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# Neuroimaging in Psychiatry

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## Introduction

Deciding when to order neuroimaging for psychiatric inpatients can be a complex decision. In the past, many inpatient units ordered these tests as a routine measure. However, unnecessary tests can drive up costs and lead to benign but distracting findings. This fact sheet serves as a quick guide to help you decide which neuroimaging tests might be appropriate for your psychiatric inpatients.

## Common Types of Neuroimaging in Psychiatry

- **CT Scan (Computed tomography)**
  - A CT scan uses X-rays to create cross-sectional images of the brain. Denser structures like bones block the X-rays, appearing white on the scan, while less dense areas like cerebrospinal fluid (CSF) appear dark. Fresh blood (eg., from a hemorrhagic stroke) appears whiter than surrounding cerebral tissue, making CT scan a great modality to diagnose an acute cerebral bleed. Rarely used in psychiatry because MRIs provide better spatial resolution.
- **MRI (Magnetic Resonance Imaging)**
  - MRI (Magnetic Resonance Imaging) uses strong magnetic fields and radio waves to create detailed images of the brain's internal structure. Unlike CT scans, MRI doesn't use X-rays, making it safer for repeated use. MRI with contrast is generally preferred for better visualization.
- **PET (Positron Emission Tomography)**
  - Uses a radioactive compound to trace metabolic activity in the brain. Ideal for tracking changes in active brain regions.

## When to Consider Neuroimaging

### ***Ruling out Brain Pathology***

The primary reason to use neuroimaging is to exclude brain pathology that might be causing psychiatric symptoms. MRI with contrast is usually preferred, but a CT scan can be used if MRI is not available. Order neuroimaging selectively to avoid unnecessary costs and patient anxiety. Here are some cases where it may be useful:

- Neurological signs or symptoms, eg., weakness, numbness, cranial nerve abnormalities.
- Pre-existing comorbid neurological condition or brain pathology, eg., a history of stroke or multiple sclerosis.
- Significant head injury history
- Late onset psychiatric symptoms (eg., first onset psychosis after age 50).
- Unexplained worsening of symptoms
- Lack of response to effective medications

## Most common brain pathologies detected

- Brain tumors
- Stroke
- Multiple sclerosis
- Temporal lobe epilepsy
- Neurodegenerative disorders (eg., Alzheimers, Parkinson's)
- Traumatic brain injury
- Inflammatory or infectious conditions

## ***Dementia diagnosis***

- MRI
  - a. Rules out conditions like normal pressure hydrocephalus, vascular disease, or trauma.
  - b. Can reveal typical patterns of Alzheimer's dementia such as hippocampal atrophy.
  - c. Detects white matter hyperintensities (WMH). WMH is a marker of impairment in the integrity of the white matter. There's an association between WMH and the development of some late-life conditions, such as major depression and vascular dementia.
  
- PET or SPECT scan
  - a. Helpful for distinguishing Alzheimers from frontotemporal dementia (FTD). In FTD, you will see lower metabolism in the frontal lobe area vs. AD, where you will see hypometabolism in the medial temporal lobe
  - b. Ligands for amyloid and tau can help assess the risk of progressing from mild cognitive impairment to Alzheimer's disease.