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ORIGINAL ARTICLE

Management of headache disorders in the Emergency Department setting

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Abstract Headache is a common presenting complaint in the Emergency Department. The aim of this study was to delineate the demographic profile of patients presenting a chief complaint of headache and to assess the application of diagnostic algorithms for the management of these patients. We examined patients admitted to the Spedali Civili Hospital ED between January 2005 and December 2009 who complained of headache not related to trauma and all patients hospitalized for headache in Neurological Clinic, from ED, between January 2008 and December 2009. 7495 patients were examined at ED for headaches. 72 % of patients were discharged, 22 % were admitted. From 2005 to 2009, there was a definite decrease in the rate of hospitalization due to headache (15 vs 9.9 % in Department of Neurology and 26 vs 18.9 % in all Departments). Considering the decrease year by year, this reduction was significant from 2007 to 2008, when the algorithms were adopted. The most common diagnosis in the ED was "Nonspecific headache" (41 %), followed by "Primary headaches and complications of primary headaches" (20.8 %), "Secondary headaches not associated with risk of serious disease" (20.4 %) and "Secondary headache associated with risk of serious disease" (5 %). Over 2-year period (2008–2009) we found an increase in the diagnosis of "Primary headaches and complications of primary headaches" and "Secondary headaches associated with risk of serious disease" compared with a decrease of "nonspecific headache" and "secondary headaches not associated with risk of serious disease". The use of the diagnostic algorithms and collaborative network between the ED and the Headache Center can improve the management of patients with headache in ED.

Keywords Headache · Emergency Department

Introduction

Headache is a widespread condition and a major reason for medical consultation. Of patients accessing Emergency Departments (ED), 1.7–4.5 % report non traumatic headache as their primary medical problem [1, 2].

The first step is to identify a secondary headache on the basis of medical history, general and neurological examination [3], and, if necessary, by neuroimaging.

Primary headaches are diagnosed in 25–55 % of patients accessing the ED, while in 33–39 % of patients headache is associated with systemic diseases. Moreover, 1–19 % of headaches represent a serious or life-threatening condition (subarachnoid hemorrhage, tumors, meningitis or intracranial neoplasm) [4].

However, some IHS diagnoses are difficult to apply in the setting of an emergency department, in relation to the timing of the assessment of the individual patient.

In 2008 the Headache Center of our Hospital started a collaboration with the ED, suggesting the use of specific diagnostic algorithms, adapted from Cortelli et al. [5]. These operational procedures were designed to help in the identification of secondary headaches or headaches associated with a serious disease based on the clinical picture of the patient referring to the ED. These algorithms suggested also different diagnostic pathways for the management of the patient. We therefore examined whether the use of these algorithms resulted in a better management of the

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patients in ED, with a reduction in the amount of hospitalization due to headaches not associated with serious disease.

We report a retrospective observational study of headache management in the ED of the Spedali Civili di Brescia Hospital. The aim of this study was to delineate the demographic profile of patients presenting a chief complaint of headache and to assess the application of diagnostic algorithms for the management of patients with headache in ED.

Objectives

The primary objective of this study was:

(a) to investigate the prevalence of primary headaches compared to secondary headaches in the ED of a large northern Italy hospital
(b) to compare the prevalence of serious disease-associated headaches with that of secondary headaches not associated with serious disease in the ED
(c) to analyze if the use of specific algorithms for the management of headache in ED could influence the rate of hospitalization of these patients.

Materials and methods

We examined all patients admitted to the ED of the Spedali Civili di Brescia Hospital between 1 January 2005 and 31 December 2009 who complained headache as a main symptom. The informations were drawn from a database documenting all medical visits in ED.

The medical records of all patients were reviewed systematically by one of the authors. Patient with headache secondary to head trauma were excluded from the study.

We collected demographic data (age, gender, and nationality), diagnostic procedure, specialist visits, outcomes and discharge diagnosis.

Discharge diagnoses were classified into four categories: primary headaches and complications of primary headaches (including migraine without aura, migraine with aura, tension-type headache, cluster headache, drug resistant headache, medication overuse headache, chronic headache, primary stabbing headache, primary exertional headache); secondary headache associated with risk of serious disease (headache attributed to cranial or cervical vascular disorders, headache attributed to meningitis, headache attributed to intracranial neoplasm, headache attributed to giant cells arteritis); secondary headaches not associated with risk of serious disease (headache attributed to rhino sinusitis, headache attributed to psychiatric disorders, headache attributed to arterial hypertension, headache associated to hyperpyrexia, headache associated to neurological diseases and cranial neuralgias,); non-specific headache.

The diagnoses were made according to the criteria described by the International Headache Society (IHS) [6] in 2004, which provides operational diagnostic criteria to differentiate the various forms of headaches.

From 1 January 2008, a diagnostic algorithm was available for physicians working in ED. This tool consisted of four different scenarios based on the clinical picture of the patient with headache. Each of these scenarios suggested a specific diagnostic pathway and the possible indication for hospitalization (see "Appendix").

In the second part of the study we evaluated all the patients hospitalized in the Department of Neurology for headache from the ED between 1 January 2008 and 31 December 2009.

We analyzed: admission diagnosis, discharge diagnosis and length of hospitalization.

The data were processed and analyzed using Microsoft Excel 2007, Microsoft Access 2007 and Spss 13.0.

Results

Demographics

Over a 5-year period (January 2005 to December 2009), 7495 patients reached the ED for headache unrelated to trauma. This represented 1.9 % of the 387,880 patients who were visited in the ED during the same period. The proportion of patients with headache remained stable through the 5 years under review.

There was a higher number of females (62 %) presenting headache compared with males (62 % female vs 38 % male). Nonetheless, during the period of examination there was a decrease in the percentage of women compared to men ($p < 0.01$), ranging from 65.2 % females vs 34.8 % males in 2005 to were 61.5 % females vs 38.5 % males in 2009 (Fig. 1).

The age range of patients in this study was 14–99 years. The average age was 43 years (SD 17.8).

25.6 % of all patients were foreign; the average age was 37 years (SD 11.9).

Outcomes

The majority of patients (72 %) were discharged after being visited in the ED; 22 % were hospitalized, 3 % refused admission, 1.5 % were transferred to another hospital and 1.1 % departed voluntarily.

Our data shows that 53 % of patients admitted were hospitalized in the department of Neurology, 15 % in Internal Medicine Departments, 8 % in the department of Neurosurgery, 8 % in Vascular Neurology, 7 % in Infective Disease Unit and the 8 % in other departments.

Hospitalization

From 2005 to 2009, there was a definite decrease in the rate of hospitalization due to headache both in the Department of Neurology (15 vs 9.9 %, $p < 0.01$, Fig. 2) as well as in all departments (26 vs 18.9 %, $p < 0.01$, Fig. 2). In particular, considering the decrease year by year, this reduction was significant from 2008 to 2009, when the algorithms were adopted ($p < 0.01$).

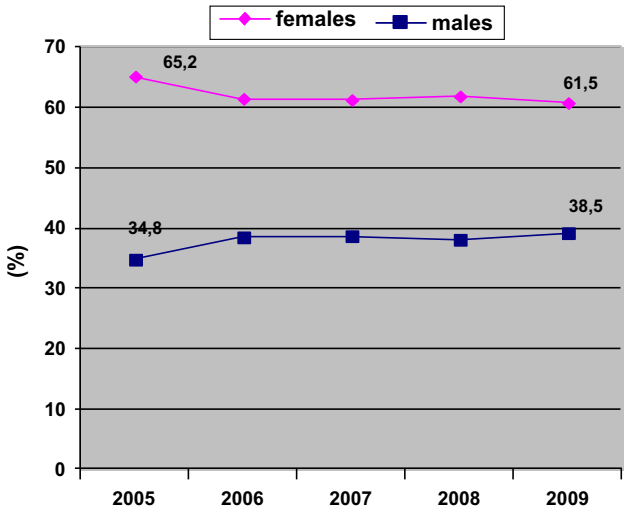

Fig. 1 Females–Male over 5 years

Diagnoses in the ED

The most common diagnosis in the ED was "Non-specific headache" (41 %), followed by "Primary headaches and complications of primary headaches" (20.8 %), and "Secondary headaches not associated with risk of serious disease" (20.4 %). "Secondary headache associated with risk of serious disease" was evident in 5 % of cases (Table 1).

Looking at the rate of hospitalization in all departments in relation to the diagnoses (Fig. 3), there is a decrease of hospitalization for "Primary headache and complication of primary headache" (24.5 % in 2005 vs 11.7 in 2009, $p < 0.01$) and for "Non-specific headache" (15.6 % in 2005; 5.9 % in 2009, $p < 0.01$).

We also observed an increase of hospitalization, although not significant, for "Secondary headaches associated with risk of serious disease" (91 % in 2005; 98 % in 2009).

Hospitalization in Neurology Department

Over a 2-years period (January 2008 to December 2009), 160 patients were admitted to the Neurology Department due to headache; 61 % were females, 39 % were males. The average age was 44.2 years (SD 17.7). The average length of hospitalization was 6.3 day.

Concerning the differences between admission and discharge diagnoses, there was an increase in "Primary headaches and complications of primary headaches" (42 % at admission vs 57 % at discharge) and in "Secondary headaches associated with risk of serious disease" (1.2 % at admission vs 10.6 % at discharge), on the other side there was a decrease in "Non-specific headache" (34 % at

Fig. 2 Total admissions and admissions in Department of Neurology

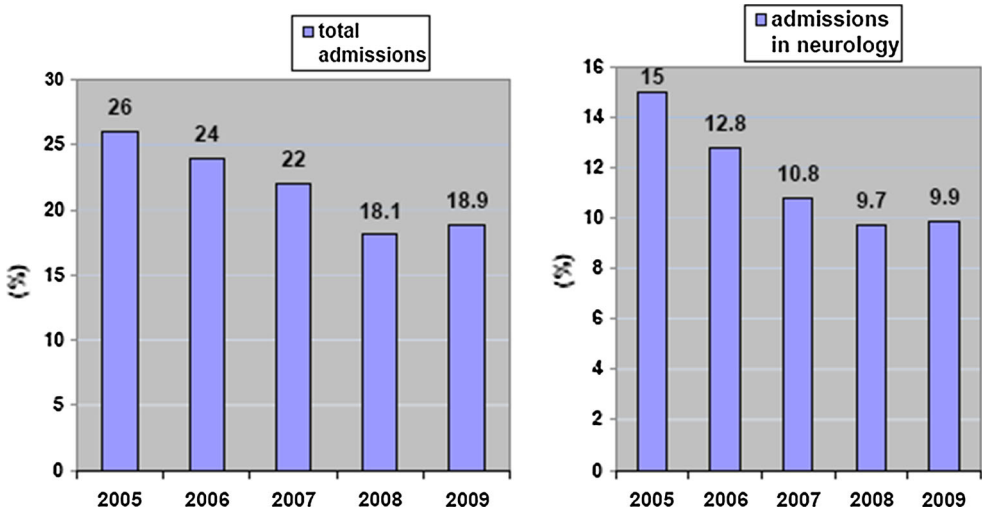

Table 1 Diagnosis made by ER physician

Diagnosis	No. of patients (%)
Primary headaches and complications of primary headaches	20.8
Migraine without aura	791 (10 %)
Migraine with aura	239 (3.1 %)
Tension-type headache	177 (2.3 %)
Cluster headache	75 (1.5 %)
Drug resistant headache	219 (2.9 %)
Analgesic overuse headache	5 (0.07 %)
Chronic headache	36 (0.5 %)
Primary stabbing headache	13 (0.2 %)
Primary exertional headache	7 (0.09 %)
Secondary headaches not associated with risk serious disease	(20.4 %)
Headache attributed to rhinosinusitis	127 (1.7 %)
Headache attributed to psychiatric disorders	80 (1 %)
Headache attributed to arterial hypertension	303 (4 %)
Headache associated to hyperpyrexia	192 (2.6 %)
Headache associated to neurological diseases	796 (10.6 %)
Cranial neuralgias	31 (0.4 %)
Secondary headache associated with risk of serious disease	(5.2 %)
Headache attributed to cranial or cervical vascular disorder	267 (3.6 %)
Headache attributed to intracranial neoplasm	58 (0.7 %)
Meningitis	57 (0.76 %)
Headache attributed to giant cells arteritis	11 (0.1 %)
Non-specific headache	3134 (41 %)
Other	877 (11.7 %)

admission vs 19.4 % at discharge) and "secondary headaches not associated with risk of serious disease" (21.9 % at admission vs 13.1 % at discharge) (Table 2).

Discussion

The prevalence of headache in ER emerging from our study did not differ significantly from the literature data (1–4 %) [2–7]. However, there is an interesting increase of males compared to females during the years, even though headache has an M/F ratio of 1:3.

During the examined period of time, there is a significant decrease in the number of hospitalizations for headache per year, in all Departments as well as in the Department of Neurology; in particular this decrease is significant from 2008 to 2009.

Furthermore, there was a decline in hospitalization due to "Primary headaches and their complications" and "Non-specific headaches", with an associated increase of "Secondary headaches associated with risk of serious disease". This trend was even more prominent after the adoption of the proposed algorithms.

This management of patients with headache is desirable, because primary headaches don't require hospitalization. Algorithms like the one used in this study can therefore be useful for the management of headache in ED, leading to a better utilization of public resources.

Despite this general improvement, the most common discharge diagnosis from the ED was still "Non-specific headache". Other studies have reported difficulties in making a definite headache diagnosis in the setting of ED

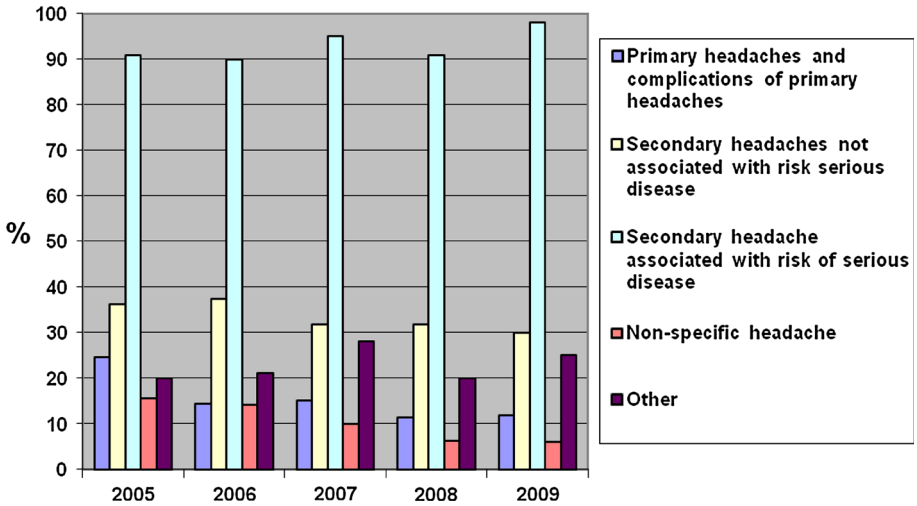

Fig. 3 Percentage of hospitalizations in relation to the diagnosis

Table 2 Admission and discharge diagnoses in Neurology Department

	Admission diagnosis	Discharge diagnosis
Primary headaches and complications of primary headaches	68 (42 %)	91 (57 %)
Migraine without aura	2 (1.3 %)	32 (20 %)
Migraine with aura	4 (2.5 %)	11 (6.9 %)
Tension-type headache	0	11 (6.9 %)
Cluster headache	1 (0.6 %)	2 (1.3 %)
Drug resistant headache	58 (36.3 %)	22 (13.8 %)
Analgesic overuse headache	2 (1.3 %)	8 (5 %)
Chronic daily headache	0	2 (1.3 %)
Primary stubbing headache	0	5 (3.1 %)
Primary exertional headache	1 (0.6 %)	2 (1.3 %)
Secondary headaches not associated with risk serious disease	35 (21.9 %)	21 (13.1 %)
Headache attributed to rhinosinusitis	0	1 (0.6 %)
Headache associated to hyperpyrexia	1 (0.6 %)	0
Headache associated to neurological diseases	34 (21.3 %)	8 (5 %)
Occipital neuralgia	0	1 (0.6 %)
Chronic post-traumatic headache	0	1 (0.6 %)
Headache attributed to low cerebrospinal fluid pressure	0	5 (3.1 %)
Diplopia-mononeuritis	0	5 (3.1 %)
Secondary headache associated with risk of serious disease	2 (1.2 %)	17 (10.6 %)
Headache attributed to cranial or cervical vascular disorder	0	4 (2.5 %)
Headache attributed to intracranial neoplasm	1 (0.6)	4 (5 %)
Headache attributed to meningitis	0	8 (5 %)
Headache attributed to giant cells arteritis	1 (0.6 %)	1 (0.6 %)
Non-specific headache	55 (34.4 %)	31 (19.4 %)

[5–8]. Physicians often work under the pressure of time constraints, and initial assessment can be difficult, especially when patients have pre-existing neurological or psychological conditions. This underlines the importance of having specific and ready-to-use tools guiding the clinician when evaluating the patient with headache.

Comparing the diagnoses of admission and discharge from the Neurology Department, we found an increase in "Primary headaches and complications" and "Secondary headaches associated with risk of serious disease" with a concomitant decrease of "Non-specific headache". However, even after an average of 6 days of hospitalization number of patients remains without a definite diagnosis. This can lead to a further recourse to ED, also in relation to the lack of a targeted therapeutic support. These points to the importance of a strict follow-up of these patients in a Headache Center.

Conclusion

In conclusion, it can be assumed that the use of the diagnostic algorithms proposed can improve the management of patients with headache in ED. A strict follow-up is needed after being discharged.

A collaborative network between the ED and the Headache Center is of primary importance to help the patient to get a definite diagnosis and appropriate treatment.

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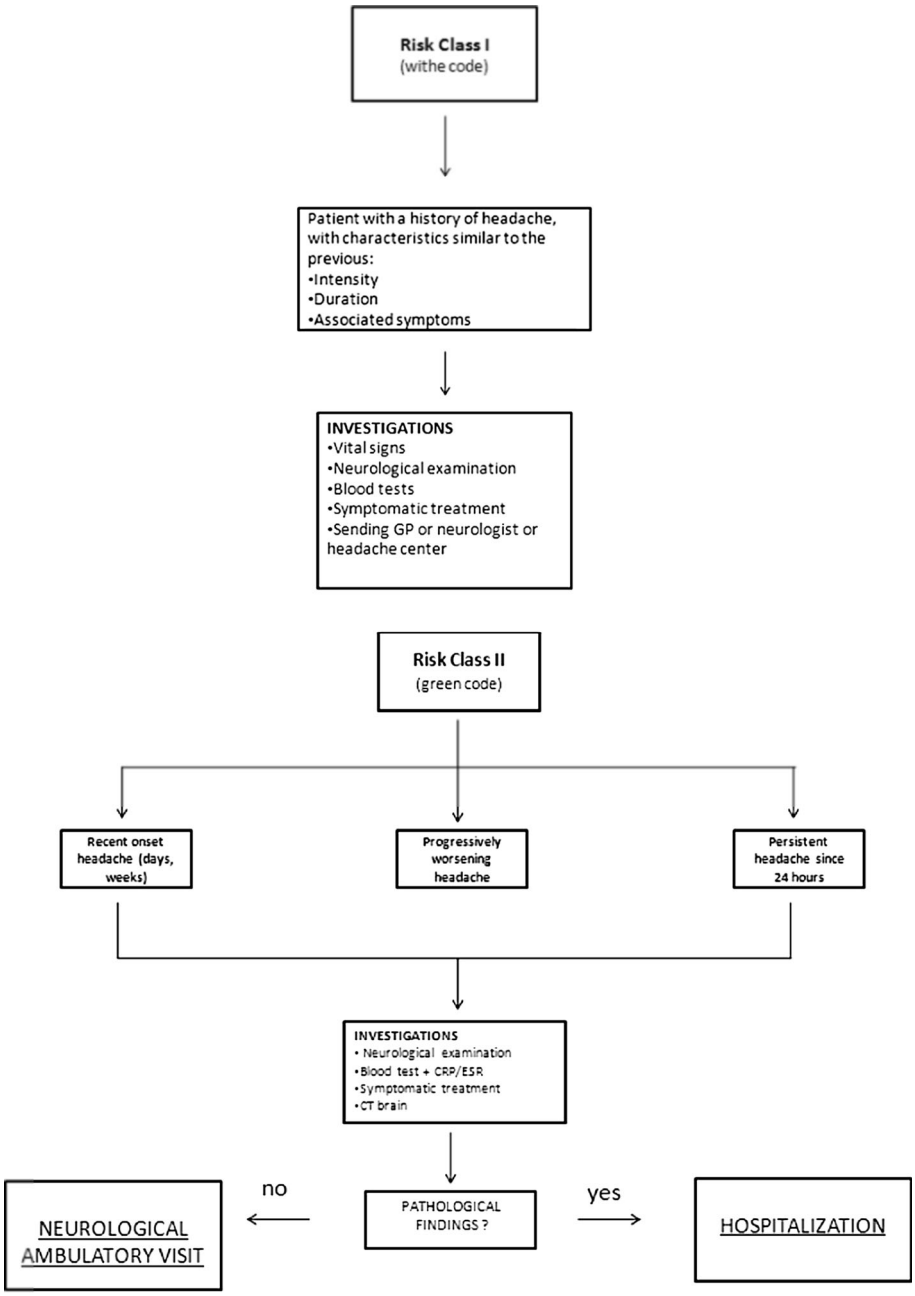
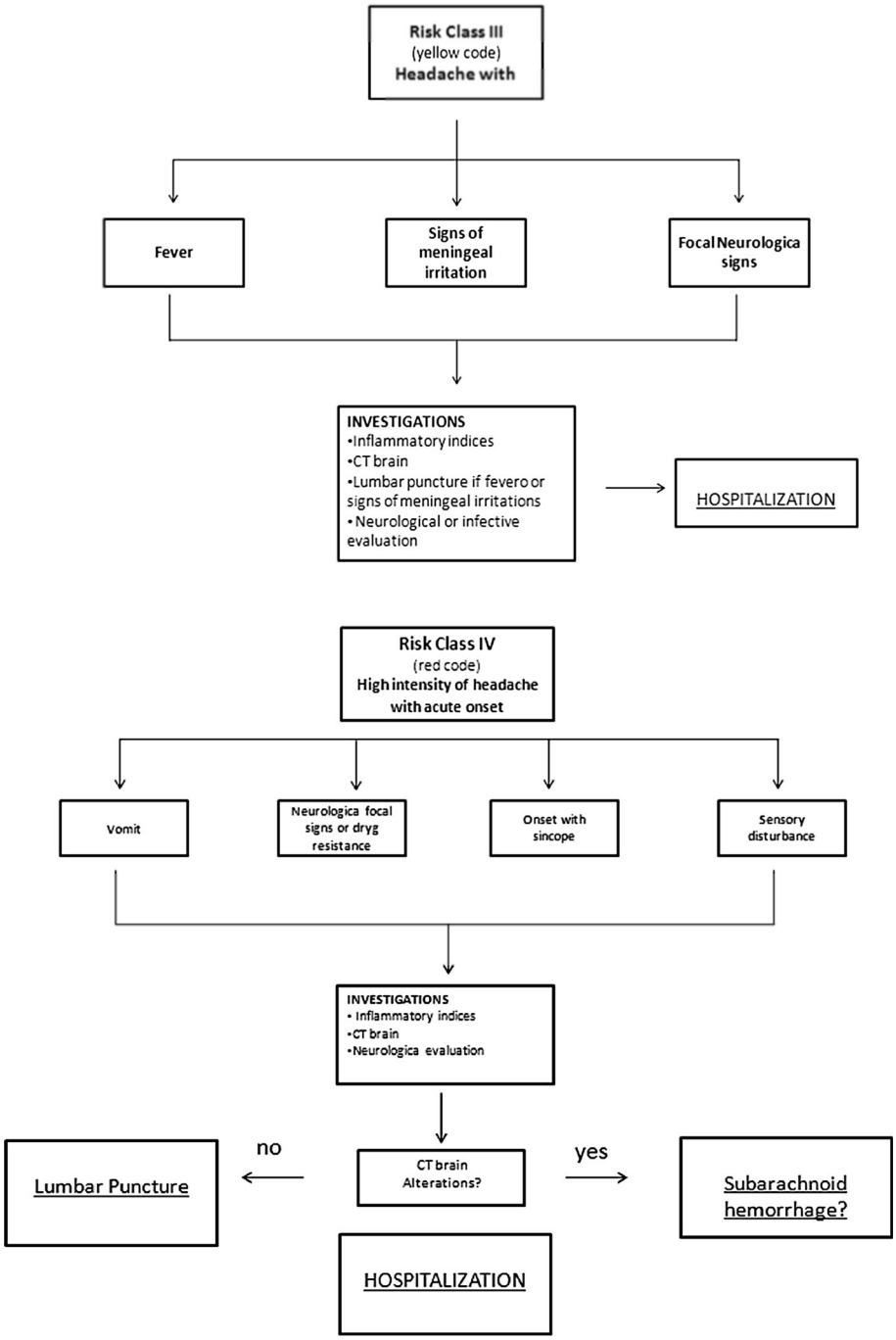
Conflict of interest The authors declare that they have no conflict of interest.

Appendix: Classes of risk


Risk Class I
(withe code)
Patient with a history of headache, with characteristics similar to the previous:
•Intensity
•Duration
•Associated symptoms
INVESTIGATIONS
•Vital signs
•Neurological examination
•Blood tests
•Symptomatic treatment
•Sending GP or neurologist or headache center
Risk Class II
(green code)
Recent onset headache (days, weeks)
Progressively worsening headache
Persistent headache since 24 hours
INVESTIGATIONS
• Neurological examination
•Blood test + CRP/ESR
•Symptomatic treatment
•CT brain
PATHOLOGICAL FINDINGS ?
no
NEUROLOGICAL AMBULATORY VISIT
yes
HOSPITALIZATION



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