



Computed Tomography Brain Scan Utilisation in Patients with Headache presenting to Emergency Departments across Australia and New Zealand

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OBJECTIVES

To establish performance indicators for benchmarking CT utilisation in patients with headache presenting to EDs, given the distribution of SNNOOP10 red flags (Box 1) for serious secondary headache diagnosis in these patients.

METHODS

Design: Multicentre observational study over 1 month in 2019.

Setting: 37 hospital groups (total of 44 EDs as some groups had oversight over more than 1 ED) across Australia and New Zealand.

Participants: Adult patients aged > 18 years presenting to EDs with non-traumatic headache.

Outcome measure: CT utilisation defined as the proportion of headache patients receiving CT brain scans.

Data Analysis: Multilevel binary logistic regression analysis using a null model with hospital groups incorporated as a random effect.

Box 1. SNNOOP10 Red Flags for serious secondary headaches (Do 2019)

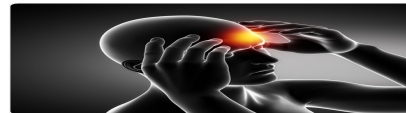
- Systemic symptoms
- Neoplasm
- Neurological deficit
- Onset sudden
- Older > 50 years
- Pattern change
- Positional
- Precipitated by Valsalva, exercise
- Papilloedema
- Progressive or atypical
- Pregnancy or puerperium
- Painful eye with autonomic features
- Post traumatic
- Pathology of immune system
- Painkiller overuse

RESULTS

There were 2,370 participants. Median (IQR) age was 54 (29-57) years, 7 in 10 were women, 1 in 5 was referred by their General Practitioner, 1 in 4 arrived by ambulance.

The observed mean CT utilisation was 39.5% (95% CI 36.9-42.0%) across 37 hospital groups over 1 month. The utilisation in all but 1 group was not statistically different from the average (Figure 1). When each observation was replicated 12 times to simulate 12-months of data, 9 of 37 (24%) hospital groups had statistically significant higher utilisation rates at above 45%, and 6 of 37 (16%) hospital groups had what we considered clinically significant and statistically significant higher utilisation rates at above 50% (10% greater than an average of 40%) (Figure 2).

If all patients aged > 50 years without a past history of headache were imaged (Edlow 2008) along with all patients with ≥ 1 red flag, the theoretical CT utilisation rate would be 50%.



Reasons for variations in CT utilisation

Physician knowledge and confidence, risk tolerance and practice of defensive medicine. Patient referred by GP, arrived by ambulance and visited previously. ED busyness (Wong 2013).

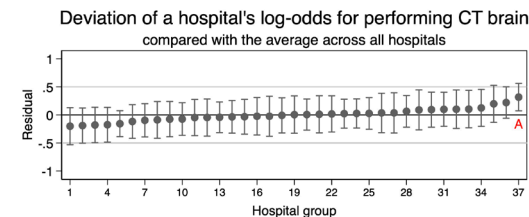
Approaches to optimising test ordering

Evidence-base: Choosing Wisely campaign, clinical-decision support systems.

Patient: resetting expectation away from "more is better", shared decision making.

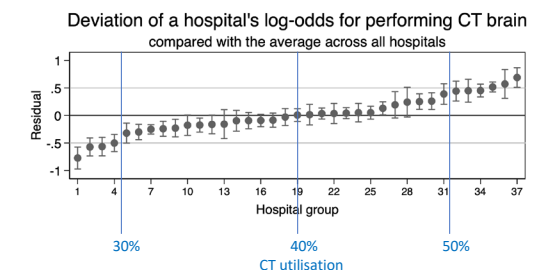
Data driven: Atlas of Health Variation, benchmarking (Hibbert 2020).

Figure 1. Observed CT utilisation – 1 month



The average hospital group has a residual of zero. The vertical lines are 95% confidence intervals. The hospital group on the far right (A) appears to be the only site that performed CT scans at a statistically higher utilisation than the average hospital group (lower limit of its 95% CI is above zero). At that site, CT was performed in 22 of 38 (58%) headache patients.

Figure 2. Simulated CT utilisation – 12 months



In this simulated dataset, 9 hospital groups have a statistically higher CT utilisation (46% to 58%), and 9 hospital groups have a statistically lower CT utilisation (22% to 34%) than the average (40%) across all 37 hospital groups. We consider a CT utilisation 10% above/below the average (40% as clinically significant).

CONCLUSIONS

Average CT utilisation for ED presentations across Australia and New Zealand is 40%. 1 in 6 hospitals had a CT utilisation > 50%. These estimates provide credible performance indicators to enable evidence-base benchmarking to address variations in headache neuroimaging.