



# Developing Evidence Based Guidelines for the Rational Use of Neuroimaging at the Sydney Eye Hospital



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## Case for change

Neuroimaging is often necessary when evaluating neuro-ophthalmic presentations. However, if neuroimaging is performed when it is not clinically required, this leads to increased direct costs, inconvenience for patients and their families, the discovery of irrelevant incidental findings as well as unnecessary radiation or contrast agent exposure. It is therefore essential to only request neuro-imaging for certain neuro-ophthalmic presentations and with the appropriate modality.

## Goal

The primary objective was to develop evidence based guidelines for the rational use of neuroimaging for all neuro-ophthalmic presentations including glaucoma at Sydney Eye Hospital (SEH).

## Objectives

Develop guidelines that address:

1. Which patients require neuroimaging
2. Which type of neuroimaging is most appropriate
3. The time in which neuroimaging should be obtained
4. Whether patients require neuroimaging as an inpatient or outpatient
5. The elements of a an effective neuroimaging request

## Method

We performed a retrospective audit of consecutive neuroimaging studies including CT and MRI brain, orbit or spine, ordered for patients at SEH, for new neuro-ophthalmic and glaucoma presentations between June 2011 and June 2016 inclusive.

Imaging was performed at SEH or surrounding Prince of Wales Hospital, St Vincent's Hospital or private radiology practices within a 5km radius of SEH, being 15 sites in total.

## Results

839 patients underwent neuroimaging for new neuro-ophthalmic or glaucoma presentations. The average age was 53 and 403 (48%) were women. This included 1042 neuroimaging studies, 596 (57%) CT and 446 (43%) MRI. The commonest clinical presentations neuroimaged were blurred vision (20%), diplopia (15%) and disc swelling (14%) (figure 1).

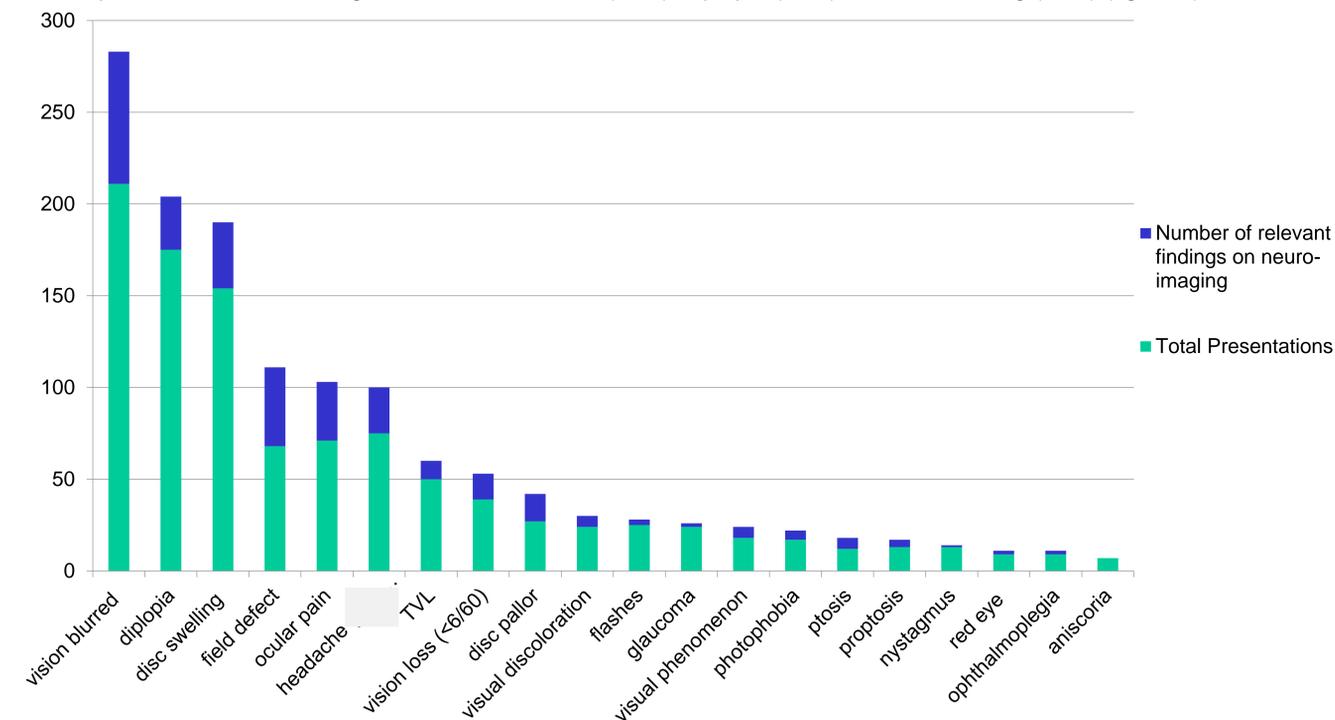


Figure 1. Neuro-ophthalmic presentations neuroimaged and the number of relevant findings

Field defects (39%), disc pallor (36%) and ptosis (33%) had the highest rate of relevant findings on neuroimaging (figure 1). 33% of scans led to an incidental finding with only 3% amenable to management (figure 2). The diagnosis of 23% of presentations imaged remained unknown. The most commonly imaged suspected diagnosis for blurred vision was optic neuritis (n=62) with 50% of patients having positive radiological confirmation. For visual field defects, in the absence of clinically suspected optic neuritis or migraine, an urgent non-contrast CT brain demonstrated an acute haemorrhagic stroke in 3% of patients. Imaging for transient binocular vision loss (TBVL) revealed 6% with an intracranial haemorrhage and 9% with a space occupying lesion while imaging transient monocular visual loss (TMVL) had no remarkable findings. In patients with diplopia, 1.5% had an aneurysm and 0.5% a carotid artery dissection all of which were either associated with a headache, ptosis or other cranial nerve palsy. The 31% of patients with relevant findings on imaging ocular pain all had other clinical features suggesting optic neuritis. 3% of patients with bilateral disc swelling had underlying space occupying lesions while 40% of glaucoma patients with sudden worsening of visual fields had a space occupying lesion.

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## Diagnostics

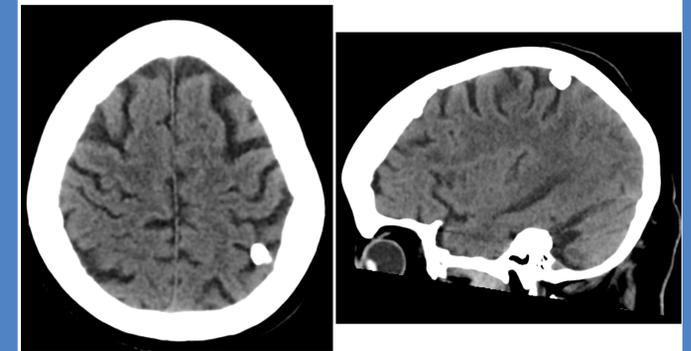


Figure 2. Meningioma, an example of an incidental finding which occurred in one third of neuroimaging studies

## Sustaining change

The results were compared with current literature and we are convening a committee of neuro-ophthalmologists, neuro-radiologists and relevant stakeholders such as the radiology and emergency department directors to review the findings and develop guidelines.

## Conclusion

For eye related presentations, an MRI brain in most clinical circumstances is the most appropriate imaging with some exceptions including suspicion of acute haemorrhage, a calcified pathology, proptosis, or a rapidly evolving emergency situation. Irrespective of imaging modality, contrast improves the sensitivity of pathology detection and should be requested unless contraindicated, or not required.

Clinical presentations with a low yield on neuroimaging, include TMVL, migraine, isolated ocular pain, isolated visual aura, flashes and/or floaters or headache without red flag features. While the individual clinical context must be considered, routine neuroimaging for these conditions does not appear appropriate.

These principles can be applied to other eye care centres and emergency departments.