UK Biobank imaging assessment visit: incidental findings

The scans we do during your UK Biobank imaging visit are not intended to diagnose disease. They are not designed to find any particular abnormalities and will not be routinely analysed by doctors or other specialists. The technicians (radiographers) who do the scans will be looking at the images to make sure of their quality, rather than looking for evidence of any health problems.

However, abnormalities can show up on scans taken for research during the canning process. Most of these are no cause for concern. But, if the radiographer does happen to notice a potentially serious abnormality while taking the scan, they will refer the scans after your visit to a specialist doctor (radiologist) for review. If the radiologist agrees that the abnormality is potentially serious (regardless of whether or not it might be treatable), we will write to you and your GP, usually within a few weeks of your visit.

We would consider something to be potentially serious if your scans suggested the possibility of a condition which, if confirmed, could have a major effect on how your body functions or on your quality of life, or could be life-threatening. For example, we would tell you and your GP if we saw an abnormality on one of your scans that looked as though it could be a malignant tumour or another similarly serious condition, such as a large swelling of the aorta (the main artery of the body). On the other hand, we would not tell you if we saw typical appearances of gallstones, a simple cyst or scarring (e.g., on the lung) as these abnormalities are common in healthy people and not considered serious

We would also not tell you about something that is clearly related to a health condition that you have already told us about. Finally, we would not tell you about a potentially serious abnormality if it was identified at a later date by researchers analysing the scans.

From our experience so far, about two out of every hundred people taking part in this visit (2%) will have an abnormality that a radiologist agrees is potentially serious and which we will write to you and your GP about. About one in three of these people will turn out to have something serious that they may not have been aware of before, while two out of every three of these people will turn out to have something non-serious. This happens because something that looks suspicious on one of our research scans can turn out to be something like a benign cyst, an artefact (or technical glitch) of the scanning process, or something that you or your GP already know about (but we don't).

It is important to understand that we will not notice all potentially serious abnormalities. For this reason, if you do not receive any feedback from us about a potentially serious abnormality, you should not regard this as reassurance about your health. It should not stop you from seeing your doctor about any health concerns that you might have. We are carefully monitoring our processes for reporting potentially

serious abnormalities. The technicians doing the scanning have ongoing training about the abnormalities that they notice.

UK Biobank has developed a list of findings which if spotted by one of the technicians during the scanning procedure would be considered potentially serious, and findings not considered serious, for use by radiographers and reporting radiologists. These lists were based on lists generated by the German National Cohort, and are subject to ongoing review (see over).

Glossary

Aneurysm	An excessive localised swelling or bulge in the wall of a major artery
Aorta	The main artery of the body, supplying blood to the circulatory system
Cyst	An abnormal sac or lump containing fluid
Haemorrhage	Bleeding in the brain, caused by a rupture in a blood vessel
Infarction	Obstruction of the blood supply to an organ, such as the heart; heart attack
Intracranial	Occurring inside the skull
Lesion	A region of an organ that has been damaged by injury or disease, such as an ulcer, abscess or tumour
Mass (eg cardiac mass)	Benign or cancerous tumour
Tumour	A swelling caused by abnormal growth of tissue, either benign (generally not harmful) or malignant (cancerous)
Ventricle	A hollow part of an organ, such as the left and right ventricles of the heart and the four connected fluid-filled cavities in the brain

Table A4i: Incidental findings on brain MRI

Potentially serious for feedback	Not for feedback
Acute brain infarction	Asymmetrical ventricles
Acute hydrocephalus	Chiari malformation[4]
Acute intracranial haemorrhage[1]	Chronic hydrocephalus
Arachnoid cyst[3]	Developmental anomalies (including venous anomalies)
Colloid cyst of third ventricle	Lipoma of corpus callosum
Intracranial mass lesion[2]	Non-acute brain infarction
Mastoiditis	Non-specific white matter hyperintensities
Suspected intracranial aneurysm or vascular malformation	Regional or global atrophy
	Suspected demyelination

[1] Not old bleeds, or micro-bleeds only detected on gradient recalled echo sequences
[2] Except meningiomata in locations considered highly unlikely to cause problems
[3] Only if large and considered likely to increase the risk of developing a subdural haematoma
[4] Descent of part of the cerebellum +/- brainstem below the foramen magnum

Table A4ii: Incidental findings on cardiac MRI

Potentially serious for feedback	Not for feedback
Aortic dissection	Atelectasis
Cardiac mass (including thrombus)	Calcified pleural plaque
Central PE	Calcified pulmonary nodule
Haemodynamically relevant pericardial effusion >2 cm	Emphysema
Heart valve defects[1]	Right sided descending aorta
Hilar, mediastinal, axillary or cervical lymphadenopathy[2]	
Lobar pneumonia or lung consolidation	
Lung mass > 2 cm	
Mediastinal mass > 2 cm	
Pleural effusion	
Pleural mass > 2 cm	
Pneumothorax	
Severe left or right ventricular dilation or dysfunction	
Severe left ventricular hypertrophy > 2 cm thick wall	
Thoracic aortic aneurysm > 5 cm	

[1] Severe regurgitation jet of any valve or severe turbulence (suggesting valve stenosis)
[2] >1.5cm and >3 lymph nodes grouped in a circumscribed region

Table A4iii: Incidental findings on the abdominal portion of the body MRI

Potentially serious for feedback	Not for feedback
Abdominal aortic aneurysm > 5 cm	Abdominal wall hernia
Acute exudative pancreatitis	Bladder diverticulum
Adrenal lesion > 2 cm	Chronic cholecystitis
Ascites	Chronic pancreatitis
Cholestasis (intra- or extra-hepatic)[1]	Fatty liver
Deep vein thrombosis	Fibroids
Hepatomegaly	Gallstones
Ileus	Hiatus hernia
Intra-abdominal mass > 3 cm	Left sided inferior vena cava
Irregular/nodular liver margin	Liver cyst
Lymphadenopathy[2]	Renal calculus
Multiple small non-cystic, liver lesions (non haemangioma-like)	Simple renal cyst
Pneumoperitoneum	Single kidney
Portal vein occlusion	
Pyelonephritis	
Renal artery stenosis > 80% or bilateral	
Solid / cystic pancreatic tumour	
Solid gallbladder lesion	
Solid liver lesion	
Solid/semi-solid renal tumour > 2 cm	
Spleen infarction	
Splenomegaly > 15 cm	
Urinary obstruction	
Urinary tract mass > 2 cm	

[1] Common bile duct >15mm (or >20mm post cholecystectomy)
[2] >1.5cm and >3 lymph nodes grouped in a circumscribed region

Table A4iv: Incidental findings on dual energy X-ray absorptiometry

Potentially serious for feedback	Not for feedback
Major vertebral fracture	Non-skeletal findings
Primary skeletal malignancy	
Skeletal metastases	

Carotid Doppler ultrasound

Although asymptomatic carotid stenosis may be picked up by carotid ultrasound, its relevance in predicting prognosis over and above conventional vascular risk factors is not established, and so it was not considered to be a potentially serious incidental finding. Extra-carotid findings were not considered relevant for UK Biobank's imaging study as the radiographers conducting the imaging are specifically trained in the vascular component of this imaging modality only. Hence, carotid Doppler data do not form part of this manuscript.