

Accuracy of hospital discharge coding is important in assessing trends in stroke rates

Dear Editor,

We read with interest the article by Meyer and colleagues [1]. The authors correctly assert some of the limitations in using hospital discharge data in estimating stroke event rates, such as its failure to take into account sufferers of stroke treated outside of the hospital setting. However, the use of ICD-10 (International Classification of Diseases, 10th edition) diagnostic coding in assessing trends in stroke rates is cautioned for another important reason which was not mentioned; the possibility of inherent errors in the hospital discharge data itself. Of course, such errors may also be present in "cause of death" data. Such errors are especially important for countries like Switzerland which lack population-based registries for diseases such as stroke.

In England, coding of hospital discharge data is conducted by non-clinical office staff and is based on what is recorded by the physician in the patient's notes. The quality of ICD-10 coded hospital discharge data is therefore highly dependent on both the quality of the original patient notes and the experience and expertise of the coder. This results in huge variances in the accuracy of hospital discharge coding. One might expect staff specialising in coding diagnoses from a specific department to code more accurately than those dealing with data from several departments. A Canadian study found staff in rural hospitals coded stroke using more general ICD-10 codes, whereas those in urban hospitals coded more specifically [2]. The use of administrative data such as hospital discharge coding in quantifying trends in stroke rates has been criticised for inaccuracy, namely low sensitivity and specificity [3]. Research from Canada suggests that ICD-10 hospital discharge coding of stroke has around 90% accuracy when reviewing this data against patient charts, with significant variations between the different stroke subtypes (85% for acute ischaemic stroke vs 98% for intracerebral haemorrhage) [4]. Other studies, especially those utilising discharge data coded under the ninth edition of the *International Classification of Diseases* (ICD-9), have found much lower rates of accuracy in hospital coded discharge data for stroke.

Whilst the study at hand included people with a stroke diagnosis either listed as the principal or second to fifth diagnosis on hospital discharge data [1], most research assessing the epidemiology of stroke relies solely on the primary diagnosis data, on the prem-

ise that this results in a higher specificity and positive predictive value (PPV) [3, 4]. However, this may miss many cases of stroke, for example, in patients admitted to hospital with significant co-morbidities given diagnostic priority over stroke on hospital discharge coding. This complicates matters somewhat.

From an epidemiological point of view, using datasets based on ICD-10 diagnostic coding can reduce the problems of non-response and recall bias associated with primary research, but can introduce other biases, namely detection and misclassification bias. Classification systems such as ICD-10 group similar diagnoses together for the purpose of comparison, losing clinical detail in the coding process. A lack of clinical interest from health professionals has been identified as a key reason for data errors in ICD-10 [5]. Closer working relationships between coding staff and clinicians – as well as standardised in-depth training for all coding staff – may lead to improved accuracy in coded clinical data.

Matthew A. Kirkman, Angélique F. Albert

Correspondence:

Matthew A. Kirkman
The Medical School
Newcastle University
Framlington Place
Newcastle upon Tyne NE2 4HH
United Kingdom
E-Mail: matthew.kirkman@gmail.com

References

- 1 Meyer K, Simmet A, Arnold M, Mattle H, Nedelchev K. Stroke events and case fatalities in Switzerland based on hospital statistics and cause of death statistics. *Swiss Med Wkly.* 2009;139(5-6):65-9.
- 2 Yiannakoulis N, Svenson LW, Hill MD, Schopflocher DP, Rowe BP, James RC, et al. Incident cerebrovascular disease in rural and urban Alberta. *Cerebrovasc Dis.* 2004;17:72-8.
- 3 Tirschwell DL, Longstreth WT Jr. Validating administrative data in stroke research. *Stroke.* 2002;33:2465-70.
- 4 Kokotailo RA, Hill MD. Coding of stroke and stroke risk factors using International Classification of Diseases, Revisions 9 and 10. *Stroke.* 2005;36:1776-81.
- 5 Williams JG, Mann RY. Hospital episode statistics: time for clinicians to get involved? *Clin Med.* 2002;2:34-7.

Author's reply

Dear Editor

We would like to thank Dr. Kirkman and Dr. Albert for their interesting comments. Their overriding concern was the possibility of inherent errors in the hospital discharge and the cause of death data. We agree that the quality of administrative data

such as hospital discharge data depends on the diagnostic standards and the coding of the original data.

According to Kirkman and Albert, non-clinical staff conduct the coding of hospital discharge data in England. Contrary to the UK, in Switzerland the coding is usually performed by staff specialised in coding diagnoses, and is supervised by independent auditors in the hospitals.

In addition, reimbursement for hospitals does not (yet) depend on the patient's diagnoses and there is no financial incentive for misclassification.

Kirkman and Albert quoted research from Canada, suggesting that ICD10 hospital discharge coding of stroke has a reduced accuracy when reviewing these data against patient charts. Significant variations occur when differentiating between ischaemic and haemorrhagic stroke. ICD9 would be even less accurate for stroke than ICD10. In our study, [1] ICD10 has been used exclusively.

Dr. Kirkman and Dr. Albert are correct in stating that results have a higher specificity and positive predictive value when a disease is coded by the primary diagnosis only. In our study, we used primary diagnosis and second to fifth diagnoses. According to our results stroke was most prevalent in the old and oldest patients, where co-morbidities are common. Therefore, it can be assumed that in an undetermined number of patients, significant co-morbidities could have been given diagnostic priority over stroke on hospital discharge coding. This could particularly be true in the case of a recurrent stroke. As a result of the inclusion procedure of our study most of these patients were not missed and thus sensitivity was increased.

Selection limited to primary diagnoses identifies incident rather than prevalent strokes. [2] However, the Swiss Hospital Statistics and Cause of Death database does not distinguish between first-ever (incident) and recurrent events. Therefore we preferred to estimate the attack rate instead of the incidence rate, and used primary diagnosis and second to fifth diagnoses to assess patients with co-morbidities suffering either a first ever or a recurrent stroke.

Hospitalisation rates for stroke may reflect the treatment practices in a given country, including hospitalisation, home and outpatient ambulatory monitoring practices. As we stated in our paper [1] we did not take into account patients with a stroke diagnosis who were treated outside of hospital and survived their stroke, resulting in an underestimation of the stroke event rate. Therefore, discharge rates cannot be used unrestrictedly as a substitute for stroke event rate.

From an epidemiological point of view, Kirkman and Albert called the reader's attention to misclassification bias. Their concern is correct. A matter of concern in all studies that examined e.g., specific causes of death is a potential misclassification of deaths and the

accuracy of the cause-of-death section in the death certificates. [3] Our findings are based on stroke as the underlying cause of death (principal diagnosis) suggesting that the mortality rate may be an underestimation of the actual stroke mortality rate. On the other hand, death certificates may overestimate the number of deaths from stroke, as stroke may be given as the cause of death when there are numerous co-morbidities and the actual reason for dying is uncertain. This limitation might particularly be the case in the elderly age group.

Due to methodological limitations an unknown number of patients with fatal and non-fatal strokes may have remained un-

recorded. In our opinion, provided that these limitations are kept in mind, the analysis of data of hospital discharge statistics and cause of death statistics permits monitoring of trends in stroke morbidity and in-hospital case fatality in Switzerland where population-based registries for diseases such as stroke are lacking.

In order to be able to estimate the overall stroke event rate more accurately, a record linkage method combining both hospital discharge statistics and cause of death databases by using date of birth, sex and zip code would be desirable.

Katharina Meyer, Anja Simmet, Heinrich Mattle, Marcel Arnold, Krassen Nedeltchev, Universitätsspital, Inselspital Bern

References

- 1 Meyer K, Simmet A, Arnold M, Mattle H, Nedeltchev K. Stroke events and case fatalities in Switzerland based on hospital statistics and cause of death statistics. *Swiss Med Weekly*. 2009;139:65–9.
- 2 Goldstein LB. Accuracy of ICD-9-CM coding for the identification of patients with acute ischemic stroke: effect of modifier codes. *Stroke*. 1998;29:1602–4.
- 3 Smith Sehdev AE, Hutchins GM. Problems with proper completion and accuracy of the cause-of-death statement. *Arch Intern Med*. 2001;161:277–84.

Cheyne-Stokes respiration

I read with interest the article by Professor Randerath [1]. Some points need to be clarified. Firstly, not only heart failure but also acute ischaemic stroke and brain tumour can cause Cheyne-Stokes respiration. [2] In one study, such abnormal breathing can be found in 53% of patients with ischaemic stroke, unrelated to the location of infarction. [3] Lastly, apart from the therapeutic options provided in the article, I believe that removing the causes e.g., brain tumour should be considered as the treatment of Cheyne-Stokes respiration.

Weekitt Kittisupamongkol

References

- 1 Randerath WJ. Therapeutic options for the treatment of Cheyne-Stokes respiration. *Swiss Med Wkly*. 2009;139(9-10):135–9.
- 2 Cheyne-Stokes and abnormal patterns of respiration. <http://www.patient.co.uk/showdoc/40000069/> Accessed April 23, 2009
- 3 Nachtmann A, Siebler M, Rose G, Sitzer M, Steinmetz H. Cheyne-Stokes respiration in ischemic stroke. *Neurology*. 1995;45(4):820–1.

Correspondence:

*Weekitt Kittisupamongkol
Hua Chiew Hospital
Bangkok 10100
Thailand
weekitti@gmail.com*

Author's reply

Dear Dr. Kittisupamongkol,

Thank you very much for your interest in the paper "Therapeutical options for the treatment of Cheyne-Stokes respiration" and your helpful comments, which I fully agree with. There is no doubt that treatment of the underlying disease is always the first therapeutic approach. However, the focus of the review was the discussion of the most recent proceedings in positive pressure application. Therefore, it may be added that there are insufficient data on the treatment in patients with stroke or brain tumours with these devices.

Winfried Randerath