OPS 8-97d are used interchangeably and both refer to complex therapy, while DRG B67B is the conventional approach.

Analysis at National Level

Age and secondary diagnoses. A significant increase in the need for inpatient treatment was observed from the 60th year of life onwards.

This was most pronounced among the group of 65 to 74 year olds and among the patients above 80 years of age (Table 2).

The analysis at national level (conventional approach) also shows that frequent secondary diagnoses to the primary diagnosis Parkinson's disease are further diseases from MDC 1 (nervous system), closely followed by diseases from MDC 5 (circulatory system) and MDC 10 (endocrine, nutritional and metabolic system). The dominant secondary diagnoses in addition to Parkinson's disease are high blood pressure, diabetes mellitus, movement disorders, dysarthria, anarthria, and dementia (Table 3; Figure 2).

Table 2. Distribution of Age Structure of DRG B67B in 2010-2012 (InEK, 2007).

B67B 2010, age (%)	B67B 2011, age (%)	B67B 2012, age (%)
40-49 (2.33)	40-49 (1.98)	40-49 (1.39)
50-54 (2.52)	50-54 (2.41)	50-54 (2.65)
55-59 (5.20)	55-59 (4.20)	55-59 (4.71)
60-64 (7.40)	60-64 (6.80)	60-64 (8.25)
65-74 (38.62)	65-74 (36.92)	65-74 (37.49)
75-79 (19.89)	75-79 (22.43)	75-79 (21.89)
>80 (23.40)	>80 (24.91)	>80 (22.76)

Note. InEK = Institute for the Hospital Remuneration System.

MDC 1 was also dominant in the group of patients receiving interdisciplinary treatment. The second most frequent category involved diseases and disturbances of the musculoskeletal system and connective tissue (MDC 8).

These were followed by diseases and disturbances of the circulatory system (MDC 5) and mental diseases (MDC 19). Also, quite frequent were diseases and disturbances of the digestive organs (MDC 6); endocrine, nutritional and metabolic diseases (MDC 10); and diseases and disturbances of the urinary organs (MDC 11).

Hospital-based data analysis of which diagnoses dominated within the MDC revealed that in Parkinson's disease the dominant diseases are (especially) dementia, pain in the locomotor system—for example, caused by falls and fractures—urinary passage infections, depression, high blood pressure, and disturbances of the sleep–wake rhythm.

Hospitalization time and costs. The average hospitalization time of patients without complex treatment was 12.1 days and for patients receiving multimodal complex therapy of Parkinson's disease 18.16 days.

Figure 3 presents the differentiated cost analysis with personnel and material costs for the conventional treatment of Parkinson's disease (DRG B67B), the determination of which formed the basis of a detailed, extensive patient-related costs analysis in accordance with the required cost calculation standards of the InEK.

The responding results for DRG B49Z, the multimodal complex therapy of Parkinson's disease, are presented in Figure 4.

The average TCMS were €556.55 for the 28,600 patients surveyed; the corresponding figure for patients undergoing complex treatment according to Procedure 8-97d was €946.44. These costs included wages and salaries, statutory social contributions, expenditure for old age pensions, expenditure for allowances and support, and fees for nonstaff doctors.

Table 3. Secondary Diagnoses in Parkinson's Disease.

	Secondary diagnosis	
Code	DRG B67B, $N = 28{,}602$ (2010-2012)	%
I10.00	benign essential hypertension: without specifying a hypertensive crisis	38.77
R26.8	other and unspecified disorder ender mobility	13.04
E11.90	non-insulin-dependent diabetes mellitus [type 2 diabetes] without complications: Not known as a derailed	10.79
R32	urinary incontinence	10.38
F02.3	dementia in primary Parkinson's disease	9.97
R47.1	dysarthria and anarthria	8.49
N39.0	urinary tract infection, site unspecified	8.43
K59.0	constipation	7.30
Z74.0	problems with respect to: mobility impaired	7.21
E86	volume depletion	6.99
R15	fecal incontinence	6.58
I67.3	progressive subcortical vascular encephalopathy	6.63
E87.6	hypokalemia	5.73
R29.6	fall tilt	5.24

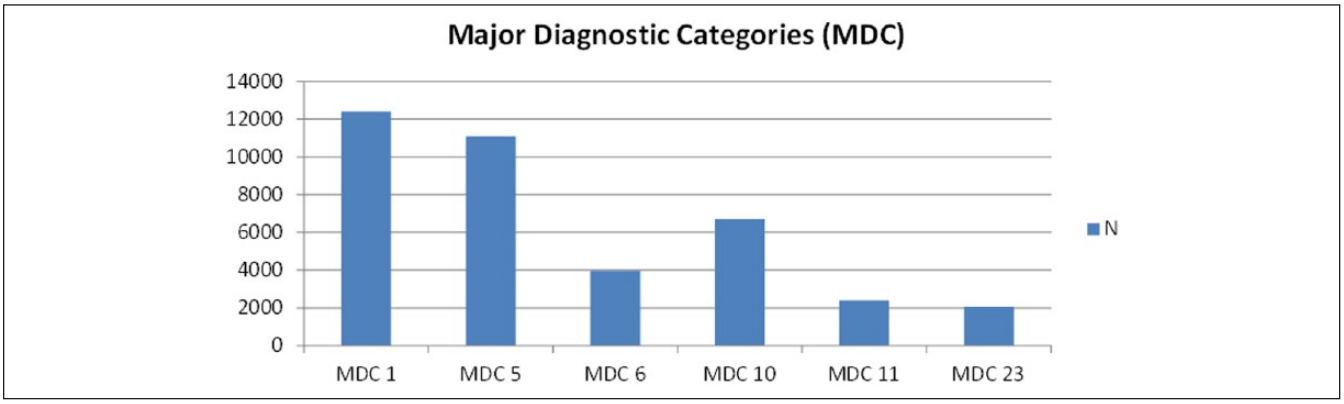


Figure 2. Distribution of the secondary diagnoses (DRG B67B).

The average TCNS were €926.18 for those with conventional therapy. For patients receiving complex therapy, the average TCNS was €1,569.55. The TCNS included wages and salaries, statutory social contributions, expenditure for old age pensions, expenditure for allowances and support, and miscellaneous personal expenditures.

The TCFMTS included wages and salaries, statutory social contributions for old age pensions, expenditures for allowances and support, and miscellaneous personal expenditures and, with an average of €395.51, was considerably higher than the costs for the DRG B49Z patients, where the average was €338.09.

The MCD included drugs (excluding implants and dialysis requirements) costs of the supplying pharmacy, blood, blood bottles, and blood plasma and were at an average of €108.5913438, which is lower than for the patients under complex therapy (€134.38).

The MCCSR and MCCSRd included medical and nursing consumables, instruments, anesthetics and other requirements, needs for X-ray and nuclear medicine, laboratory requirements, examinations in outside institutions, needs for electrocardiography (ECG), electroencephalography (EEG), sonography, needs of physiotherapy, pharmaceutical requirements, and disinfectants (average cost DRG B67B €207.6 vs. €404.44 for DRG B49Z).

The POCMI with an average of €414.26 for complex therapy was higher than the figure for the comparison group (€248.67). The POCMI includes the costs for shared services in the field of medical care, maintenance of medical technical equipment, and writing off non-consumables that have been replaced, especially the medical non-consumables.

The most significant differences (€926.76 vs. €1,910.77 for OPS 8-97d) were found regarding the POCNMI. These included the costs for water, energy, fuels, and housekeeping

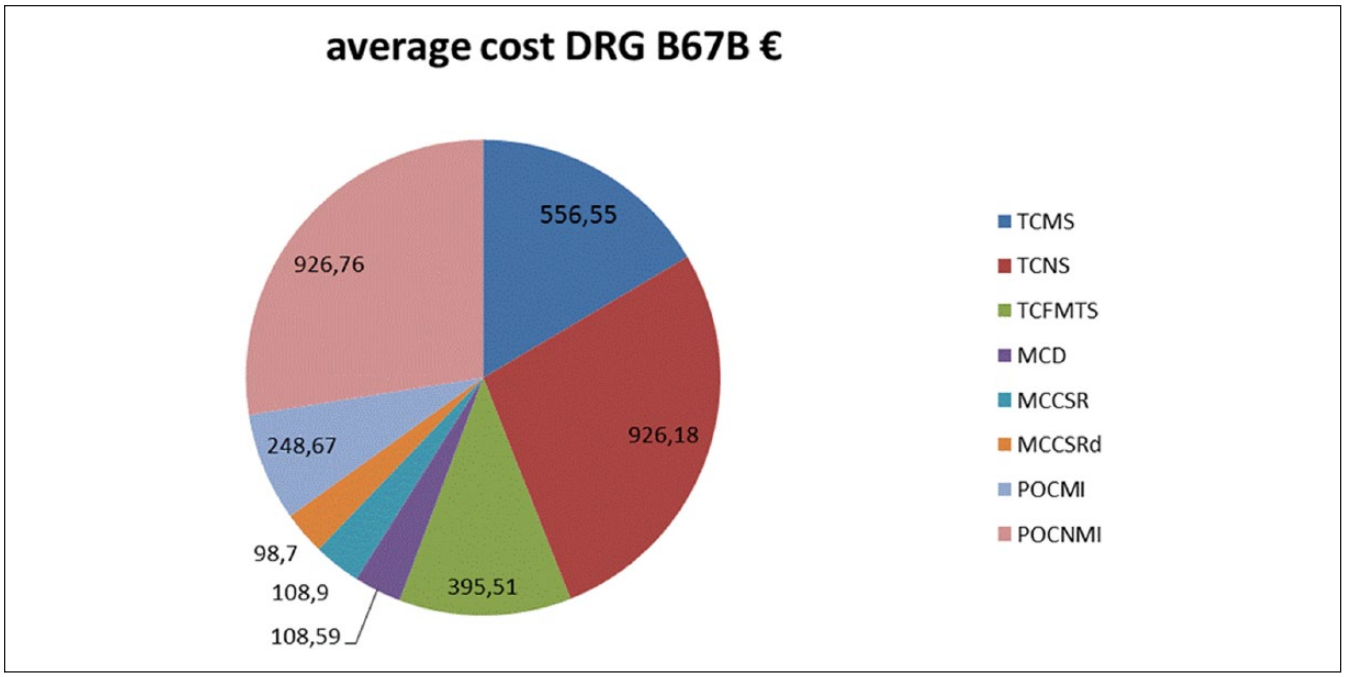


Figure 3. Cost types for DRG B67B in EUR (2008-2014), InEK.
Note. TCMS = total costs of medical service; TCNS = total costs of the nursing service; TCFMTS = total costs of the function and of medical and technical service; MCD = material costs for drugs; MCCSR = material costs of the care setting requirements (without drugs, implants, transplants); MCCSRd = material costs of the care setting requirements (direct costs, no drugs, implants, transplants); POCMI = personnel and operating costs of the medical infrastructure; POCNMI = personnel and operating costs of non-medical infrastructure; InEK = Institute for the Hospital Remuneration System.

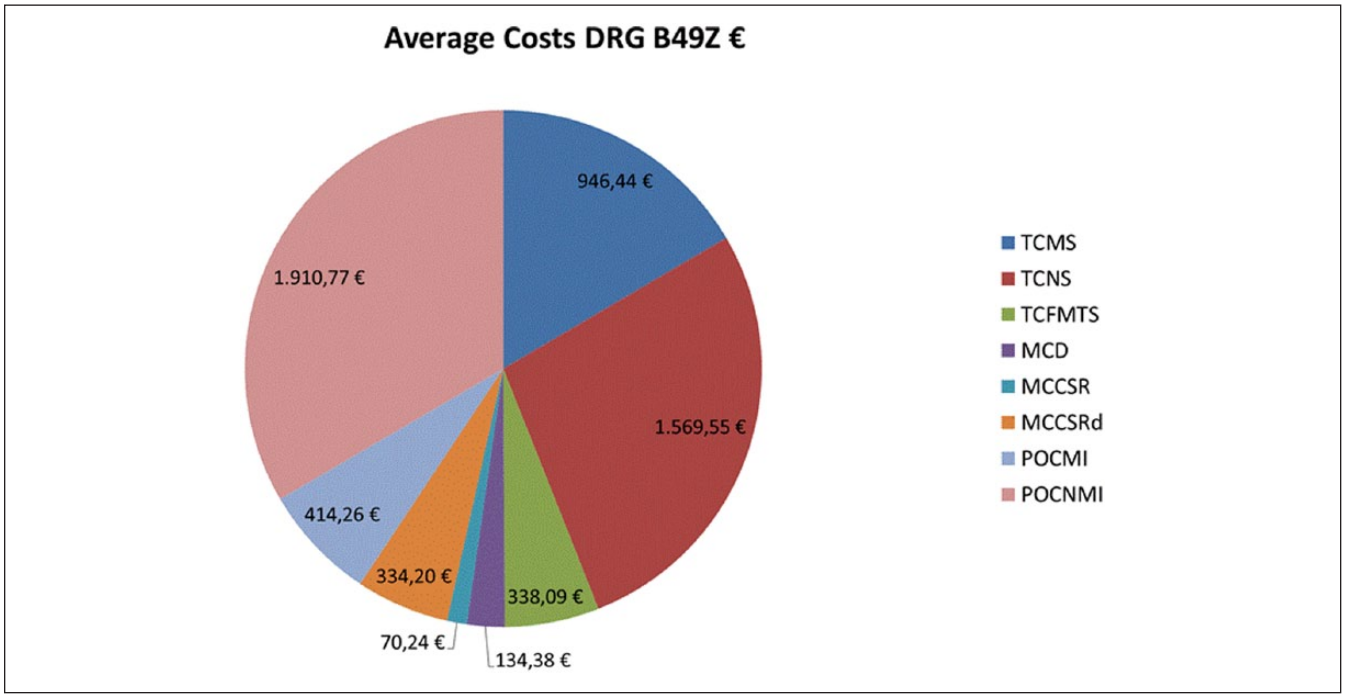


Figure 4. Cost types for DRG B49Z in EUR (2008-2014).
Note. TCMS = total costs of medical service; TCNS = total costs of the nursing service; TCFMTS = total costs of the function and of medical and technical service; MCD = material costs for drugs; MCCSR = material costs of the care setting requirements (without drugs, implants, transplants); MCCSRd = material costs of the care setting requirements (direct costs, no drugs, implants, transplants); POCMI = personnel and operating costs of the medical infrastructure; POCNMI = personnel and operating costs of non-medical infrastructure.

requirements including material expenditures, for example, cleaning materials and disinfectants, laundry purchasing, laundry cleaning and maintenance, household consumables, tableware, and fuels. Also included are the costs of administration, for example, office materials, printing costs, telephones and fax machines, telegrams, radio and television, travel costs, mileage payments, expenses, personal procurement costs, consultation costs, inspection, legal and lawyers' fees, IT, and organizational expenditure. They also include expenditures for central services, for example, central administration, central personnel administration, central accounting, central billing, central printing shop, central housekeeping, central laundry, taxes, charges, and insurance. In addition, they include miscellaneous ordinary expenditures such as rents, leases, licenses, freight charges for deliveries, material expenditure for further training and continuing education, and hire charges for non-consumables.

Discussion

Several countries see the need to collect and analyze cost data for health economic evaluations for Parkinson's disease (LePen, Wait, Moutard-Martin, Dujardin, & Ziégler, 1999; Lökk, Borg, Svensson, Persson, & Ljunggren, 2012; Winter et al., 2009; Yang & Chen, 2017).

However, there are only a few DRG-based cost-studies of individuals with Parkinson disease that included comorbidities (Mukherjee, Wu, & Jones, 2016), and there is a research gap regarding investigations of interdisciplinary treatments. There are only a few studies of multidisciplinary care approach in PD (Giladi, Manor, Hilel, & Gurevich, 2014; van der Marck et al., 2009), but no economic inpatient care evaluations. With a focus on Germany, the present study aimed at providing more data here. In Germany, the so called Procedure 8-97d allows patients to be treated by a variety of specialized health care professions, and there is also the possibility of a higher remuneration than for conventional therapy. However, cost data are missing for assessing the required sum, which this investigation aims to offer by showing the cost differences between the treatment approaches and by assessing the composition of the total costs by subdividing these into cost types.

In Germany, the total costs for a stay in hospital for conventional treatment of Parkinson's disease amounts on average to €3,369.86 with an average hospitalization time of 12.01 days. The total costs are over approximately 70% lower than the total costs for an interdisciplinary treatment of Parkinson's disease in German hospitals. At the moment, it would not be possible to cover the costs of complex treatment at the prices set for the conventional approach, even if the sum of some cost types is lower for interdisciplinary versus conventional therapy.

The TCMS were much higher in OPS 8-97d conditions. The reason in this case could be the interdisciplinary nature of the services provided. Many of the patients suffered from additional diseases from MDC 8, which require specialist treatment such as orthopedic surgery and pain therapy. As a result of the frequent occurrence of internal disturbances, specialist for internal medicine was also integrated in the treatment process. The treatment of the Parkinson's patients by additional and different specialists plus the integration of these specialists in interdisciplinary assessments and team meetings can explain the divergence in costs.

The significant differences in the MCCSRd possibly arose as a result of instrumental diagnoses being performed by external providers of services.

The greatest costs difference is reflected in the POCNMI. This is a result of the patients' longer average hospitalization time and is associated with higher costs in the area of medical care, consumables, cleaning, and administration. In addition to costs for further training and continuing education, the administration costs include those for documentation.

Conclusion and Limitations

This study includes all of the costs of inpatient care of Parkinson's disease. As part of a cost-of-illness study, economic data analysis and its results provide important information for hospital management and health-policy makers, clinicians, and health professionals (Vuong, Ho, Nguyen, & Vuong, 2018). The complex therapy of Parkinson's disease in Germany is an innovative treatment tool providing a reference for optimizing care for individuals with PD. However, the reimbursement needs to be adapted, as well, which may prove to be a difficult negotiation process with health insurance bodies. The data presented in this study can serve as a basis for agreements.

Further studies and publications will need to focus on objective quality indicators in inpatient therapy of Parkinson's disease to evaluate the aspects of costs and therapy outcome in the context of care quality.

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