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INPATIENT CASE-RELATED TREATMENT COSTS FOR DIFFERENT CARDIOVASCULAR DISEASES IN GERMANY

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Objectives

As part of a non-interventional study, hospitalizations due to the following diagnoses of cardiovascular disease (CVD) were documented: atrial fibrillation (AF), stroke or TIA (SoT), acute coronary syndrome (ACS), arterial embolism (AE), decompensated heart failure (DHF), syncope (S), ventricular arrhythmia (VA), and cardiac arrest (CA, non-fatal cardioplegia). The objectives of this cost analysis therefore were to quantify inpatient treatment costs per hospital stay for each of these diagnoses from the perspective of Statutory Health Insurance (SHI) in Germany.

Methods

Type of analysis

- Cost study for the reference year 2012 by means of secondary analysis of publicly available official data in Germany

Data sources

- \`G-DRG V2013 Browser 2012 § 21 KHEntG´ edited by the Institute for the Hospital Remuneration System (Institut für das Entgeltsystem im Krankenhaus, InEK) and exhaustive for Germany. It comprises all invoiced diagnosis-related groups (DRGs) with their cost weights and information on main and secondary diagnoses as well as on procedures underlying each DRG for cases with normal length of stay (LoS). Short-stay as well as long-stay cases are not reported [1]
- Germany-wide average base rate of 2,991.53 € in 2012 published by the National Association of SHI Funds (GKV-Spitzenverband) [2]

Data extraction and quantification of case-related inpatient treatment costs

- Data extraction was based on the ICD10-Codes corresponding to the main CVD diagnoses (Table 1)

Quantification of case-related inpatient treatment costs

No DRGs were documented during the non-interventional study. As very different ICD10-Codes lead to a specific DRG, the quantification of case-related treatment costs had to be done in five consecutive steps. This is exemplified by the main diagnosis ACS in Table 2 and summarized in Table 3:

- In the first step, the invoiced DRGs for every individual ICD10-Code from Table 1 were extracted. These DRGs are listed in column 2 of Table 2 together with the number of cases with normal LoS (column 5 of Table 2)
- In the second step, the proportion of an individual DRG within a main diagnosis was calculated (DRG weight factor in column 6 of Table 2). This was achieved by dividing the number of cases per DRG due to the ICD10-Code of interest (column 5 of Table 2) by the number of all DRG cases due to the ICD10-Codes of interest within a main diagnosis (sum of cases in column 5 of Table 2)
- In the third step, the cost weight of an individual DRG (column 3 of Table 2) was multiplied by the DRG weight factor (column 6 of Table 2) to reflect the prevalence of an individual DRG within all DRGs related to the main diagnosis, i.e. the weighted cost weight (WCW) in column 7 of Table 2
- In the fourth step, the WCWs were summed up to obtain an average cost weight for a main diagnosis (SWCW) based on all those DRGs and relating cost weights documented for a main diagnosis (value of 1.730 for ACS in the last row of column 7 of Table 2)
- In the last step, the SWCW for each of the CVD diagnoses was multiplied by the Germany-wide average base rate for calculation of costs per hospital stay (Table 3)

Results

In the reference year 2012 the case-related treatment costs incurred by SHI in Germany for each of the CVD diagnoses were as follows (Table 3):

- 2,786 € for atrial fibrillation (AF)
- 5,008 € for stroke or TIA (SoT)
- 5,176 € for acute coronay syndrome (ACS)
- 6,167 € for arterial embolism (AE)
- 3,771 € for decompensated heart failure (DHF)
- 1,930 € for syncope (S)
- 8,170 € for ventricular arrhythmia (VA)
- 15,909 € for cardiac arrest (CA, non-fatal cardiolplegia)

Conclusions

- From the perspective of German SHI, inpatient treatment costs for the considered CVD diagnoses varied from about 1,900 € for syncope (S) to about 15,900 € for cardiac arrest (CA)
- Generally, hospitalizations due to CVD have a remarkable impact on the budget of German SHI funds
- Though there are limitations due to the fact that only costs incurred by normal length of stay could be estimated, the results of this cost study can be used for further health economic analyses in CVD from the perspective of SHI in Germany

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Table 1: Main diagnoses and corresponding ICD10-Codes

Main diagnosis	ICD10-Codes
Atrial fibrillation (AF)	• I48.- Atrial fibrillation and flutter (flutter was not considered in the present analysis)
Stroke or TIA (SoT)	• I61.- Intracerebral haemorrhage • I62.- Other nontraumatic intracranial haemorrhage • I63.- Cerebral infraction • I64 Stroke, not specified as haemorrhage or infraction • G45.8 Other transient cerebral ischaemic attacks and related syndromes • G45.9 Transient cerebral ischaemic attack, unspecified
Acute coronary syndrome (ACS)	• I20.0 Unstable angina • I21.- Acute myocardial infarction
Arterial embolism (AE)	• I74.- Arterial embolism and thrombosis
Decompensated heart failure (DHF)	• I50.- Heart failure
Syncope (S)	• R55 Syncope and collapse
Ventricular arrhythmia (VA)	• I47.2 Ventricular tachycardia • I49.0 Ventricular fibrillation and flutter
Cardiac arrest (CA, non-fatal cardioplegia)	• I46.- Cardiac arrest

Table 2: Calculation of the sum of weighted cost weights (SWCW) using the main diagnosis ACS as example

ICD10-Code related to ACS	DRG	Cost weight	All cases per DRG	Cases due to ICD10-Code related to ACS	DRG weight factor *	Weighted cost weight (WCW) *
(1)	(2)	(3)	(4)	(5)	(6)	(7)
I20.0 Unstable angina	F06E	4.907	4,773	873	0.003	0.016
I20.0 Unstable angina	F06F	4.082	23,045	1,965	0.008	0.031
...	...	...	...	...	...	...
...	...	...	...	...	...	...
I21.0 Acute transmural myocardial infarction of inferior wall	F09B	3.379	1,457	300	0.001	0.004
I21.0 Acute transmural myocardial infarction of inferior wall	F09C	2.032	743	55	<0.001	<0.001
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
I21.9 Acute myocardial infarction, unspecified	F77Z	1.642	4,517	6	<0.001	<0.001
Sum				**260,840**	**1.000**	**1.730**

* Calculated exactly; displayed with three decimal places

Table 3: Calculation of costs incurred by SHI per hospital stay Due to each of the main diagnoses

Main diagnosis	Sum of weighted cost weights (SWCW)	Costs per hospital stay incurred by SHI *
Atrial fibrillation (AF)	0.931	2,786 €
Stroke or TIA (SoT)	1.674	5,008 €
Acute coronary syndrome (ACS)	1.730	5,176 €
Arterial embolism (AE)	2.061	6,167 €
Decompensated heart failure (DHF)	1.261	3,771 €
Syncope (S)	0.645	1,930 €
Ventricular arrhythmia (VA)	2.731	8,170 €
Cardiac arrest (CA, non-fatal cardioplegia)	5.318	15,909 €

* Rounded to the nearest € (2012 values). Achieved by multiplying the SWCW per main diagnosis by the Germany-wide average base rate of 2,991.53 € in the year of 2012 [2]

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