

# Discharge against medical advice and premature leave of neurological patients from an interdisciplinary emergency department: a retrospective observational study.

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## Research article

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# Abstract

**Background:** Discharge against medical advice (DAMA) or premature leave (PL) from the emergency department represent relevant medical problems with impact on patient safety and potential medicolegal consequences. They may also indicate structural or procedural problems in the ED. To date, no dedicated analysis of DAMA/PL exists for neurological patients presenting to the ED. **Methods:** A retrospective observational study was performed of all patients with neurological complaints presenting to a German interdisciplinary emergency department between January and December 2017. DAMA/PL patients were compared to the total of patients who were admitted or discharged regularly (non-DAMA/PL). **Results:** Of all neurological cases, 3% left against medical advice and 2.2% left prematurely. DAMA/PL patients were younger ( $p < .001$ ), and their presentation was more frequently self-motivated ( $p < 0.001$ ). Waiting times did not differ between DAMA/PL and non-DAMA/PL patients ( $p = .166$ ) but treatment duration was significantly shorter in the former ( $p < .001$ ). Headaches, seizures and sensory deficits were the most frequent presenting symptoms in DAMA/PL patients, and in 56.1% of those presenting with a seizure had a history of epilepsy. The most common documented reason for leaving was the length of waiting time. **Conclusions:** Both individual and structural/systemic reasons contribute to DAMA/PL in neurological patients. Optimization of pre-hospital assessment and the development of alternative models of care for patients with non-urgent conditions appear to be promising targets for future improvements regarding demand management and the direction of patient flow.

## Background

Discharge against medical advice (DAMA) and uncompleted emergency care due to premature leave (PL), often without being seen by a medical professional, occur in 1-3% of emergency department (ED) visits [1]. They present relevant and multi-faceted problems: With an increased risk for adverse health events, ED readmission and subsequent hospitalization [2-4], DAMA and PL negatively impact patient safety. Moreover, the issue bears potential medicolegal implications, and a high prevalence may indicate institutional problems requiring review and improvement [5,6].

Patients presenting with neurological complaints in the ED are often particularly challenging because signs or symptoms may be non-specific, their dignity and the ensuing diagnostic and therapeutic implications may not be evident from the outset [7,8]. For example, headache, the most common chief complaint among ED neurological patients [9], is frequently found among patients leaving against medical advice [1,10]. While most headaches are of benign etiology, a small percentage of patients have a serious underlying cause warranting immediate medical attention [11]. In addition, neurological symptoms may manifest episodically in non-benign conditions, such as the waxing and waning course observable in patients with basilar artery thrombosis. This may theoretically lead patients to prematurely leave the ED due to intermittent symptom improvement and subsequent clinical deterioration may be brought to medical attention with relevant delay and potentially devastating consequences. To date, studies about DAMA and PL from the ED have not specifically focused on patients with neurological complaints. In a retrospective

analysis, we sought to investigate the characteristics of patients admitted to our interdisciplinary ED for neurological evaluation.

## Methods

### *Study design*

We retrospectively analyzed patient records of 5340 patients who consecutively presented or were referred to the interdisciplinary ED of the University Medical Centre, Mannheim, Germany, between January 1<sup>st</sup> 2017 and December 31<sup>st</sup> 2017 for neurological consultation. The study was approved by the local ethics committee.

### *Analysis of neurological referrals to the interdisciplinary ED*

Data analyzed included basic demographic information, whether the patient lived in the local area (living within a radius of 25 kilometers from the hospital), chief complaint/presenting symptom [9], time and mode of presentation to the ED, door-to-doctor time and length of ED stay. Patients were categorized as discharged against medical advice (DAMA) when they signed respective standardized documentation after receiving an explanation about risks and consequences by an ED physician at any time during their stay. We defined premature leave (PL) patients as those who left without notifying ED staff of their intention and accordingly without signing respective documentation. Since DAMA/PL patients left at different stages of diagnosis or treatment, it was often unclear whether a complete evaluation would have resulted in admission or discharge. Consequently, we compared characteristics of DAMA/PL patients and all patients who were either admitted or discharged regularly (=non-DAMA/PL).

In DAMA/PL patients, additional information (symptom duration, repeat visits within the next 30 days, reason for DAMA/PL if given) was obtained from medical records. We provide an additional descriptive analysis of these variables.

### *Statistical analysis*

Statistical analysis was performed with STATA for Mac, StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC. The distribution of categorical variables between groups was compared by chi2 tests or Fisher's exact test, depending on group sizes. Group comparisons of ordinal data were assessed using Mann-Whitney-U-tests and group comparisons of metric data were assessed using independent samples t-tests. Bonferroni correction for multiple testing was applied where suitable. A p-value of <.05 was considered significant.

## Results

## *Demographics*

Within the 12-month observational period, a total of 45,445 patients were seen in the ED. In 5340 (12.0%) of these, a neurological evaluation was requested. Mean age of neurological patients was 56.2 years (SD±21.27), 2583 (48.4%) were male. Of all neurological patients, 2530 (47.4%) were admitted, 2529 (47.4%) were discharged regularly. One-hundred and sixty-one patients (3.0%) were discharged against medical advice; 120 patients (2.2%) left prematurely without informing ED staff.

While there were no differences in gender distribution, mean age and age spectra differed significantly between DAMA/PL and non-DAMA/PL patients with DAMA/PL patients being significantly younger ( $p<.001$ ; table 1, figure 1). Moreover, patients not living in the local area were more likely to leave DAMA/PL ( $p<.001$ ).

## *Time and mode of presentation*

There were no differences regarding the time of presentation to the ED between DAMA/PL and non-DAMA/PL patients. Door-to-doctor times did not differ between the groups, but duration of stay in the ED was significantly shorter in DAMA/PL patients ( $p<.001$ ; table 1). ED presentations of DAMA/PL were significantly more frequently self-motivated ( $p<.001$ ; table 1). Notably, there were no differences in the proportion of patients brought to the ED by emergency medical service personnel including an additional emergency physician ( $p=.503$ ; table 1).

## *Presenting symptoms*

Percentages of frequencies of presenting symptoms categorized by DAMA/PL vs. non-DAMA/PL are presented in table 1 and figure 2. Most frequent presenting symptoms in DAMA/PL patients were headaches, seizures and sensory deficits. Significant group differences emerged with respect to the latter two, which were more frequently found in DAMA/PL patients ( $p=.001$  and  $p<.001$ , respectively).

## *Detailed description of DAMA/PL patients*

Of all 281 DAMA/PL patients, 156 (55.5%) left prior to physical exam or diagnostic measures deemed necessary for further evaluation, one-hundred and twenty-five patients (44.5%) left after complete diagnostic work-up yielding an indication for admission. Figure 3 depicts the proportions of diagnostic procedures in DAMA/PL patients that were performed or recommended but declined by the patient as well as the proportion of patients in whom a complete work-up was performed. All but one of those leaving after complete work-up signed respective documentation. Symptom duration was documented in 116 cases and ranged from 22 minutes up to 1 year. In 51 cases, the reason for DAMA/PL was documented: 36 patients

stated the need to wait as reason to leave, mean waiting time in these patients was 97.7 ( $\pm$ 106.24) mins. Other reasons given were: symptom improvement either spontaneously (two patients) or because of analgesia administered in the ED (one patient), need to care for family members (six patients), preferred treatment in a different hospital closer to home (four patients), need to go to work and other urgent appointment (one patient each). Forty patients (14.2%) of DAMA/PL patients revisited the ED within the next 30 days, 15 of these (5.3% of all DAMA/PL patients) were admitted (table 2).

Discharge diagnoses of DAMA/PL patients are depicted in figure 4. While in 61 cases (21.7%), no discharge diagnosis could be arrived at, most frequent diagnoses in DAMA/PL patients were seizures and headaches. In 23 of 41 (56.1%) DAMA/PL cases with seizure as presenting symptom, epilepsy was known and previously diagnosed.

## Discussion

We retrospectively studied discharges against medical advice and premature leaves of neurological patients from an interdisciplinary ED. This issue has hitherto not been investigated in detail. DAMA and PL rates of approximately 3 and 2%, respectively, as well as the observed predominance of younger age in the DAMA/PL subgroup are comparable to studies of unselected ED patient populations [1,12,13].

Neurological conditions have been observed to carry a high risk of DAMA [13]. Headaches, seizures and sensory deficits were the most frequent presenting symptoms in DAMA/PL patients in our investigation, and the latter two were significantly more prevalent in DAMA/PL compared to non-DAMA/PL patients. In our study population, more than half of DAMA/PL patients presenting with a seizure had a previously known epilepsy. Patients with known epilepsy and – in retrospect – typical seizures make up a considerable portion of ED admissions due to seizures [14]. Limited access to relevant information on scene regarding whether a seizure was typical or whether it may have been secondary to some condition requiring immediate medical attention as well as the lack of formal non-conveyance criteria often impact the decision of emergency medical service (EMS) staff to err on the side of safety and transport a patient to hospital [15,16]. As a consequence, incongruencies regarding the perceived necessity for ED presentation between patients and EMS or ED personnel may be one factor contributing to DAMA/PL in this subgroup of patients. Such differences in perception and evaluation may also underlie the higher proportion of patients with sensory deficits leaving DAMA/PL. While they may indicate a serious underlying pathology, it can be hypothesized that sensory deficits are less functionally impeding or less noticeable to other people than neurological deficits such as dysarthria, motor deficits or gait ataxia. Accordingly, patients with sensory deficits may wish to leave the ED despite the need for further in-hospital work-up or monitoring. The large proportion of DAMA/PL patients presenting with headache, which also rated among the top ten DAMA diagnoses in a general population [1], presumably reflects – at least in part – the fact that headache, in most cases in the context of a primary headache disorder [17], is the most prevalent neurological symptom in the ED [9].

Conclusions regarding outcomes and impact of DAMA/PL on patient safety is limited because with the exception of cases of readmission to our IED, information regarding ED visits and admissions to other

hospitals or treatments in outpatient settings is lacking. The rate of revisits to our ED within the next month and subsequent hospital admissions of DAMA/PL patients was rather low with approximately 14 and 5%, respectively. The small number does not allow for further statistical analysis, but the top two discharge diagnoses in DAMA/PL patients – headache and epileptic seizure – resulted in readmission in only four cases, where a relevant underlying etiology was detected upon further work-up, or relevant therapeutic consequences ensued.

Reasons for DAMA/PL were not recorded for every patient. There appear, however, to exist different, but interrelated, types of reasons for DAMA/PL. First, there are individual reasons such as personal or professional commitments perceived as conflicting with a hospital admission or preference of a different hospital. Another patient-related factor impacting on the wish to leave may be related to the low rate of declined diagnostic procedures in DAMA/PL patients, particularly with regard to imaging as patients may not see any need for further work-up once a serious structural CNS pathology has been ruled out.

Long waiting times, a main reason to prematurely leave the ED [18], certainly contains a patient-related aspect, but they also indicate structural insufficiencies in prehospital assessment in particular: in recent years, EDs have been dealing with increasing numbers of neurological patients [19], many of whom present with non-urgent complaints but nonetheless consider themselves in need of urgent medical evaluation [20]. Inappropriate utilization of ED resources promotes overcrowding and negatively impacts on waiting times. Consequently, a structured evaluation for treatment urgency for neurological patients is needed, all the more so because neurological symptoms are not adequately represented in current triage systems. Interdisciplinary EDs may benefit from a dedicated emergency neurology nurse overseeing patient management in co-operation with the neurologist on-call, and may, in particular, redirect patients with non-urgent complaints towards alternative care providers before they actually enter the ED. This may be particularly relevant for the conditions frequently encountered in DAMA/PL patients, i. e. headache and seizure in cases of previously known epilepsy, where the vast majority is of benign etiology [11], or no relevant diagnostic or therapeutic consequences ensue [21], respectively. Moreover, limited health literacy poses a relevant challenge for health practices and policies [22], maybe even more so in light of the complexities of many neurological disorders [23]. Among others, campaigns to increase knowledge about alternative care providers apart from the ED may aid in improving demand management. It can be assumed that this also, through impacting on ED waiting times, will have an indirect influence on DAMA/PL rates. In sum, the investigation of DAMA/PL patients both in general as well as in particular patient populations, ideally informed by research into patient motivations for ED presentation, provides an opportunity to identify aspects requiring improvement on an institutional and a systemic level.

### *Limitations*

Our study has several limitations. To begin with, as a retrospective evaluation, it critically rests on the completeness and accuracy of medical records. Particularly in PL patients, documentation is often incomplete. In DAMA patients, a more complete and detailed investigation into motivations for leaving would certainly be informative. Moreover, information regarding ED visits and admissions to other hospitals or treatments in outpatient settings and other outcome information is lacking. Accordingly,

prospective investigations including follow-up assessment, e.g. via telephone interviews, would be desirable. DAMA/PL patients left at different stages of the ED visit. Hence, it was not always clear whether a complete evaluation would have resulted in admission or discharge.

## Conclusions

Both individual and systemic reasons contribute to DAMA/PL in patients presenting to the emergency department with neurological complaints. While the former, by their very nature, are not amenable to modifications in the structure of emergency care provision, the latter indicate insufficiencies in the pre-hospital assessment of neurological patients as well as a lack of alternative care providers. As such, they may be critically influenced by structural improvements targeting demand management and patient direction and flow.

## Abbreviations

DAMA – discharge against medical advice

PL – premature leave

ED – emergency department

## Declarations

### *Ethics approval and consent to participate*

The study was approved by the local ethics committee (Ethics committee II, University Medicine Mannheim, reference no. 2018-502N-MA).

### *Consent for publication*

Not applicable – retrospective observational study.

### *Availability of data and materials*

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### *Competing interests*

The authors declare that they have no competing interests.

### *Funding*

There were no sources of funding.

### *Authors' contributions*

CH	Designed and conceptualized study; major role in the acquisition and analysis of data, revised the manuscript for intellectual content
PS	Major role in the acquisition of data; revised the manuscript for intellectual content
AA	Interpreted the data; revised the manuscript for intellectual content
MP	Designed and conceptualized study; revised the manuscript for intellectual content
KS	Designed and conceptualized study; major role in the acquisition of data, revised the manuscript for intellectual content

All authors read and approved the final manuscript.

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Not applicable.

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## Tables

**Table 1.** Characteristics of patients leaving prematurely or against medical advice and patients regularly discharged or admitted.

	Patients who signed to leave against medical advice (N=161) or left before complete ED care without signing (N=120); total N=281	Patients who were regularly discharged or admitted (N=5059)	p value
<b>Demographics</b>			
age, mean (SD)	44.1 (19.2)	56.9 (0.30)	.000
<30, N (%)	84 (29.9%)	825 16.3%)	.000
30-50, N (%)	94 (33.5%)	1104 (21.8%)	.000
50-70 N (%)	71 (25.3%)	1456 (28.8%)	.205
>70, N (%)	32 (11.4%)	1674 (33.1%)	.000
sex, M, N (%)	141 (50.2%)	2442 (48.3%)	.535
urban residence, N (%)	174 (61.9%)	2986 (59.0%)	.336
rural residence, N (%)	93 (33.1%)	1985 (39.2%)	.040
other, N (%)	14 (5.0%)	88 (1.7%)	.000
<b>Time of ED presentation , N (%)</b>			
weekend	73 (26.0%)	1220 (24.1%)	.478
0h-6h	22 (7.8%)	475 (9.4%)	.381
6h-12h	63 (22.4%)	1425 (28.2%)	.036
12h-18h	129 (45.9%)	1981 (38.9%)	.024
18h-24h	67 (23.8%)	1178 (23.3%)	.829
<b>ED times in mins, mean (SD)</b>			
door-to-doctor time	42.4 (74.1)	38.7 (0.96)	.166
treatment duration	197.5 (274.07)	260.4 (2.44)	.000
<b>Mode of presentation, N (%)</b>			
Self-initiated or recommended Emergency medical service (EMS)	140/236 (59.3%)	2055/5055 (40.7%)	.000
EMS with emergency physician	75/236 (31.8%)	2481/5055 (49.1%)	.000
	21/236 (8.9%)	518/5055 (10.2%)	.503
<b>Presenting symptom according to Royl, 2010, N (%)</b>			
Ataxia/movement disorder	2/221 (0.9%)	60 (1.2%)	1.00
Impaired consciousness	7/221 (3.2%)	238 (4.7%)	.288
Seizure	41/221 (18.6%)	560 (11.1%)	.001
	36/221 (16.3%)	652 (12.9%)	.141

Headache	8/221 (3.6%)	139 (2.7%)	.440
Other pain	20/221 (9.0%)	652 (12.9%)	.094
Motor deficit	7/221 (3.2%)	279 (5.5%)	.131
Confusion/amnesia	17/221 (7.7%)	254 (5.0%)	.078
Disturbed vision	34/221 (15.4%)	426 (8.4%)	<b>.000</b>
Sensory deficit			
Impaired language/speech/swallowing	12/221 (5.4%)	491 (9.7%)	.034
	31/221 (14.0%)	776 (15.3%)	.596
Vertigo	1/221 (0.5%)	282 (5.5%)	<b>.000</b>
Other neurological complaint	5/221 (2.3%)	250 (4.9%)	.076
Non-neurological complaint			

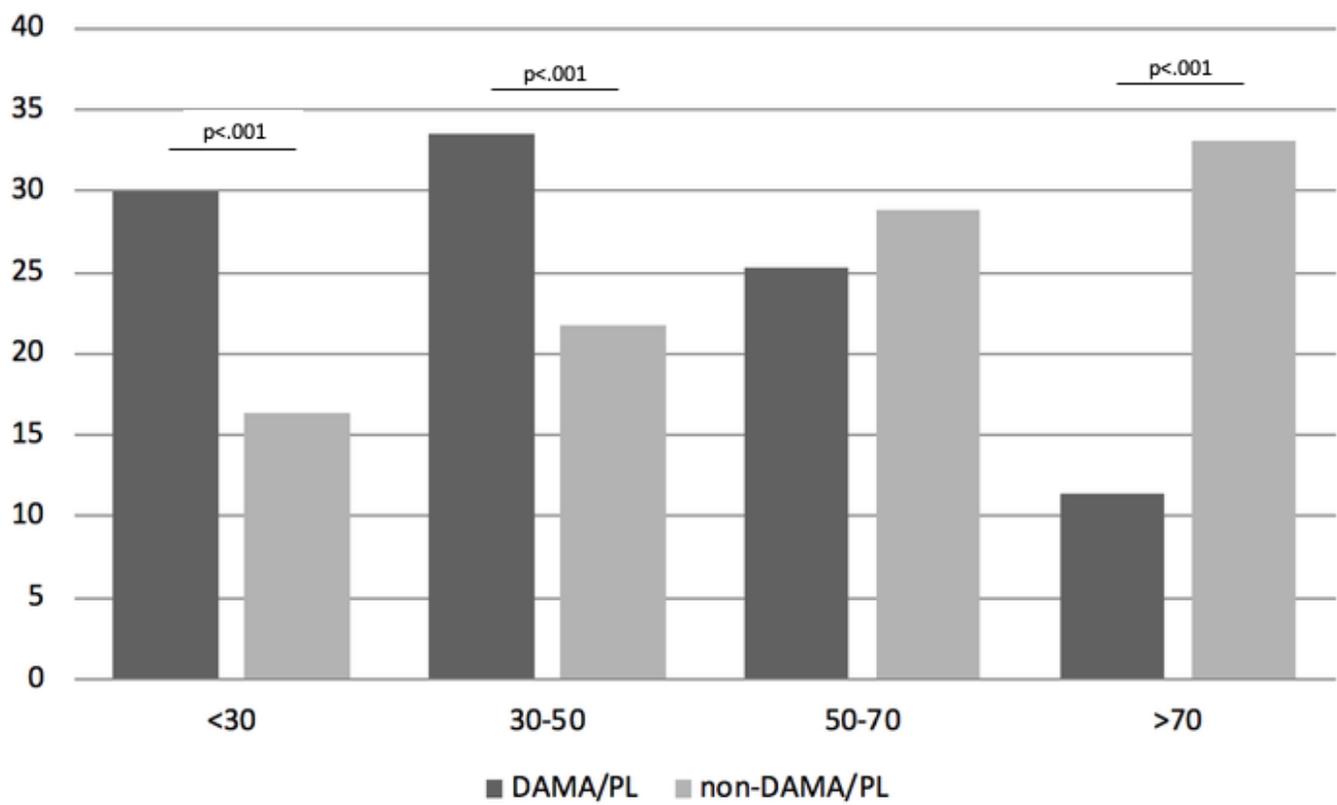
With Bonferroni correction (for 32 tests): statistical significance with  $p < .0015$ .

**Table 2.** Repeat visits of DAMA/PL patients resulting in hospital admission.

Patient	Age range	sex	Latency of repeat visit after initial presentation (days)	discharge diagnosis on day of DAMA/PL	discharge diagnosis after readmission
1	30's-40's	M	2	transient visual deficit and perioral sensory loss of unclear etiology	somatization disorder
2	60's-70's	F	1	left-hemispheric TIA	left-hemispheric TIA
3	50's-60's	M	4	brainstem stroke	brainstem stroke
4	30-40's	M	2	VI nerve palsy of unclear etiology	idiopathic VI nerve palsy
5	70's-80's	W	1	structural epilepsy due to acute subdural hematoma	structural epilepsy due to acute subdural hematoma
6	30's-40's	M	3	right-hemispheric TIA	right-hemispheric TIA
7	30's-40's	W	3	disturbed vision of unclear etiology	somatization disorder
8	50's-60's	W	2	complicated migraine	reversible vasoconstriction syndrom with secondary subarachnoid hemorrhage
9	50's-60's	M	0 (same day)	series of seizures in known structural epilepsy	series of seizures in known structural epilepsy
10	50's-60's	M	4	left-hemispheric TIA	left-hemispheric TIA
11	40's-50's	M	4	posterior circulation stroke	posterior circulation stroke
12	60's-70's	W	13	intracerebral hemorrhage	hypertensive urgency (readmission due to non-neurological cause)
13	40's-50's	W	14	headache	subarachnoid hemorrhage
14	50's-60's	W	7	brainstem TIA	posterior circulation stroke
15	50's-60's	W	25	headache	pseudo-meningocele

TIA, transient ischemic attack.

## Figures



**Figure 1**

Age spectra (<30 years, 30-50 years, 50-70 years, >70 years) of DAMA/PL and non-DAMA/PL patients, %.

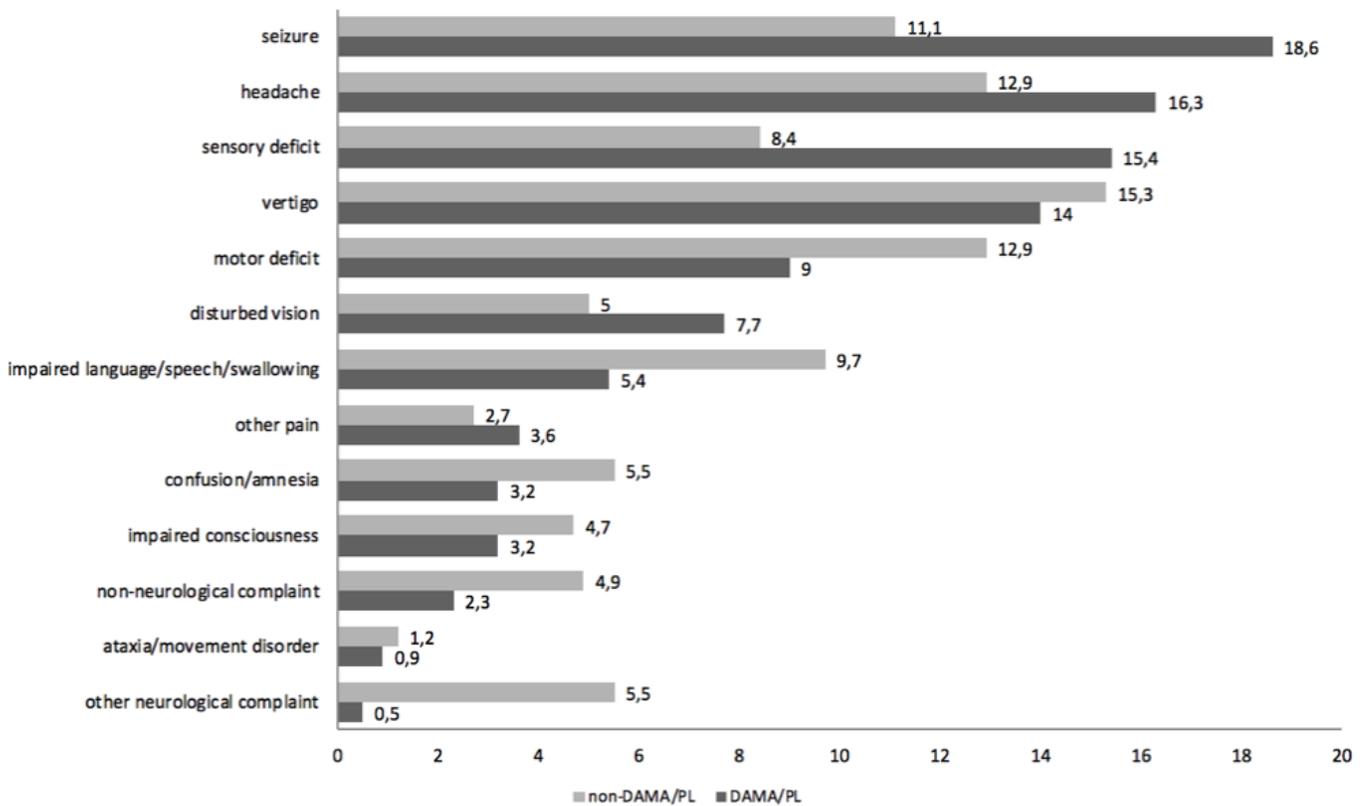
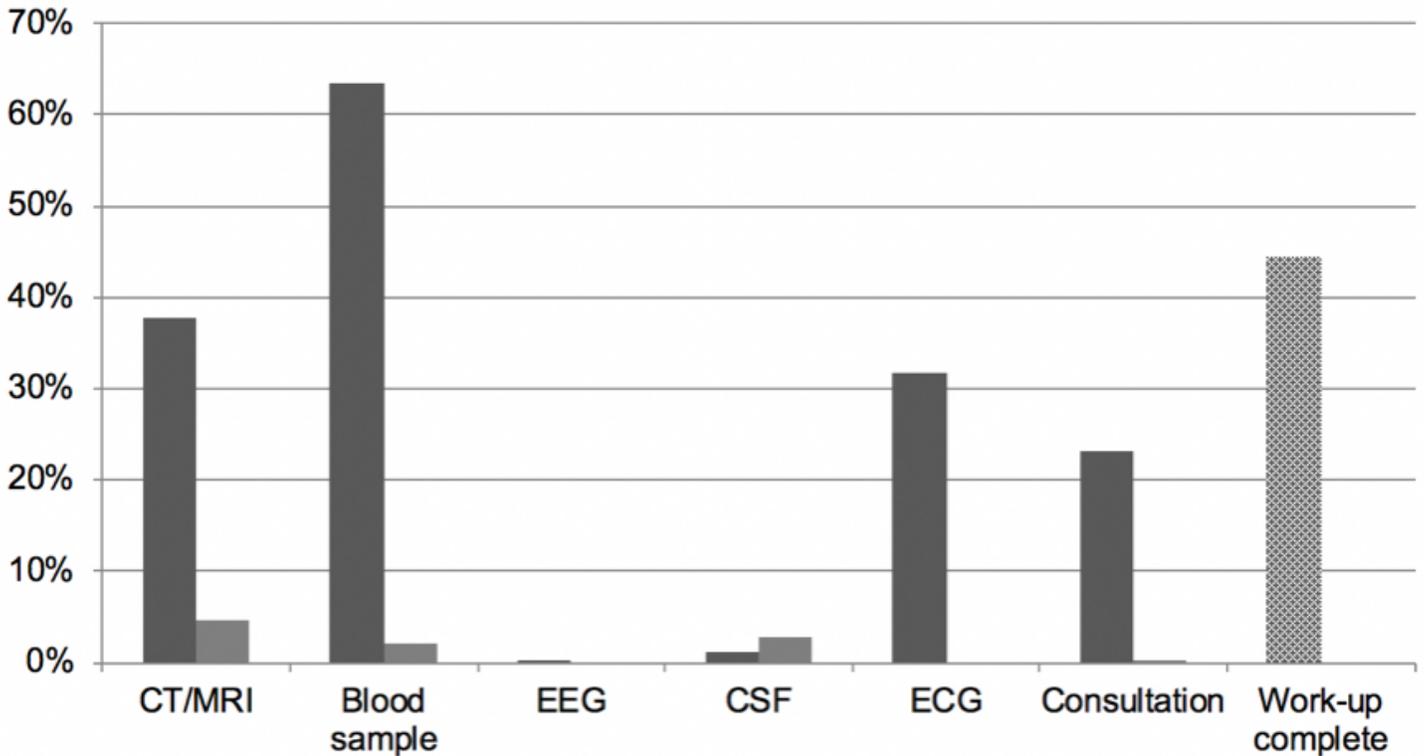


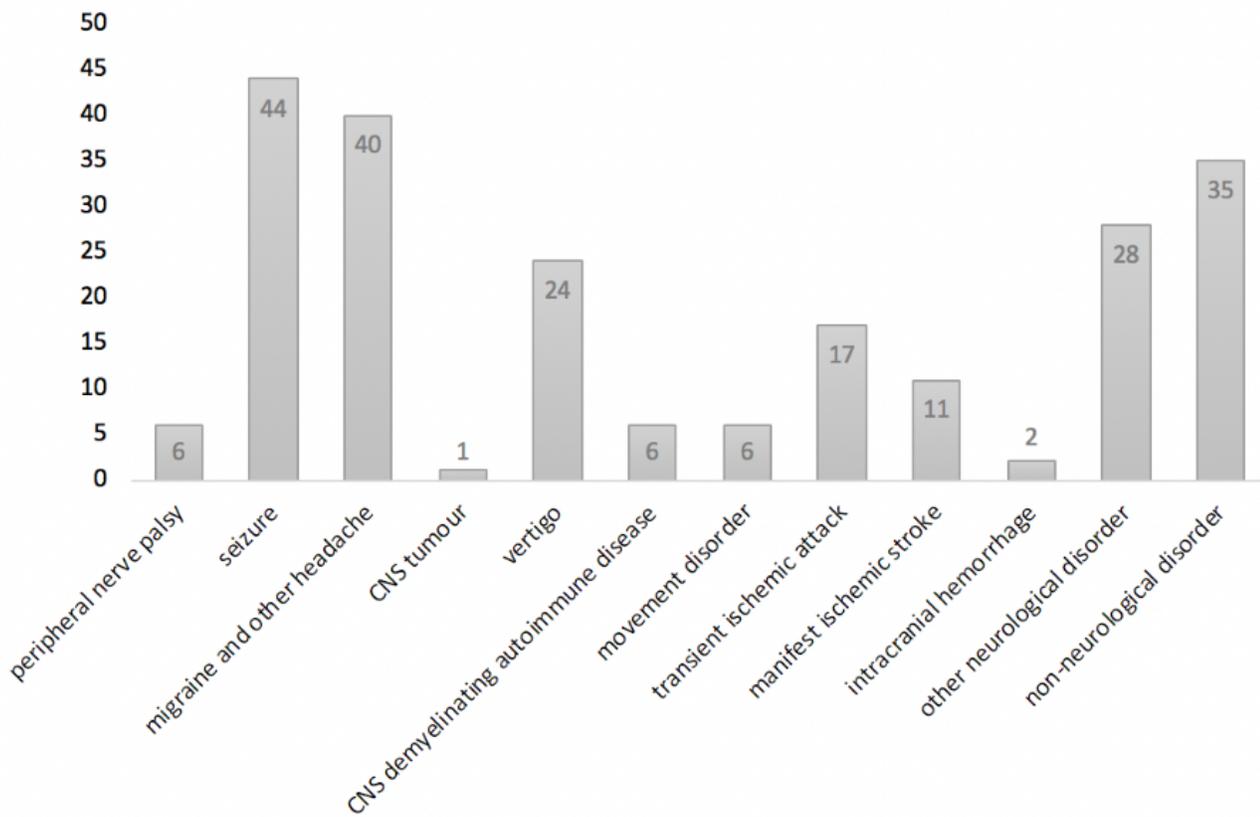
Figure 2

Spectrum of presenting symptoms in DAMA/PL and non-DAMA/PL patients, %.



**Figure 3**

Diagnostic procedures in DAMA/PL patients. Dark grey: performed procedures, %. Light grey: declined procedures, %. Dotted: Proportion of DAMA/PL patients with complete diagnostic work-up, %.



**Figure 4**

Discharge diagnoses of DAMA/PL patients, n. In 61 cases, insufficient information prevented making a diagnosis.