Factors Influencing Incidental Findings

• Body part scanned
• Age of patients
• Whether they have any pre-disposing conditions
  – Hypertension, etc.
• Type of scan performed (i.e., amount of anatomy included)
  – Often most of the study is fMRI or other sequences
    not typically used for diagnosis
• Operator’s experience
  – Technologists > Students, etc.
What is an Incidental Finding?

• “an incidental finding is a finding concerning an individual research participant that has potential health or reproductive importance and is discovered in the course of conducting research but is beyond the aims of the study.”

Two Main Models

• Researcher referral
• Read everything
Consent Forms: Researcher Referral

• The investigators for this project are not trained to perform radiological diagnosis, and the scans performed in this study are not optimized to find abnormalities. The investigators and Stanford are not responsible for failure to find existing abnormalities in your MRI scans.

• However, on occasion the investigator may notice a finding on a MRI scan that seems abnormal. When this occurs, a radiologist will be consulted as to whether the finding merits further investigation, in which case the principal investigator of the research study being conducted will contact you and your primary care physician and inform you of the finding.

• The decision as to whether to proceed with further examination on treatment lies solely with you and your physician.

Available at http://cafn.stanford.edu/index.php/Documents
Workflow: Researcher Referral

• Someone sees something.
  – Do not alarm subject (!)
  – (Maybe) mechanism for immediate rad consultation
  – (Maybe) screening by a more senior non-MD on site
• If deemed significant at this level, PI made aware.
• Referred to radiologist for a report (of some kind)
  – Often limited, because non-clinical imaging protocol is used
• Report given to PI (maybe) with recommendations for follow-up
• Follow-up is responsibility of patient
  – Including any incurred expenses

*Consensus of workflows from Stanford Lucas Center, Stanford CNI, UCSF, and MGH
Possible Sequelae

- **No action necessary**
  - most common

- **Routine referral**
  - Anatomic sequences not adequate for diagnosis
  - Contrast needed but not given

- **Urgent referral**
  - Follow-up in next few days

- **Immediate referral**
  - In theory, cannot wait for specialist read
  - Least common (fortunately)

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Issues with Referrals

Stressful for patient
May lead to more tests
Financial costs
False positives

Potential treatable causes
A Large Study

• Meta-analysis: 16 studies, 19,559 subjects
• Excluded white matter lesions, silent infarcts, and microbleeds, mega cisterna magna, cavum septum pellucidum, asymmetric ventricles
• Prevalence of:
  – Non-neoplastic findings 2.0% (95% CI 1.1-3.1%)
    • Arachnoid cyst 0.5%, Aneurysm 0.35%, Chiari 0.24%
  – Neoplastic findings 0.7% (0.47-0.98%)
    • Meningioma 0.29%, Pit adenoma 0.15%, LGG 0.05%
• More common on high-resolution studies
  – 4.3% vs. 1.7%

Morris et al. Incidental findings on brain magnetic resonance imaging: systematic review and meta-analysis, BMJ 2009; 339:b3016
A Small Study

• Research MRI setting
  – 2 3T, 1 7T, 1 3T PET/MRI
  – Circa 1000 human scans per year
• Primarily neuro brain scans (>70%)
  – A lot of EPI
• Scans performed primarily by students & technologists (non-MD’s and non-radiologists)
Incidental Findings

- Review of 2.5 year period (2013-2015)
  - 49/2500 cases referred, 80% brain
  - About 2% of total

- 11 cases required contacting subject
  - 0.4%

- 2 cases leading to possible action
  - 0.1%
Cases Not Requiring Follow-up

• Perivascular spaces, VR spaces (n=9)
• Nothing (n=4)
• Arachnoid cyst (n=2)
• Arachnoid granulation (n=2)
• Sinus disease (n=2)
• White matter hyperintensities (n=2)
• Pineal cystic lesion (n=2)
• Normal pituitary (n=2)
Perivascular Spaces

*a.k.a. Virchow-Robin Spaces*
Perivascular Spaces

a.k.a. Virchow-Robin Spaces
Perivascular Spaces
*a.k.a. Virchow-Robin Spaces*

- CSF signal intensity
- Surrounding small vessels
- Usually bilateral
- Most common locations
  - Basal ganglia, esp putamen
  - Supratentorial WM
  - Midbrain
Arachnoid Cyst

- Located CSF collections
- CSF signal intensity
- Can be large and have mass effect
- May thin adjacent skull
- No underlying brain tissue changes
- Common locations
  - Anterior temporal tip (esp L)
  - Retrocerebellar
  - Over frontal convexities
- Almost never intervened upon
Urgent Case 1

- Small subacute subdural hematoma
  - Observation only, no intervention performed
Urgent Case 2

- Pituitary adenoma/Rathke’s cleft cyst
  - Discussion with neurosurgeon re: possible surgery
Researcher Referral Model: Issues

• Does not allow participants to “opt out” of being informed about even minor findings
• Does not address possible significant findings that are not obvious enough to be identified by the research team
  – Often technologist or student
• Alternatives
Read Everything Model

• All scans read by a neuroradiologist
• Example: NCANDA study
  – Study of healthy adolescents looking at brain changes due to alcohol consumption
  – N=833
• Abnormalities found in 11.4% of cases
  – 6% after removing mega cisterna magna, etc.
  – 0.4% urgent referrals (3/833)

Pfefferbaum et al., Cerebral Cortex 2015; 1-21.
Read Everything Model

• More abnormalities detected
• Most not relevant
• Dilemmas:
  – 5 gray matter heterotopias found
  – All presumably asymptomatic
  – ? Should this be reported to children/parents?
• Most severe abnormalities probably found at same rate as researcher referral model
• Expensive (if you have to pay)

Pfefferbaum et al., Cerebral Cortex 2015; 1-21.
Conclusions

• If you scan, you will see abnormalities
• Two main models, lots of discretion in between
• Be prepared
  – Inform patients via consent process
  – Know the procedure in your lab
  – Work on your poker face
• Many will be normal variants or artifacts
• Low index of suspicion for referral for researchers
• You may save a life.
• Good luck!

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This talk available @ http://cafn.stanford.edu/index.php/Lectures
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