mmol/mol. Patients were followed up for major adverse cardiovascular events (MACE) including cardiovascular death, heart failure hospitalisation, non-fatal MI and non-fatal stroke. CMR studies were performed on a Siemens Prisma 3T scanner (Siemens Healthineers, Erlangen, Germany).

Results Of 343 patients, 176 were normoglycaemic and 167 dysglycaemic. During follow up (median 623 days) there were 35 MACE events in 30 patients, including 23 heart failure hospitalisations (6.7%), 4 strokes (1.1%), 7 cardiovascular deaths (2.0%) and 1 (0.3%) acute coronary syndrome. Univariate Cox regression analysis showed left ventricle ejection fraction (LVEF), right ventricle ejection fraction (RVEF), native T1, extracellular volume fraction, myocardial perfusion reserve (MPR) and the presence of occult IHD all to have significant association with MACE. However MPR was only associated with MACE in dysglycaemic patients (hazard ratio (HR) 0.19, 95% confidence interval (CI) 0.08–0.46, P<0.001) and occult IHD was only associated with MACE in normoglycaemic patients (HR 3.45, 95% CI 1.23–9.71, P=0.02) (figure 1). The relationship between MPR and MACE in dysglycaemic patients was still significant even after correction for LVEF, RVEF and HbA1c (HR 0.553, 95% CI 0.318–0.962, P=0.036).

Conclusions In patients with a recent diagnosis of heart failure, impairment of myocardial microvascular function is associated with adverse outcomes in dysglycaemic but not normoglycaemic patients, possibly explaining the excess risk in these patients. Further studies are needed to confirm these findings and establish if impaired microvascular function or associated outcomes can be altered by medical therapy.

Abstract 11 Figure 1 (i) Schematic (not to scale) showing the internal and external phantom structure. (ii) Phantom front view showing isocentre line and liquid crystal display thermometer. (iii) T1 and T2 times in the T2 phantom as measured at 3T and 1.5T. Slow scan reference data for T1/T2 (i) Schematic (not to scale) showing the internal and external phantom structure. (ii) Phantom front view showing isocentre line and liquid crystal display thermometer. (iii) T1 and T2 times in the T2 phantom as measured at 3T and 1.5T. Slow scan reference data for T1/T2 mapping is key to quantifying myocardial inflammation. Use of T2 mapping in clinical studies is burgeoning but in the absence of a quality control system, single-center findings are not generalizable and longitudinal studies cannot reliably track alterations in T2 times reflecting the inflammatory state of the myocardium.

Aim We used our expertise gained from the development of the T1 Mapping and Extracellular Volume (TIMES) phantom, to develop a dedicated T2 mapping CMR phantom to medical device standards.
Method A design collaboration including a specialist MRI small-medium enterprise, clinicians, physicists and national metrology institutes was formed. A T2 mapping phantom (figure 1 i) was designed to cover clinically relevant T1 and T2 times in native and post-contrast myocardium across field-strengths (figure 1 iii,v). Two earlier prototypes had been manufactured and tested, with the third and final one being reported here.

Results The T2 mapping phantom which can be used at both 1.5 and 3 Tesla is an agarose gel-based phantom using nickel chloride as the paramagnetic relaxation modifier. It contains nine differently-doped agarose gel tubes embedded in a gel/beads matrix.

The phantom was free of air bubbles and susceptibility artifacts at both field strengths (figure 1 ii) and T2 maps were free from off-resonance artifacts (figure 1 iv). The incorporation of high-density polyethylene beads in the main gel fill was effective at flattening the B0 and B1 fields (figure 2 i,ii). T1 and T2 times measured in the phantom showed coefficients of variation of ≤1% between repeat scans indicating good short-term reproducibility. Temperature dependency experiments conducted at the national metrology institutes (figure 2 iii) confirmed that over the range 13–40°C the short-T1/2 tubes were more stable with temperature than the long-T1/2 tubes.

Conclusion The program has developed a T2 mapping phantom for CMR replicating clinically relevant T1/T2 times across myocardial health and disease. The device will be shortly listed under the Food and Drug Administration (FDA) database and Conformité Européenne (CE) marking. Reproducible mass manufacture of this phantom may now commence to support the use of T2 mapping in longitudinal cohort studies, multicentre research or inflammation imaging.