Incidence of Hospitalized Stroke in the Czech Republic: The National Registry of Hospitalized Patients

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Background: Contemporary stroke incidence data are not available in some countries and regions, including in Eastern Europe. Based on previous validation of the accuracy of the National Registry of Hospitalized Patients (NRHOSP), we report the incidence of hospitalized stroke in the Czech Republic (CR) using the NRHOSP. *Methods:* The results of the prior validation study assessing the accuracy of coding of stroke diagnoses in the NRHOSP were applied, and we calculated (1) the overall incidence of hospitalized stroke and (2) the incidence rates of hospitalized stroke for the three main stroke types: cerebral infarction (International Classification of Diseases Tenth Revision, CI I63), subarachnoid hemorrhage (SAH I60), and intracerebral hemorrhage (ICH I61). We calculated the average annual age- and sex-standardized incidence. *Results:* The overall incidence of hospitalized stroke was 241 out of 100,000 individuals. The incidence of hospitalized stroke for the main stroke types was 8.2 cases in SAH, 29.5 in ICH, and 211 in CI per 100,000 individuals. The standardized annual stroke incidence adjusted to the 2000 World Health Organization population for overall stroke incidence of hospitalized stroke was 131 per 100,000 individuals. Standardized stroke incidence for stroke subtypes was 5.7 cases in SAH, 16.7 in ICH, and 113 in CI per 100,000 individuals. *Conclusions:* These studies provide an initial assessment of the burden of stroke in this part of the world. The estimates of hospitalized stroke in the CR and Eastern Europe suggest that ICH is about three times more common than SAH, and hemorrhagic stroke makes up about 18% of strokes. **Key Words:** Stroke—incidence—epidemiology—registry—Czech Republic—intracerebral hemorrhage—subarachnoid hemorrhage.

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Introduction

Although stroke is a significant global health concern, validated, comprehensive stroke epidemiology data, and long-term trends are unavailable for many countries.[1]

There are scant data regarding stroke incidence in Central and Eastern Europe, although the burden of stroke is suggested to be higher there than in other parts of the world according to the Global Burden of Disease Study (GBD) in 2010. However, it was noted by the authors of GBD that such an estimate is based only on "a scarcity of high-quality epidemiological stroke data."[1] Stroke incidence data for Central and Eastern Europe have been extrapolated from Russia and Asia,[2-4] and it is unclear if the impact of stroke is similar in this population. Other stroke incidence data from Estonia[5] and Ukraine[6] were reported from before or around the time of collapse of the Iron Curtain in 1989-1990, which may differ from the current incidence given the changes in lifestyle, management of stroke, and treatment of stroke risk factors. It is reported that there were differences in stroke incidence and mortality between Western and Eastern European countries,[7-9] but it is not clear if such differences persist given that socioeconomic factors are becoming less and less disparate across Europe.

The World Health Organization (WHO) has suggested a stepwise approach to stroke surveillance (STEPS Stroke), with the first of the three steps being a hospital-based registry.[10]

To provide a detailed assessment of stroke epidemiology in the Czech Republic (CR), we previously validated an administrative database called the National Registry of Hospitalized Patients (NRHOSP),[11] and here we report the incidence of hospitalized stroke in the CR using the NRHOSP.

Methods

This study is based on the NRHOSP, which prospectively collects data from all hospital admissions in the CR. All inpatient medical facilities are legally mandated to prospectively register all completed inpatient admissions. The completeness of the registry is monitored at the central and regional level. The International Classification of Diseases Tenth Revision (ICD-10) coding has been used since 1994.

At birth, all citizens of the CR are assigned a personal identification number with which they can be located in the NRHOSP. Thus, the NRHOSP provides a strategy to indentify virtually all hospitalized strokes in the CR.

Validity of the NRHOSP[11]

The methodology and results of the validation of stroke diagnosis in the NRHOSP have been described thoroughly elsewhere.[11] The validation was completed for stroke cases diagnosed in 2011. In short, the validation study provided a random sample selected from all hospital admissions in 1 year at a national level. All 173 hospitals in the CR in 2011 were considered for validation. Hospitals with an insufficient number of stroke or transient cerebral ischemic attack (TIA) patients were excluded. Thus, 72 hospitals met the inclusion criteria. Of these 72 hospitals, we randomly selected 10 hospitals (5 small and 5 large), and then 50 patients from each hospital, admitted during 2011, were stratified according to stroke diagnosis (10 cases for each of the following diagnoses: ICD-10 cerebrovascular codes I60 [subarachnoid hemorrhage, SAH], I61 [intracerebral hemorrhage, ICH], I63 [cerebral infarction, CI], I64 [stroke, not specified as hemorrhage or infarction], and G45 [TIA]). Anonymized hospital records were requested for each of the randomly selected patients. Two reviewers independently assessed the discharge summaries from hospitalization, with reviewers blinded to discharge diagnosis. In case of disagreement, a third senior reviewer made the final decision. The validation was based on assessment of discharge summaries, most of which were high quality and included a computed tomography or magnetic resonance imaging head report (95%).

We found that the level of accuracy of coding in the NRHOSP is high for SAH (I60, 91%) and ICH (I61, 91%), whereas the accuracy of coding for CI (I63, 82%) was somewhat lower. The most important reason for disagreement between the NRHOSP diagnosis and reviewer diagnosis was incorrect coding of unspecified stroke (I64), most often due to the use of the I64 diagnosis instead of the more specific CI I63 diagnosis. The validation suggested that appropriate consideration of CI cases included in the unspecified stroke diagnostic category I64 (61% cases of unspecified stroke I64 were actually CI I63) and TIA G45 categories (11% of TIA, G45, cases were actually CI I63) would be needed for an incidence study of patients hospitalized for stroke in the CR, which would utilize the NRHOSP database.

Incidence Calculations

We calculated the incidence of hospitalized stroke in the CR in 2011 using the NRHOSP, which included all cases of hospitalized stroke in the CR in 2011.

Overall Hospitalized Stroke Incidence

For overall hospitalized stroke incidence, we allowed one stroke for each patient (regardless of the diagnosis—I60, I61, I63, and I64). If the patient had different stroke events, we included only the first stroke recorded in 2011. All other stroke events recorded for this patient were excluded for this analysis. The incidence was adjusted based on the results from the validation study, as outlined below.