Appendix 1

CMR image acquisition

CMR scans were performed on a 3.0 T whole-body scanner MAGNETOM Trio Tim and Skyra (Siemens Medical Solutions). Patients were examined in the supine position and a dedicated 2-element cardiac-phased array coil was attached to the patients. A standard electrocardiogram (ECG)-triggering device was simultaneously used, and localizers were used to determine the cardiac axes. A balanced steady-state free-precession (bSSFP) sequence [repetition time (TR)/echo time (TE): 2.81/1.22 ms; flip angle: 40°; slice thickness: 8 mm; field of view (FOV): 250×300 mm; matrix size: 208×139] was used. Following a survey scan, 8–12 continuous cine CMR images in short-axis from the base to the apex and the long-axis 2-chamber, 3-chamber, and 4-chamber view cine series were acquired during multiple breath-holding periods.

Subsequently, to detect myocardial infarction, a contrast dose of 0.2 mL/kg of gadobenate dimeglumine (MultiHance 0.5 mmol/mL; Bracco) was injected into the right antecubital vein using an automated injector (Stellant, MEDRAD) at a flow rate of 2.5–3.0 mL/s, which was followed by a 20-mL saline flush at a rate of 3.0 mL/s. Late gadolinium enhancement (LGE) imaging was obtained at an average of 10–15 min after contrast injection via segmented-turbo-FLASH-phase-sensitive inversion recovery (PSIR) sequence (TR/TE: 750/1.18 ms; flip angle: 40°; slice thickness: 8 mm; FOV: 400×270 mm; matrix size: 256×148).

CMR image analysis

All CMR images analyses were performed using dedicated software (CVI42 version 5.9.1, Circle Cardiovascular Imaging, Inc.) by 2 investigators with at least 3 years of CMR experience and who were blinded to patients' clinical information. We manually delineated the endocardial (excluding papillary muscles and trabeculations) and epicardial contours in serial short-axis slices at the end-diastole and end-systole, and then left ventricular end diastolic volume (LVEDV), left ventricular end systolic volume (LVESV), left ventricular stroke volume (LVSV), LVEF and left ventricular mass (LVM) were calculated automatically. Trabeculations were defined as the myocardium protruding from the LV compacted myocardial wall into the cavity at end-diastole (46). LVM was calculated at end-diastole and was indexed to body surface area (BSA) to obtain the left ventricular mass index (LVMI). Maximal noncompacted to compacted (NC:C) ratio was defined as the maximal end diastolic ratio of the thickness of the LV noncompacted myocardium to compacted myocardium in any long-axis view (17). The number of noncompacted segments was evaluated based on American Heart Association standard segmentation recommendations, including 6 basal segments, 6 middle segments, and 4 apical segments (3,47). Right ventricular (RV) function and size evaluation in CMR were performed according to the criteria described by Petersen *et al.* (48).

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Table S1 The detailed definitions of events and end points

Event	End points	All cohort (n=96), n (%)	Training cohort (n=76), n (%)	Validation cohort (n=20), n (%)
Heart failure	HF hospitalization, cardiac resynchronization therapy implantation, LV assist device implantation, heart transplantation	11 (11.46)	8 (10.53)	3 (15.00)
Ventricular arrhythmia	Ventricular tachycardia/fibrillation, implantable cardioverter defibrillator therapy	6 (6.25)	4 (5.26)	2 (10.00)
Systemic embolism	Embolic stroke/transient ischemic attack, embolic myocardial infarction, peripheral artery embolism	0	0	0
All-cause death	–	4 (4.17)	3 (3.95)	1 (5.00)

HF, heart failure; LV, left ventricular.

Table S2 The details of the 105 radiomic features

Feature type	Radiomics features
Shape-based	Elongation, flatness, least axis length, major axis length, maximum 2D diameter column, maximum 2D diameter row, maximum 2D diameter slice, maximum 3D diameter, mesh volume, minor axis length, sphericity, surface area, surface volume ratio, voxel volume
First-order	10^{th} percentile, 90^{th} percentile, energy, entropy, interquartile range, kurtosis, maximum, mean absolute deviation, mean, median, minimum, range, robust mean absolute deviation, root mean squared, skewness, total energy, uniformity, variance
GLCM	Autocorrelation, joint average, cluster prominence, cluster shade, cluster tendency, contrast, correlation, difference average, difference entropy, difference variance, joint energy, joint entropy, Imc1, Imc2, Idm, Idmn, Id, Idn, inverse variance, maximum probability, sum entropy, sum squares
GLRLM	Gray-level nonuniformity, gray-level nonuniformity normalized, gray-level variance, high gray-level run emphasis, long-run emphasis, long-run high gray-level emphasis, long-run low gray-level emphasis, low gray-level run emphasis, run entropy, run length nonuniformity, run length nonuniformity normalized, run percentage, run variance, short-run emphasis, short-run high gray-level emphasis, short-run low gray-level emphasis
GLSZM	Gray-level nonuniformity, gray-level nonuniformity normalized, gray-level variance, high gray-level zone emphasis, large-area emphasis, large-area high gray-level emphasis, large-area low gray-level emphasis, low gray-level zone emphasis, size-zone nonuniformity, size-zone nonuniformity normalized, small-area emphasis, small-area high gray-level emphasis, small-area low gray-level emphasis, zone entropy, zone percentage, zone variance
GLDM	Dependence entropy, dependence nonuniformity, gray-level nonuniformity, dependence nonuniformity normalized, dependence variance, gray-level variance, high gray-level emphasis, large-dependence emphasis, large-dependence high gray-level emphasis, low gray-level emphasis, large-dependence low gray-level emphasis, small-dependence emphasis, small-dependence high gray-level emphasis, small-dependence low gray-level emphasis
NGTDM	Busyness, coarseness, complexity, contrast, strength

See the Pyradiomics documentation (https://pyradiomics.readthedocs.io/en/latest/index.html) for the details of all radiomics features. GLCM, gray-level co-occurrence matrix; Imc, informational measure of correlation; Idm, inverse difference moment; Idmn, Inverse Difference Moment Normalized; Id, inverse difference; Idn, inverse difference normalized; GLRLM, gray-level run length matrix; GLSZM, gray-level size-zone matrix; GLDM, gray-level dependence matrix; NGTDM, neighboring gray tone difference matrix.

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Table S3 The details of the machine learning pipeline

Machine learning pipeline	Detailed parameters
ADASYN imbalanced learning	Python imbalanced-learn (version 0.9.0); sampling strategy, auto; n neighbors =5
XGBoost feature selection	Python XGBoost (version 0.82); booster, GBTree, maximum depth, 10; lambda value, 1; learning rate, 0.01; evaluated metric, AUC; sample:feature ratio, 10
SVM modeling	Python Scikit-learn (version 0.24.2); C-support vector classification; C =1, kernel, rbf; gamma, scale; probability = true; cache size, 200

ADASYN, adaptive synthetic; XGBoost; extreme gradient boosting; GBT, gradient-boosted decision tree; AUC, area under the receiver operating characteristic curve; SVM, support vector machine.

Table S4 Inter- and intraobserver variability of the 12 most important radiomics features

Radiomics feature	Intraobserver (n=96)		Interobserver (n=96)	
	ICC	95% CI	ICC	95% CI
First-order minimum	0.934	0.903–0.956	0.917	0.879–0.944
Shape flatness	0.993	0.990–0.995	0.994	0.991–0.996
Shape elongation	0.996	0.994–0.998	0.992	0.988–0.995
GLCM cluster shade	0.996	0.994–0.998	0.995	0.993–0.997
GLSZM gray-level nonuniformity	1.000	0.999–1.000	0.999	0.999–1.000
GLSZM large-area high gray-level emphasis	0.997	0.995–0.998	0.991	0.986–0.994
Shape maximum of the 2D diameter row	0.984	0.976–0.989	0.984	0.976–0.989
NGTDM coarseness	0.997	0.996–0.998	0.997	0.995–0.998
GLCM Idn	0.995	0.992–0.997	0.979	0.969–0.986
First-order kurtosis	0.996	0.994–0.997	0.985	0.978–0.990
GLSZM size-zone nonuniformity normalized	0.999	0.999–1.000	0.999	0.999–0.999
First-order 10th percentile	0.980	0.970–0.986	0.979	0.969–0.986

ICC, intraclass correlation coefficient; CI, confidence interval; GLCM, gray-level co-occurrence matrix; GLSZM, gray-level size-zone matrix; NGTDM, neighboring gray-tone difference matrix; GLCM Idn, gray-level co-occurrence matrix inverse difference normalized.

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Table S5 Comparation of the 12 most important radiomic features between different magnetic resonance scanners

Radiomics feature	Trio Tim (n=64)	Skyra (n=32)	P
First-order minimum	−69.33 (−78.92, −61.04)	−70.92 (−76.57, −54.26)	0.529
Shape flatness	0.11±0.02	0.10±0.02	0.010
Shape elongation	0.93 (0.90, 0.96)	0.95 (0.92, 0.97)	0.126
GLCM cluster shade	6,407.77 (1,809.62, 13,926.11)	4,641.12 (1,810.87, 8,870.81)	0.234
GLSZM gray-level nonuniformity	105.07 (80.92, 143.41)	139.81 (94.72, 209.90)	0.034
GLSZM large area high gray-level emphasis	3,059.62 (2,328.52, 4,007.85)	4,446.98 (3,269.78, 5,705.16)	<0.001
Shape maximum of the 2D diameter row	82.17 (71.65, 95.25)	87.47 (75.18, 100.81)	0.437
NGTDM coarseness	0.00±0.00	0.00±0.00	0.007
GLCM Idn	0.95±0.01	0.96±0.01	0.147
First-order kurtosis	3.37 (3.00, 3.99)	3.62 (3.19, 4.25)	0.247
GLSZM size-zone nonuniformity normalized	0.58±0.09	0.59±0.05	0.531
First-order 10th percentile	−4.07±24.81	32.75±38.20	<0.001

GLCM, gray-level co-occurrence matrix; GLSZM, gray-level size-zone matrix; NGTDM, neighboring gray-tone difference matrix; GLCM Idn, gray-level co-occurrence matrix inverse difference normalized.

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