

Relationship between neuroimaging protocol re-acquisition and cardiovascular risk factors in the assessment of cerebrovascular imaging markers



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Cardiovascular risk factors influence the acquisition and quality of MRI images																																																											
INTRODUCTION		METHODS		RESULTS																																																							
Context: Increasing use of neuroimaging in population studies to investigate links between risk factors and brain health indices. Image quality and availability potentially influenced by some risk factors Aim: Assessing the relationship between cardiovascular risk factors and availability of sequences used for assessment of cerebrovascular health.		Risk factors: Age at scan, Sex, White blood cells count (WBC), HDL-Cholesterol, Triglycerides, Total cholesterol, Framingham risk score (FRS), HbA1c, Diastolic BP, Systolic BP, Body Mass Index (BMI), Smoking status Statistical analysis: - Spearman correlation between number of repetition and absence of ASL - Univariate logistic regression between risk factors and presence of repetition or absence of ASL sequence		- Repetition of any structural sequence associated with absence of ASL (rho=0.73 p<0.0001) - Higher BMI (OR=1.14 [1.08;1.19] per additional 1kg/m2) and FRS (OR=1.20 CI=[1.02; 1.41] per 10 points p=0.03) associated with higher risk of reacquisition. - Age at scan associated with FLAIR repetition (OR=3.38 [2.24;5.11] p<0.0001). Number of individuals with different number of repeated scans																																																							
Study population: - NSHD – 1946 Birth cohort - Insight46 - Neuroimaging sub-study of NSHD Wave 1 Imaging protocol: - Order: T1-weighted, T2-weighted, T2-FLAIR and ASL - Structural images re-acquired in case of sub-optimal image quality. - ASL abandoned if not enough time left for acquisition.		RESULTS - Repeat structural scan required in 43.5% of cases 29.1% individuals with repeated T1-w <table><tr><th>Sequences</th><th># of acquired scans</th></tr><tr><td></td><td>1 / 2 / 3 / 4 / 5 / 6 / 7</td></tr><tr><td>T1-w</td><td>334 / 105 / 30 / 1 / 1 / 0 / 0</td></tr><tr><td>T2-w</td><td>402 / 68 / 1 / 0 / 0 / 0 / 0</td></tr><tr><td>T2-FLAIR</td><td>380 / 87 / 4 / 0 / 0 / 0 / 0</td></tr><tr><td>Structural sequences</td><td>0 / 0 / 268 / 98 / 80 / 21 / 4</td></tr></table>		Sequences	# of acquired scans		1 / 2 / 3 / 4 / 5 / 6 / 7	T1-w	334 / 105 / 30 / 1 / 1 / 0 / 0	T2-w	402 / 68 / 1 / 0 / 0 / 0 / 0	T2-FLAIR	380 / 87 / 4 / 0 / 0 / 0 / 0	Structural sequences	0 / 0 / 268 / 98 / 80 / 21 / 4	<table><tr><th></th><th>No repetition (n=268)</th><th>>=1 repetition (n=203)</th></tr><tr><td>Age</td><td>70.57 (0.68)</td><td>70.78 (0.64)</td></tr><tr><td>WBC</td><td>6.52 (2.11)</td><td>6.45 (1.48)</td></tr><tr><td>HDL</td><td>1.67 (0.50)</td><td>1.58 (0.49)</td></tr><tr><td>Triglycerides</td><td>1.55 (0.80)</td><td>1.70 (0.94)</td></tr><tr><td>Total Cholesterol</td><td>5.40 (1.17)</td><td>5.24 (1.07)</td></tr><tr><td>FRS</td><td>17.45 (11.00)</td><td>20.00 (12.85)</td></tr><tr><td>HbA1c</td><td>5.71(0.64)</td><td>5.75 (0.59)</td></tr><tr><td>Diastolic BP</td><td>72.84 (9.98)</td><td>73.83 (9.98)</td></tr><tr><td>Systolic BP</td><td>132.97 (19.15)</td><td>135.89 (19.62)</td></tr><tr><td>BMI</td><td>26.57 (3.88)</td><td>28.98 (4.83)</td></tr><tr><td>Female</td><td>135 (50.4)</td><td>96 (47.3)</td></tr><tr><td>Smoker</td><td>9 (3.4)</td><td>14 (6.8)</td></tr><tr><td>ASL missing</td><td>6 (2.2)</td><td>124 (61.1)</td></tr></table> Higher systolic BP (OR=1.14 CI=[1.02; 1.27] per 10mmHg, p=0.013) associated with higher risk of T1 reacquisition			No repetition (n=268)	>=1 repetition (n=203)	Age	70.57 (0.68)	70.78 (0.64)	WBC	6.52 (2.11)	6.45 (1.48)	HDL	1.67 (0.50)	1.58 (0.49)	Triglycerides	1.55 (0.80)	1.70 (0.94)	Total Cholesterol	5.40 (1.17)	5.24 (1.07)	FRS	17.45 (11.00)	20.00 (12.85)	HbA1c	5.71(0.64)	5.75 (0.59)	Diastolic BP	72.84 (9.98)	73.83 (9.98)	Systolic BP	132.97 (19.15)	135.89 (19.62)	BMI	26.57 (3.88)	28.98 (4.83)	Female	135 (50.4)	96 (47.3)	Smoker	9 (3.4)	14 (6.8)	ASL missing	6 (2.2)	124 (61.1)
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CONCLUSIONS Quality and availability of scans in population studies potentially influenced by cardiovascular risk factors Risk for underestimation of relationship between risk factors and imaging biomarkers in complete case analysis		CONTACT c.sudre@ucl.ac.uk																																																									