3. Methods

3.1 Patients

3.1.1. Hospital and Department of Neurology

The Charité Campus Benjamin Franklin is the university hospital of the Freie Universität Berlin located in the Steglitz-Zehlendorf district serving the southwest of Berlin. The Neurological Department is a 53 bed department, including a Stroke Unit that serves as a referral center for surrounding hospitals and practitioners. Each year approximately 2000 cases are admitted as inpatients to the Department.

3.1.2 Patient selection

All inpatient discharge summaries are kept as Microsoft Word files on a central server. Using the Microsoft Windows search function, the keyword “Schwindel” (the word for vertigo in German) was used to identify discharge letters containing the keyword in the years 2002, 2003, 2004, and Jan-Jun 2005. A total of 1205 patients were identified. All 1205 patients' discharge summaries were read in detail, and patients were selected for the study when they fulfilled the following criteria:

Inclusion criteria:

1. Chief complaint was acute vertigo.
2. No new obvious neurological symptoms or signs occured such as limb weakness, facial paralysis, ophthalmoplegia, dysarthria, hemianopia, aphasia, or unconsicouness.
3. Unspecific or only subjective neurological symptoms such as remittent local paraesthesia did not lead to exclusion.
4. Slight ear symptoms such as ringing or numbness could coexist, but none that could be diagnosed as a definite peripheral origin by the Ear-nose-throat (ENT) Department. History, clinical symptoms and signs did not suggest vertigo origin.
5. Head CT on admission did not reveal origin of vertigo.
6. Cranial MRI examination during period of hospitalization.

Exclusion criteria:

1. Patients who based on history, neuro exam, ENT exam and/or internal medicine exam were diagnosed as central vertigo or peripheral vertigo or psychiatric vertigo.
2. Presence of clinical signs at admission that strongly suggested vertigo of either central or peripheral origin, such as pathological spontaneous nystagmus, inexhaustible nystagmus, vertical nystagmus, lateropulsion while standing or walking, or DxaHallpik test positive nystagmus.

3.2 MRI examination

3.2.1 Imaging technique of MRI

A Siemens Vision 1.5 Tesla MRI scanner was used. The minimum imaging protocol consisted of T1, T2 and DWI (diffusion weight imaging) sequences of the head. Optional additions depending on findings after baseline scanning were T1 with contrast, T2* gradient echo, and MR arteriography sequences.

3.2.2 Stratification of patients after MRI examination

Following MRI examination, the patients could be divided into two groups:

1. Group 1: the cause of vertigo could be identified as central vertigo after MRI examination
2. Group 2: the cause of vertigo was still unknown after MRI examination (VUC)

3.3 Observed parameters

The complete medical records of all included patients were hand-searched. Further data extracted from the medical records were:

1. Unique identifier,
2. gender,
3. age,
4. the type of vertigo described by the patient,

5. the duration of the vertigo,
6. the intensity of vertigo,
7. postural triggers of vertigo,
8. diplopia or other subjective eye symptoms,
9. ear symptoms such as tinnitus, decreased hearing or other ear symptoms,
10. postural imbalance
11. concomitant headache,
12. vegetative manifestations like nausea, vomiting, sweating
13. ataxia sign such as Romberger test, finger-nose-test, tandem gait,
14. spontaneous nystagmus,
15. provoked or other nystagmus,
16. new onset of neurological deficits,
17. other symptoms,
18. the result of ENT consultation,
19. blood glucose on admission,
20. admission blood pressure,
21. blood lipids including cholesterol, HDL, LDL, triglyceride,
22. other cerebrovascular risk factors,
23. electroencephalogram (EEG),
24. EKG or holter EKG,
25. extracranial and transcranial Doppler and color-coded duplex sonography
26. cranial computer tomography (CT),
27. cranial magnetic resonance imaging (MRI),
28. magnetic resonance angiography (MRA),
29. discharge diagnosis.

3.4 Statistical analysis

The collected variables were entered into an Excel spreadsheet. Descriptive statistics were used to characterize the investigated cohort. Comparisons between group 1 and group 2 were performed using Chi square, Fisher's Exact test and t-

tests where appropriate were performed using SPSS software 10.0 (SPSS Inc, USA).