

**Delivery indicators and enablers for cardiovascular  
disease: a modified Delphi method and UK NHS feasibility  
assessment study**

**Supplementary materials**

## Supplementary material A

- CVDPREVENT (to March 2021) – Indicator CVDP001CHOL:  
<https://www.cvdprevent.nhs.uk/data-extract?period=2&systemLevel=2&indicator=5>
- CVDPREVENT (to March 2021) – Indicator CVDP002FH:  
<https://www.cvdprevent.nhs.uk/data-extract?period=2&systemLevel=2&indicator=9>
- CVDPREVENT (to March 2021) – Indicator CVDP003FH:  
<https://www.cvdprevent.nhs.uk/data-extract?period=2&systemLevel=1&indicator=10>
- GP practice populations (April 2021):  
<https://digital.nhs.uk/data-and-information/publications/statistical/patients-registered-at-a-gp-practice/april-2021>
- NHS Digital. English prescribing dataset (EPD):  
<https://opendata.nhsbsa.net/dataset/english-prescribing-data-epd>
- NHS Digital. Hospital Episode Statistics (HES):  
<https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics>
- Local authority to ICS lookup:  
<https://geoportal.statistics.gov.uk/datasets/ons::lsoa-2011-to-clinical-commissioning-groups-to-sustainability-and-transformation-partnerships-april-2021-lookup-in-england/explore>
- Local authority mapping information:  
<https://geoportal.statistics.gov.uk>  
[https://en.wikipedia.org/wiki/2019%E2%80%932023\\_structural\\_changes\\_to\\_local\\_government\\_in\\_England](https://en.wikipedia.org/wiki/2019%E2%80%932023_structural_changes_to_local_government_in_England)
- Lower tier local authority to upper tier local authority lookup:  
<https://geoportal.statistics.gov.uk/datasets/ons::lower-tier-local-authority-to-upper-tier-local-authority-april-2021-lookup-in-england-and-wales/explore>
- NHS Health Check (2017/81 Q1 - 2021/22 Q2):  
<https://fingertips.phe.org.uk/profile/nhs-health-check-detailed/data>
- People invited for an NHS Health Check (2017/81 Q1 - 2021/22 Q2):  
<https://fingertips.phe.org.uk/profile/nhs-health-check-detailed/data#page/3/gid/1938132726/pat/15/ati/402/are/E06000047/iid/91111/age/219/sex/4/cat/-1/ctp/-1/yr/5/cid/4/tbm/1/page-options/car-do-0>

- People receiving an NHS Health Check (2017/81 Q1 - 2021/22 Q2):  
<https://fingertips.phe.org.uk/profile/nhs-health-check-detailed/data#page/3/gid/1938132726/pat/15/par/E92000001/ati/402/are/E06000047/iid/91112/age/219/sex/4/cat/-1/ctp/-1/yrr/5/cid/4/tbm/1/page-options/car-do-0>
- Prevalence estimates (2015):  
<https://fingertips.phe.org.uk/profile/prevalence/data#page/3/gid/1938133099/pat/15/ati/101/are/E06000047/iid/92783/age/164/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1/page-options/car-do-0>
- Prevalence estimates, atrial fibrillation (2019):  
<https://www.gov.uk/government/publications/atrial-fibrillation-prevalence-estimates-for-local-populations>
- Prevalence estimates, cardiovascular disease (2014/15):  
<http://tools.england.nhs.uk/cfv2016/cvd/atlas.html>
- Prevalence estimates, heart failure (2015):  
<https://fingertips.phe.org.uk/profile/prevalence/data>
- Prevalence estimates, hypertension (2017):  
<https://www.gov.uk/government/publications/hypertension-prevalence-estimates-for-local-populations>
- Quality and Outcomes Framework (2020/21) – indicators SMOK005, AF001, AF007, CHD001, CHD005, HF001, HF005, HF007, HYP001:  
<https://digital.nhs.uk/data-and-information/publications/statistical/quality-and-outcomes-framework-achievement-prevalence-and-exceptions-data/2020-21>
- Wilmington Healthcare, Core Data on file.

**Supplementary table A.** Criteria for reviewing delivery indicators based on the ESC's QIs for CVD[7]

Domain	Criteria	Marking
Importance	DI reflects a clinical area that is of high importance and impact on the delivery of the CVD NHS LTP, where implementation of indicator will impact on factor	Likert scale 0–5
Evidence base	DI is based on acceptable evidence consistent with contemporary knowledge	Y/N
Specification	DI has clearly defined patient group to whom the measurement applies (denominator)	Y/N
Validity	DI is able to correctly assess what it is intended to, adequately distinguishes between good and poor impact	Y/N
Reliability	DI is reproducible even when data are extracted by different people and estimates of implementation on the basis of available data are likely to be reliable and unbiased	Y/N
Feasibility	DI may be identified and implemented with reasonable cost and effort data needed for the assessment are (or should be) readily available and easily extracted within an acceptable time frame	Y/N
Interpretability	DI is interpretable by healthcare providers, so that practitioners can understand the results of the assessment and take actions accordingly	Y/N
Actionability	DI is influential to the current practice where a large proportion of the determinants of adherence to the DI is under the control of healthcare providers	Y/N

CVD, cardiovascular disease; DI, delivery indicator; NHS LTP, NHS long term plan.

**Supplementary table B.** Candidate indicators assessed by core group in Step 2. Light grey shading indicates candidate indicators eliminated during this step; dark grey shading indicates candidate indicators not voted on by core group but added in later.

Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others <sup>+</sup>	Accepted for survey inclusion
Access to integrated care records for CVD	Access for complete MDT to patient integrated care record	ICS has a primary/secondary care integrated care record (yes/no)		24	26	✓
	Complete MDT and primary care have access to integrated care records	NA	NA	22	16	✗
Identifying CVD review patients	Proportion of general practices actively using case identification tools as part of electronic patient record for CVD risk management	Number of practices that have protocol to actively search on their patient record system for and specifically invite patients into practice for review (rather than just marking notes) in last year in ICS	Number of practices in last year in ICS	21	0	✓
Effective processes for inviting for CVD review in primary care	Total proportion of NHS Health Checks taken up versus those offered to eligible population	People receiving NHS Health Check in last year in ICS	People invited for NHS Health Check in last year in ICS	22	33	✓
Processes for actively managing CVD review invitations	Proportion of general practices using appointment reminder tools	Number of practices using patient text reminder tools in last year in ICS	Number of practices in last year in ICS	23	0	✓
	Proportion of general practices with out-of-working-hours appointments available for NHS Health Checks and/or CVD reviews	Number of practices that actively book NHS Health Checks and/or CVD review appointments out of accepted working hours (6.30 pm to 8.00 am on weekdays and all day at weekends and on bank holidays) in last year in ICS	Number of practices in last year in ICS	23	0	✓
Delivering CVD review management	CVD reviews offered by other providers such as community teams and community pharmacy	Number of other providers (such as community pharmacy, community health) that offer CVD review services in last year in ICS	Number of providers in last year in ICS	19	0	✓
Effectiveness of diagnosis of CVD reviews	Proportion of general practices that have their own ambulatory blood pressure monitors	NA	NA	17	0	✗
Effectiveness of CVD reviews in primary care	Proportion of identified patients with AF	Number of patients on general practice AF registers in last year in ICS	Estimated number of patients with AF in last year in ICS	25	29	✓
	Proportion of identified patients with CHD	Number of patients on general practice CHD registers in last year in ICS	Estimated number of patients with AF in CHD in last year in ICS	24	23	✓
	Proportion of identified patients with HF	Number of patients on general practice HF registers in last year in ICS	Estimated number of patients with HF in last year in ICS	24	24	✓
	Proportion of patients identified with hypertension	Number of patients on general practice hypertension registers in last year in ICS	Estimated number patients with hypertension in last year in ICS	25	25	✓

Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others*	Accepted for survey inclusion
Effective treatment of identified CVD patients	Percentage of patients diagnosed with hypertension (diagnosed after or on 1 April 2009) given lifestyle advice in preceding 12 months for smoking cessation, safe alcohol consumption and healthy diet	Data no longer available in QOF		ND	10	✘
	HF003: in patients with current diagnosis of HF due to LVSD, the percentage of patients currently treated with ACE inhibitor or ARB	HF003: in patients with current diagnosis of HF due to LVSD, the percentage of patients currently treated with ACE inhibitor or ARB in last year in ICS	Register of patients with HF due to LVSD used to calculate APDF for HF003 and HF006	22	33	✘
	HF006: Percentage of patients with current diagnosis of HF due to LVSD currently treated with beta-blocker licensed for HF	HF006: percentage of patients with current diagnosis of HF due to LVSD currently treated with beta-blocker licensed for HF	Register of patients with HF due to LVSD used to calculate APDF for HF003 and HF006	23	33	✘
	HF007: percentage of patients with confirmed diagnosis of HF who have been optimised on medication	Number of patients with diagnosis of HF on register, who had review in preceding 12 months, including assessment of functional capacity and review of medication to ensure medicines optimisation at maximal tolerated doses in last year in ICS	Number of patients on register of patients with HF in last year in ICS			✓
	Percentage of identified patients with hypertension prescribed antihypertensives in last available year	NA	NA	21	27	✘
	Percentage of CVD patients at risk with hypertension treated with statin in last available year	NA	NA	19	27	✘
	Percentage of CVD patients at risk with AF treated with DOAC in last available year	NA	NA	25	33	✘
	Percentage of adult patients with CVD on lipid-lowering medication	Number of patients aged ≥18 years with GP-recorded CVD with previous prescription for lipid-lowering medication in last year in ICS	Number of patients with CVD in last year in ICS			✓
	Percentage of NICE-identified at-risk patients who smoke offered support and treatment	Number of patients with any or any combination of following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers who have record of offer	Number of patients with any or any combination of following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who	24	30	✓

Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others*	Accepted for survey inclusion
		of support and treatment within preceding 12 months in last year in ICS	are recorded as current smokers in last year in ICS			
	Identified interventional cardiologist(s) available to deliver new valvular treatment	NA	NA	17	15	✘
Ability to identify AF patients	Proportion of general practices that have access to an ECG machine	Number of practices that have direct access to 12-lead ECG machine on premises in last year in ICS	Number of practices in last year in ICS	21	0	✓
	Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF	Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF in last year in ICS		21	0	✓
	Average waiting time for access to TTE	Average waiting time for access to TTE in last year in ICS		24	0	✓
	Proportion of general practices with policy for taking pulse at every healthcare contact	Number of general practices with policy for taking pulse at every healthcare contact in last year in ICS	Number of practices in last year in ICS	22	0	✓
AF patients are appropriately managed on anticoagulant	Percentage of patients diagnosed with AF who are currently treated with anticoagulation drug therapy	Number of patients currently treated with anticoagulation drug therapy in those patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -VASC** score ≥2 in last year in ICS	Number of patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -VASC** score ≥2 in last year in ICS	25	33	✓
Processes in place to enable prescription of DOAC at diagnosis for AF patients	DOAC can be initiated in primary care	Primary care prescribing identified in formulary status for DOAC (yes/no)		23	30	✓
	Ratio of prescribed DOAC per identified AF patients	Number of prescribed items for DOAC in last year in ICS	Number of patients on general practice AF registers in last year in ICS	21	27	✓
Identification of people with FH	Ratio of actual versus estimated patients with FH	Number of patients with genetically confirmed FH, all ages in last year in ICS	Number of patients on GP record recorded possible, probable and confirmed FH, all ages in last year in ICS	24	29	✓
Availability of appropriate FH treatment	Appropriate treatment initiation and management (bempedoic acid, inclisiran) is available within ICS	NA	NA	18	0	✘
Availability of FH service	ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing	Identified ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing (yes/no)		23	0	✓
Primary care trained in making FH diagnosis	Targeted professional skills training in FH available for primary care in ICS/STP within year	NA	NA	20	0	✘

Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others*	Accepted for survey inclusion
At-risk CHD patients are appropriately treated with aspirin or alternative agent	Percentage of patients with CHD appropriately treated with aspirin or alternative agent	Number of patients with CHD with record in preceding 12 months that aspirin, alternative antiplatelet therapy or anticoagulant is being taken in last year in ICS	Number of patients with CHD in last year in ICS	24	32	✓
At-risk CVD patients with PAD are appropriately treated with aspirin or alternative	Percentage of patients with PAD with record in preceding 12 months that aspirin or alternative antiplatelet is being taken	NA	NA	23	27	✗
Access to local practice pharmacists for CHD management	Practice pharmacists per 1,000 patients with CHD	Number of practice pharmacists reported in last year in ICS x 1,000	Number of patients with CHD per 1,000 in last year in ICS	21	18	✓
There is confidence in awareness and diagnosis of HF	PCN with breathlessness diagnostic pathway	Number of PCNs in ICS identified with breathlessness diagnostic pathway in last year in ICS	Number of PCNs in last year in ICS	23	0	✓
Access to appropriate HF diagnostics	Percentage of patients with confirmed diagnosis of HF	Patients with diagnosis of HF on or after 1 April (relevant year): 1. Which has been confirmed by echocardiogram or specialist assessment between 3 months before or 6 months after entering onto the register <i>or</i> 2. if newly registered in preceding 12 months, with no record of diagnosis originally being confirmed by echocardiogram or specialist assessment, record of echocardiogram or specialist assessment within 6 months of date of registration in last year in ICS	Number of patients on general practice HF register in last year in ICS			✓
	Proportion of general practices with access to an ECG machine	NA	NA	25	0	✗
	Proportion of general practices that have policy for actively using NT-proBNP in primary care for diagnosis of HF	Number of practices that have policy for actively using NT-proBNP in primary care for diagnosis of HF in last year in ICS	Number of practices in last year in ICS	24	0	✓
	Proportion of general practices that have access to community echocardiography	Number of practices that have access to community echocardiography in last year in ICS	Number of practices in last year in ICS	19	0	✓



Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others*	Accepted for survey inclusion
	Availability of community echocardiography service for HF and heart valve disease diagnosis	NA	NA	23	0	✘
Access to local specialist HF nurses	Specialist HF nurses per 1,000 HF patients	Number of identified specialist HF nurses in last year in ICS x 1,000	Estimated number of HF patients in last year in ICS	24	25	✓
Appropriate in-hospital referral processes in place for CR	In-hospital referral to CR is electronic	NA	NA	20	0	✘
Appropriate provision of CR services	Proportion of patients with guideline indication for CR starting treatment	Patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	25	32	✓
	Proportion of female patients with guideline indication for CR starting treatment	Female patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Female patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS			✓
	Proportion of male patients with guideline indication for CR starting treatment	Male patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Male patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS			✓
Appropriate access to CR services	Proportion of ethnic minority patients with guideline indication for CR starting treatment	Ethnic minority patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Ethnic minority patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	18	28	✓
	Proportion of White British patients with guideline indication for CR starting treatment	White British patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	White British patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	18	26	✓
	Local CR services are personalised to patient availability – out-of-hours/ virtual/alternative sites	Patients offered group-based, home-based and out-of-hours CR services in last year in ICS	Total number of patients offered CR service in last year in ICS	19	21	✓
	Local CR services are tailored to patient demographics	NA	NA	21	0	✘
	Local CR services are tailored to age	NA	NA	20	0	✘
CR is resourced appropriately	Average waiting time for starting CR therapy	Average waiting time to start CR for HF/STEMI/CABG/PCI patients in last year in ICS		24	26	✓

Critical factor	Indicator	Numerator	Denominator	Importance (0–5)	Sum of others*	Accepted for survey inclusion
	CR nurses per 1,000 patients indicated for CR	Number of CR nurses reported in last year in ICS	Patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	23	23	✓
Local organisations work as an integrated team	Local services operate virtual MDTs (involving primary care) for patients having CVD	NA	NA	19	0	✗
There are sufficient community defibrillators for ICS demographics	ICS plan for provision of community defibrillators	ICS plan for provision of community defibrillators in last year (yes/no)		17	0	✓
Local ambulance response time to A&E	Local ambulance response time to A&E?	NA	NA	18	0	✗

\*Yes=1, no=0 for each domain.

\*\*CHA<sub>2</sub>DS<sub>2</sub>-VASC, C=congestive heart failure (or LVSD), H=hypertension: blood pressure consistently above 140/90 mmHg (or treated hypertension on medication), A<sub>2</sub>=age ≥75 years, D=diabetes mellitus, S<sub>2</sub>=prior stroke, TIA or thromboembolism; Vasc=vascular disease (e.g. peripheral artery disease, myocardial infarction, aortic plaque), A=age 65–74 years, and Sc=Sex category (i.e. female sex).

ACE, angiotensin-converting enzyme; APDF, adjusted practice disease factor; AF, atrial fibrillation; ARB, angiotensin receptor blocker; BME, black and minority ethnic; CABG, coronary artery bypass graft; CHD, coronary heart disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CR, cardiac rehabilitation; CVD, cardiovascular disease; DOAC, direct-acting oral anticoagulant; ECG, electrocardiography; FH, familial hypercholesterolaemia; GP, general practitioner; HF, heart failure; ICS, integrated care system; LVSD, left ventricular systolic dysfunction; MDT, multidisciplinary team; NA, not available; NICE, National Institute for Health and Care Excellence; NSTEMI, non-ST elevation myocardial infarction; NT-proBNP, N-terminal pro B-type natriuretic peptide; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; PCN, primary care network; QOF, Quality and Outcomes Framework; STEMI, ST elevation myocardial infarction; STP, sustainability and transformation plan; TIA, transient ischaemic attack; TTE, transthoracic echocardiography.

**Supplementary table C.** Candidate indicators evaluated by review group in Step 3, the review group's scores, and acceptance/rejection by core group. Grey shading indicates candidate indicators eliminated during this step.

Critical factor	Indicator	Numerator	Denominator	Review group total score			Accepted by core group
				Median	Mean	Minimum	
Access to integrated care records for CVD	Access for complete MDT to patient integrated care record	ICS has a primary/secondary care integrated care record (yes/no)		5	4.5	3	✓
Effective processes for inviting for CVD review in primary care	Total proportion of NHS Health Checks taken up versus those offered to eligible population	People receiving NHS Health Check in last year in ICS	People invited for NHS Health Check in last year in ICS	4	4.0	3	✓
Effectiveness of CVD reviews in primary care	Proportion of identified patients with AF	Number of patients on general practice AF registers in last year in ICS	Estimated number of patients with AF in last year in ICS	5	4.3	2	✓
	Proportion of patients identified with CHD	Number of patients on general practice CHD registers in last year in ICS	Estimated number of patients with CHD in last year in ICS	4	4.2	3	✓
	Proportion of patients identified with HF	Number of patients on general practice HF registers in last year in ICS	Estimated number of patients with HF in last year in ICS	5	4.4	3	✓
	Proportion of patients identified with hypertension	Number of patients on general practice hypertension registers in ICS in last year in ICS	Estimated number of patients with hypertension in last year in ICS	5	4.5	3	✓
Effective treatment of identified CVD patients	Percentage of patients with confirmed diagnosis of HF who have been optimised on medication.	Number of patients with a diagnosis of HF on register, who had review in preceding 12 months, including assessment of functional capacity and review of medication to ensure medicines optimisation at maximal tolerated doses in last year in ICS	Number of patients on register of patients with HF in last year in ICS	5	4.5	2	✓
	Percentage of adult patients with CVD on lipid-lowering medication	Number of patients aged ≥18 with GP-recorded CVD with previous prescription for lipid-lowering medication in last year in ICS	Number of patients with CVD in last year in ICS	5	4.3	2	✓
	Percentage of NICE-identified at-risk patients who smoke offered support and treatment	Number of patients with any or any combination of following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers who have a record of offer of support and treatment within preceding 12 months in last year in ICS	Number of patients with any or any combination of the following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers in last year in ICS	4	3.9	2	✓

Critical factor	Indicator	Numerator	Denominator	Review group total score			Accepted by core group
				Median	Mean	Minimum	
AF patients are appropriately managed on anticoagulant	Percentage of patients diagnosed with AF who are currently treated with anticoagulation drug therapy	Number of patients currently treated with anticoagulation drug therapy in those patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -VASC* score $\geq 2$ in last year in ICS	Number of patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -VASC* score $\geq 2$ in last year in ICS	5	4.5	2	✓
Processes in place to enable prescription of DOAC at diagnosis for AF patients	DOAC can be initiated in primary care	Primary care prescribing identified in formulary status for DOAC (yes/no)		5	4.2	2	✓
	Ratio of prescribed DOAC per identified AF patients	Number of prescribed items for DOAC in last year in ICS	Number of patients on general practice AF registers in last year in ICS	4	4.0	2	✓
Identification of people with FH	Ratio of actual versus estimated patients with FH	Number of patients with genetically confirmed FH, all ages in last year in ICS	Number of patients on GP record recorded possible, probable and confirmed FH, all ages in last year in ICS	4	3.8	2	✓
At-risk CHD patients are appropriately treated with aspirin or alternative agent	Percentage of patients with CHD appropriately treated with aspirin or alternative agent	Number of patients with CHD with a record in the preceding 12 months that aspirin, alternative antiplatelet therapy, or anticoagulant is being taken in last year in ICS	Number of patients with CHD in last year in ICS	4	4.0	2	✓
Access to local practice pharmacists for CHD management	Practice pharmacists per 1,000 patients with CHD	Number of practice pharmacists reported in last year in ICS x 1,000	Number of patients with CHD in last year in ICS	4	3.9	2	✓
Access to appropriate HF diagnostics	Percentage of patients with confirmed diagnosis of HF	Patients with diagnosis of HF on or after 1 April (relevant year): 1. which has been confirmed by echocardiogram or specialist assessment between 3 months before or 6 months after entering onto the register or 2. if newly registered in preceding 12 months, with no record of diagnosis originally being confirmed by echocardiogram or specialist assessment, record of echocardiogram or specialist assessment within 6 months of date of registration in last year in ICS	Number of patients on general practice HF register in last year in ICS	4	4.3	3	✓
Access to local specialist HF nurses	Specialist HF nurses per 1,000 HF patients	Number of identified specialist HF nurses in last year in ICS x 1,000	Estimated number of HF patients in last year in ICS	5	4.4	2	✓

Critical factor	Indicator	Numerator	Denominator	Review group total score			Accepted by core group
				Median	Mean	Minimum	
Appropriate provision of CR services	Proportion of patients with guideline indication for CR starting treatment	Patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	5	4.4	2	✓
	Proportion of female patients with guideline indication for CR starting treatment	Female patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Female patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	4	3.7	1	✓
	Proportion of male patients with guideline indication for CR starting treatment	Male patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Male patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	4	3.6	1	✗
	Proportion of ethnic minority patients with guideline indication for CR starting treatment	Ethnic minority patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Ethnic minority patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	4	3.9	2	✓
	Proportion of White British patients with guideline indication for CR starting treatment	White British patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	White British patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	4	3.7	2	✗
	Local CR services are personalised to patient availability – out-of-hours/virtual/alternative sites	Patients offered group-based, home-based and out-of-hours CR services in last year in ICS	Total number of patients offered CR service in last year in ICS	4	3.8	2	✓
CR is resourced appropriately	Average waiting time for starting CR therapy	Average waiting time to start CR for HF/STEMI/CABG/PCI patients in last year in ICS		4	4.0	2	✓
	CR nurses per 1,000 patients indicated for CR	Number of CR nurses reported in last year in ICS	Patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS	4	3.7	3	✗
Processes for actively managing CVD review invitations	Proportion of general practices using appointment reminder tools	Number of practices using patient text reminder tools in last year in ICS	Number of practices in last year in ICS	3	3.4	1	✗
	Proportion of general practices with out-of-working-hours appointments available for NHS Health Checks and/or CVD reviews	Number of practices that actively book NHS Health Checks and/or CVD review appointments out of accepted working hours (6.30 pm to 8.00 am on weekdays and all day at weekends and on bank holidays) in last year in ICS	Number of practices in last year in ICS	4	4.0	1	✓

Critical factor	Indicator	Numerator	Denominator	Review group total score			Accepted by core group
				Median	Mean	Minimum	
Delivering CVD review management	CVD reviews offered by other providers such as community teams and community pharmacy	Number of other providers (such as community pharmacy and community health) that offer CVD review services in last year in ICS	Number of providers in last year in ICS	4	3.7	0	✓
Identifying CVD review patients	Proportion of general practices actively using case identification tools as part of electronic patient record for CVD risk management	Number of practices that have protocol to actively search on their patient record system for and specifically invite patients into practice for review (rather than just marking notes) in last year in ICS	Number of practices in last year in ICS	4	4.1	3	✓
Ability to identify AF patients	Proportion of general practices that have access to ECG machine	Number of practices that have direct access to 12-lead ECG machine on premises in last year in ICS	Number of practices in last year in ICS	4	4.1	2	✓
	Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF	Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF in last year in ICS		4	3.8	2	✓
	Average waiting time for access to TTE	Average waiting time for access to TTE in last year in ICS		5	4.6	4	✓
	Proportion of general practices with policy for taking pulse at every healthcare contact	Number of general practices with policy for taking pulse at every healthcare contact in last year in ICS	Number of practices in last year in ICS	4	3.7	2	✗
Availability of FH service	ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing	Identified ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing (yes/no)		4	3.9	2	✓
There is confidence in awareness and diagnosis of HF	PCN with breathlessness diagnostic pathway	Number of PCNs in ICS identified with breathlessness diagnostic pathway in last year in ICS	Number of PCNs in last year in ICS	4	4.2	2	✓
Access to appropriate HF diagnostics	Proportion of general practices that have policy for actively using NT-proBNP in primary care for diagnosis of HF	Number of practices that have policy for actively using NT-proBNP in primary care for diagnosis of HF in last year in ICS	Number of practices in last year in ICS	5	4.3	2	✓
	Proportion of general practices that have access to community echocardiography	Number of practices that have access to community echocardiography in last year in ICS	Number of practices in last year in ICS	4	3.9	0	✓
There are sufficient community defibrillators for ICS demographics	ICS plan for provision of community defibrillators	ICS plan for provision of community defibrillators in last year (yes/no)		4	3.9	1	✓

\*CHA<sub>2</sub>DS<sub>2</sub>-VASc, C=congestive heart failure (or left ventricular systolic dysfunction), H=hypertension: blood pressure consistently above 140/90 mmHg (or treated hypertension on medication), A<sub>2</sub>=age ≥75 years, D=diabetes mellitus, S<sub>2</sub>=prior stroke, TIA or thromboembolism; Vasc=vascular disease (e.g. peripheral artery disease, myocardial infarction, aortic plaque), A=age 65–74 years, and Sc=Sex category (i.e. female sex).

AF, atrial fibrillation; CABG, coronary artery bypass graft; CHD, coronary heart disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CR, cardiac rehabilitation; CVD, cardiovascular disease; DOAC, direct-acting oral anticoagulant; ECG, electrocardiography; FH, familial hypercholesterolaemia; GP, general practitioner; HF, heart failure; ICS, integrated care system; MDT, multidisciplinary team; NICE, National Institute for Health and Care Excellence; NSTEMI, non-ST elevation myocardial infarction; NT-proBNP, N-terminal pro B-type natriuretic peptide; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; PCN, primary care network; STEMI, ST elevation myocardial infarction; TIA, transient ischaemic attack; TTE, transthoracic echocardiography.

**Supplementary table D.** Final validated delivery indicators (DIs, no shading) and delivery enablers (DEs, light grey shading).

Factor	Indicator	Numerator	Denominator	LTP objectives						Data source	
				3.67	3.68	3.69	3.70	3.71	3.72		
1	Access to integrated care records for CVD	1a Access for complete MDT to patient integrated care record	ICS has a primary/secondary care integrated care record (yes/no)		✓	✓	✓	✓	✓	✓	ICS plans
2	Effective processes for inviting for CVD review in primary care	2a Total proportion of NHS Health Checks taken up versus those offered to eligible population	People receiving NHS Health Check in last year in ICS	People invited for NHS Health Check in last year in ICS	✓	✓	✓				PHE
3	Effectiveness of CVD reviews in primary care	3a Proportion of identified patients with AF	Number of patients on general practice AF registers in last year in ICS	Estimated number of patients with AF in last year in ICS	✓	✓	✓				QOF AF001, PHE
		3b Proportion of patients identified with CHD	Number of patients on general practice CHD registers in last year in ICS	Estimated number of patients with CHD in last year in ICS	✓	✓	✓				QOF CHD001, PHE
		3c Proportion of patients identified with HF	Number of patients on general practice HF registers in last year in ICS	Estimated number of patients with HF in last year in ICS	✓	✓	✓				QOF HF001, PHE
		3d Proportion of patients identified with hypertension	Number of patients on general practice hypertension registers in last year in ICS	Estimated number of patients with hypertension in last year in ICS	✓	✓	✓				QOF HYP001, PHE
4	Effective treatment of identified CVD patients	4a Percentage of patients with confirmed diagnosis of HF who have been optimised on medication	Number of patients with diagnosis of HF on register, who had review in preceding 12 months, including assessment of functional capacity and review of medication to ensure medicines optimisation at maximal tolerated doses in last year in ICS	Number of patients on register of patients with HF in last year in ICS			✓	✓			QOF HF007/HF001
		4b Percentage of adult patients with CVD on lipid-lowering medication	Number of patients aged ≥18 with GP-recorded CVD with previous prescription for lipid-lowering medication in last year in ICS	Number of patients with CVD in last year in ICS			✓				CVDPREVENT CVDP001CHOL
		4c Percentage of NICE-identified at-risk patients who smoke offered support and treatment	Number of patients with any or any combination of following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers who have record of offer of support and treatment within preceding 12 months in last year in ICS	Number of patients with any or any combination of following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers in last year in ICS			✓				QOF SMOK005
5	AF patients are appropriately	5a Percentage of patients diagnosed with AF who	Number of patients currently treated with anticoagulation drug therapy in	Number of patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -			✓				QOF AF007



Factor	Indicator	Numerator	Denominator	LTP objectives						Data source	
				3.67	3.68	3.69	3.70	3.71	3.72		
	managed on anticoagulant	are currently treated with anticoagulation drug therapy	those patients with AF with record of CHA <sub>2</sub> DS <sub>2</sub> -VASC** score ≥2 in last year in ICS	VASC** score ≥2 in last year in ICS							
6	Processes in place to enable prescription of DOAC at diagnosis for AF patients	6a	DOAC can be initiated in primary care	Primary care prescribing identified in formulary status for DOAC (yes/no)			✓				Wilmington Healthcare, Core Data on file
		6b	Ratio of prescribed DOAC per identified AF patients	Number of prescribed items for DOAC in last year in ICS	Number of patients on general practice AF registers in last year in ICS			✓			GP prescribing data, QOF AF001
7	Identification of people with FH	7a	Ratio of actual versus estimated patients with FH	Number of patients with genetically confirmed FH, all ages in last year in ICS	Number of patients on GP record recorded possible, probable and confirmed FH, all ages in last year in ICS		✓				CVDPREVENT CVDP003FH, CVDP002FH
8	At-risk CHD patients are appropriately treated with aspirin or alternative agent	8a	Percentage of patients with CHD appropriately treated with aspirin or alternative agent	Number patients with CHD with record in preceding 12 months that aspirin, alternative antiplatelet therapy, or anticoagulant is being taken in last year in ICS	Number of patients with CHD in last year in ICS			✓			QOF CHD005
9	Access to local practice pharmacists for CHD management	9a	Practice pharmacists per 1,000 patients with CHD	Number of practice pharmacists reported in last year in ICS x 1,000	Number of patients with CHD per 1,000 in last year in ICS			✓			Wilmington Healthcare, Core Data on file, QOF CHD001
10	Access to appropriate HF diagnostics	10a	Percentage of patients with confirmed diagnosis of HF	Patients with diagnosis of HF on or after 1 April (relevant year): <ol style="list-style-type: none"> <li>which has been confirmed by echocardiogram or specialist assessment between 3 months before or 6 months after entering onto the register</li> </ol> or <ol style="list-style-type: none"> <li>if newly registered in preceding 12 months, with no record of diagnosis originally being confirmed by echocardiogram or specialist assessment, record of echocardiogram or specialist assessment within 6 months of date of registration in last year in ICS</li> </ol>	Number of patients on general practice HF register in last year in ICS				✓		QOF HF005
		10b	Proportion of general practices that have policy for actively using NT-	Number of practices that have policy for actively using NT-proBNP in primary care for diagnosis of HF in last year in ICS	Number of practices in last year in ICS				✓		

Factor	Indicator	Numerator	Denominator	LTP objectives						Data source
				3.67	3.68	3.69	3.70	3.71	3.72	
	proBNP in primary care for diagnosis of HF									
	10c Proportion of general practices that have access to community echocardiography	Number of practices that have access to community echocardiography in last year in ICS	Number of practices in last year in ICS				✓			
11	Access to local specialist HF nurses	11a Specialist HF nurses per 1,000 HF patients	Number of identified specialist HF nurses in last year in ICS x 1,000	Estimated number of HF patients in last year in ICS				✓		Wilmington Healthcare, Core Data on file, QOF HF001
12	Appropriate provision of CR services	12a* Proportion of patients with guideline indication for CR starting treatment	Patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS					✓	NACR adjusted, Hospital Episode Statistics data
		12b* Proportion of female patients with guideline indication for CR starting treatment	Female patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Female patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF) in last year in ICS					✓	NACR adjusted, Hospital Episode Statistics data
13	Appropriate access to CR services	13a* Proportion of ethnic minority patients with guideline indication for CR starting treatment	Ethnic minority patients with guideline-indicated CR (NSTEMI, PCI, CABG and HF) starting CR in last year in ICS	Ethnic minority patients identified with guideline-indicated CR (NSTEMI, PCI, CABG and HF), in last year in ICS					✓	NACR adjusted, Hospital Episode Statistics data
		13b* Local CR services are personalised to patient availability – out-of-hours/virtual/alternative sites	Patients offered group-based, home-based and out-of-hours CR services in last year in ICS	Total number of patients offered CR service in last year in ICS					✓	NACR
14	CR is resourced appropriately	14a* Average waiting time for starting CR therapy	Average waiting time to start CR for HF/STEMI/CABG/PCI patients in last year in ICS						✓	NACR
15	Processes for actively managing CVD review invitations	15a Proportion of general practices with out-of-working-hours appointments available for NHS Health Checks and/or CVD reviews	Number of practices that actively book NHS Health Checks and/or CVD review appointments out of accepted working hours (6.30 pm–8.00 am on weekdays and all day at weekends and on bank holidays) in last year in ICS	Number of practices in last year in ICS	✓	✓	✓			
16	Delivering CVD review management	16a CVD reviews offered by other providers such as community teams and community pharmacy	Number of other providers (such as community pharmacy, community health) that offer CVD review services in last year in ICS	Number of providers in last year in ICS	✓	✓	✓			
17	Identifying CVD review patients	17a Proportion of general practices actively using case identification tools as part of electronic	Number of practices that have protocol to actively search on their patient record system for and specifically invite patients into practice for review (rather	Number of practices in last year in ICS	✓	✓	✓	✓		

Factor	Indicator	Numerator	Denominator	LTP objectives						Data source	
				3.67	3.68	3.69	3.70	3.71	3.72		
	patient record for CVD risk management	than just marking notes) in last year in ICS									
18 Ability to identify AF patients	18a Proportion of general practices that have access to ECG machine	Number of practices that have direct access to 12-lead ECG machine on premises in last year in ICS	Number of practices in last year in ICS	✓							
	18b Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF	Average waiting time for access to ambulatory rhythm monitoring for paroxysmal AF in last year in ICS		✓							
	18c Average waiting time for access to TTE	Average waiting time for access to TTE in last year in ICS		✓							
19 Availability of FH service	19a ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing	Identified ICS or PCN plan for identifying and referring patient with suspected FH for genomic testing (yes/no)		✓							
20 There is confidence in awareness and diagnosis of HF	20a PCN with breathlessness diagnostic pathway	Number of PCNs in ICS identified with breathlessness diagnostic pathway in last year in ICS	Number of PCNs in last year in ICS				✓				
21 There are sufficient community defibrillators for ICS demographics	21a ICS plan for provision of community defibrillators	ICS plan for provision of community defibrillators in last year (yes/no)						✓			

\*Requires access to data from the NACR, which was inaccessible to the study team.

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