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Comparison of the length of hospitalization and mortality rate for people with diabetes in diabetes-certified vs. non-certified hospitals in Germany

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Marie Auzanneau¹, Alexander Eckert¹, Stefanie Lanzinger¹

¹Institute of Epidemiology and Medical Biometry, Ulm University



Marie Auzanneau

Ulm University, Institute of Epidemiology and Medical Biomet...

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We use this protocol and it's working

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Abstract

Our aim is to analyze whether the advantages of the hospitals certified by the German Diabetes Association (DDG) regarding in-hospital mortality when compared to non-certified hospitals as presented in a preprint are consistent after adjustment for several potential confounders. In particular, we want to carry out adjusted regression models to compare the length of the hospitalization and the mortality rate for people with diabetes in certified vs. non-certified hospitals.

Materials

Same data source (German DRG statistics for 2021-2023) and the same inclusion criteria (all inpatient cases aged ≥ 20 years with and without any type of diabetes as a main or secondary diagnosis based on ICD-10 codes) as described in the preprint (see reference 1).

Background

1

The German Diabetes Association (DDG) certifies hospitals that prove they provide evidence-based diabetes treatment conform to the guidelines and have appropriately qualified medical personnel. These certifications aim to ensure high-quality diabetes care and increase the safety of in-patients with diabetes, even when the cause of the hospitalization is not directly related to diabetes, which represents the majority of cases (94%).

In an explorative analysis based on the German Diagnosis Related Groups (DRG) statistics and published as a preprint (1), we found that patients with diabetes admitted to DDG-certified hospitals, regardless of the cause of hospitalization, had more complications but a similar in-hospital mortality than people with diabetes admitted in non-certified hospitals (4.5 vs. 4.5, $p=0.061$), as well as a similar length of hospital stay (8.1 days vs. 8.2 days, $p=0.034$, level of significance <0.01). Our results also indicated that adults with diabetes admitted to DDG-certified hospitals because of their diabetes (diabetes as the main diagnosis) had lower in-hospital mortality even though they also had more complications compared to people admitted for diabetes in non-certified hospitals.

These first descriptive results suggest a potential selection bias or confounding by indication: it is possible that certified hospitals treat a greater proportion of individuals with diabetes with more comorbidities and more severe medical conditions than non-certified hospitals. Therefore, we plan to perform further analyses in order to compare in-hospital mortality and length of hospital stay in certified hospitals vs. non certified hospitals after adjusting for possible confounders at the patient and the hospital level.

Methods

2

- 2.1 · **Description of patient's characteristics in certified hospitals and in non-certified hospitals expanded to patients without diabetes.** The aim is to investigate whether all patients, not only those with diabetes, differ between certified and non-certified hospitals in terms of sex, age, obesity, hospital-acquired and procedure-related complications, in-hospital mortality, and length of hospital stay. This description will help

us to describe the general profile of certified hospitals in comparison with non-certified hospitals.

2.2 · **Calculation of adjusted estimates and odds-ratios for hospital mortality and length of hospital stay between diabetes certified hospitals and non-certified hospitals.**

2.3 o Therefore, we will use logistic and linear regression models adjusting for several possible confounders. To obtain comparable groups at patient level, we will adjust for sex, age, as well as for obesity, emergency as reason for the admission, and hospital-acquired and procedure-related complications, as proxy measures for the severity of the patient's medical condition. At hospital level, we will adjust for the number of inpatient cases in the hospital (as proxy for the size of the hospital) and include the hospital as a random intercept to account for the hierarchical structure of the model (hospitals as clusters) and the variability at baseline between hospitals. As a sensitivity analysis, we plan to additionally adjust the models for hypoglycemia, diabetic ketoacidosis, and acute metabolic disorder with multiple complications.

2.4 o We aim to perform the regression analyses for all people hospitalized with diabetes, as well as only for those with type 1 or type 2 diabetes. In each case, we will repeat the regression analysis for the cases with diabetes (all types, or only type 1 or type 2 diabetes) coded as main diagnosis, for those with diabetes coded as secondary diagnosis, and for all cases together (regardless of main or secondary diagnosis).

2.5 In addition, we will carry out the analyses for people with diabetes and with specific indications: DKA, hypoglycemia, and the ten most frequent main diagnoses in people with diabetes (1), i.e.: heart failure, atherosclerosis, cerebral infarction, atrial flutter and atrial fibrillation, chronic ischaemic heart disease, myocardial infarction, angina pectoris, other disorders of urinary system, fracture of femur, and COPD.

Protocol references

1. Auzanneau M, Fritsche A, Eckert AJ, Seidel-Jacobs E, Heni M, Lanzinger S. Advantages of DDG-certified hospitals for hospitalized patients with diabetes - A nationwide DRG analysis in Germany [Internet]. Endocrinology (including Diabetes Mellitus and Metabolic Disease); 2025 [cited 2025 Jun 22]. Available from: <http://medrxiv.org/lookup/doi/10.1101/2025.04.07.25325368>