AMBULATORY CARDIAC MONITORING UTILISATION AND GUIDELINE ALIGNMENT AMONG SYMPTOMATIC, ARRHYTHMIA-NAÏVE PATIENTS IN ENGLAND

RWD157

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BACKGROUND

- Ambulatory cardiac monitoring (ACM) in England spans short-term Holter, extended Holter, ambulatory event monitors and implantable loop recorders (ILRs). NICE, BHRS and ESC guidance informs device selection by symptom type.
- Evidence on monitoring patterns among newly symptomatic, arrhythmia-naïve patients remains limited. This study assessed contemporary practice and guideline alignment across England.

METHODS

- **Data source:** Hospital Episode Statistics (HES), NHS England, accessed via IQVIA; April 2020 – February 2026.
- **Design:** Retrospective cohort study, England.
- **Cohort:** Adults (≥18 years) with
  - ≥1 qualifying symptom,
  - AND ≥1 prior cardiovascular or metabolic risk factor,
  - AND no prior arrhythmia or conduction disorder.
- **Monitored subgroup:** Defined by a procedure code for an ACM (OPCS-4 U19), with no ACM other than the index ACM type during baseline.
- **Index date:** Date of the first observed ACM (OPCS-4 U19) in monitored patients; patients without a recorded ACM were counted only and have no index date.
- **ACM modalities:** Implantable loop recorder (U19.1); short-term Holter (U19.2–U19.3); extended Holter (U19.5); ambulatory event monitor (U19.6); other specified/unspecified (U19.8–U19.9).
- **Symptom clusters:** Bradycardia; palpitations; breathing disorders; chest pain; neurologic/ syncope.
- **Cardiovascular/metabolic Risk factors (18):** Hypertension, cardiovascular disease, structural heart disease, heart failure, myocardial infarction, unstable angina, coronary atherosclerosis, stroke, peripheral artery disease, septal defects, cardiogenic shock, type 2 diabetes, hypercholesterolaemia, obesity, chronic kidney disease, acute kidney failure, COPD, liver dysfunction.
- **Major arrhythmias:** Atrial fibrillation/flutter; ventricular tachycardia/fibrillation; supraventricular tachycardia; AV block and conduction disorders (including sick sinus syndrome).
- **Analysis:** Descriptive counts rounded to the nearest 5 (NHS rules) by categories. Monitoring rate = patients with a U19 code ÷ group total.

RESULTS

1. **53.5% of patients with a major arrhythmia had no ACM recorded in HES**
2. **Among named devices, short-term Holter led in every symptom cluster**
3. **Monitoring varied 1.7-fold across NHS regions and 4.2-fold across ICBs**

Figure 1: Cohort composition (1)

729,520
Symptomatic, Arrhythmia-Naïve Patients | Apr 2020 – Feb 2026

ARRHYTHMIA STATUS	MONITORING STATUS
105,185 14.4% Major Arrhythmia	**240,345** 32.9% Received Any ACM
624,335 85.6% No Major Arrhythmia	**489,175** 67.1% No Recorded ACM

48,945 had a Major Arrhythmia **AND** were monitored
46.5% of the 105,185 • 20.4% of the 240,345

56,240 (53.5%)
had a Major Arrhythmia yet no recorded ACM

The two branches are independent classifications of the same 729,520 patients, not nested subsets; each pair sums to the cohort total.

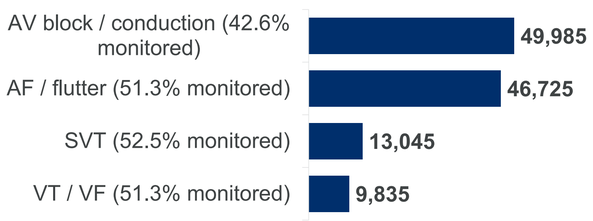
Table 1: Cohort characteristics (N=729,520)

Subgroup	n	% cohort	Any ACM %
SEX			
Male	372,165	51.0	**34.0**
Female	354,630	48.6	**31.6**
Not recorded	2,730	0.4	–
AGE BAND			
18-40	32,130	4.4	**34.1**
41-74	402,240	55.1	**36.0**
75+	295,150	40.5	**28.7**
ETHNICITY			
White	586,365	80.4	**32.3**
Asian	43,660	6.0	**39.0**
Black	20,935	2.9	**40.2**
Mixed	5,520	0.8	**40.8**
Other groups	99,335	13.6	**34.5**

Patients may have more than one ethnicity recorded across HES episodes; categories are not mutually exclusive.

Monitoring falls with age: 28.7% at 75+ vs 36.0% at 41–74.

Figure 2: Major arrhythmia class (n=105,185)



AV block/conduction is the largest class (49,985) and the least monitored (42.6%).

Table 2: Top risk factors

Risk factor	n	% cohort	Any ACM %
Hypertension	590,485	80.9	**34.0**
Cardiovascular disease	389,665	53.4	**37.6**
Structural heart disease	298,895	41.0	**34.9**
Diabetes type 2	261,140	35.8	**32.8**
Acute kidney failure	252,225	34.6	**29.6**
Chronic kidney disease	240,785	33.0	**32.5**
Hypercholesterolaemia	232,255	31.8	**39.3**
PAD	224,925	30.8	**36.9**
Heart failure	216,440	29.7	**35.6**
Unstable angina	204,230	28.0	**40.1**
Obesity	178,980	24.5	**37.1**
Coronary atherosclerosis	173,055	23.7	**44.3**

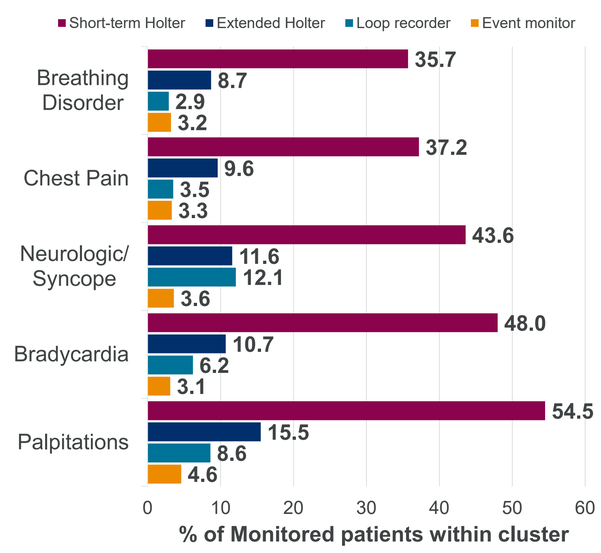
Hypertension (80.9%) is the most common; monitoring ranges from 29.6% to 44.3% across these 12.

Table 3: Monitoring by symptom cluster (2)

Symptom cluster	Eligible	% cohort	Any ACM %
Breathing Disorder	301,605	41.3	**31.1**
Neurologic/Syncope	264,945	36.3	**35.6**
Chest Pain	227,085	31.1	**35.8**
Bradycardia	86,480	11.9	**38.6**
Palpitations	43,280	5.9	**53.6**

Palpitations are monitored most (53.6%); breathing disorder, the largest cluster, least (31.1%).

Figure 3: Monitor type by symptom cluster (2)



Among named devices, short-term Holter leads in every cluster (35.7–54.5% of monitored).

Figure 4: Monitoring by NHS region (3)



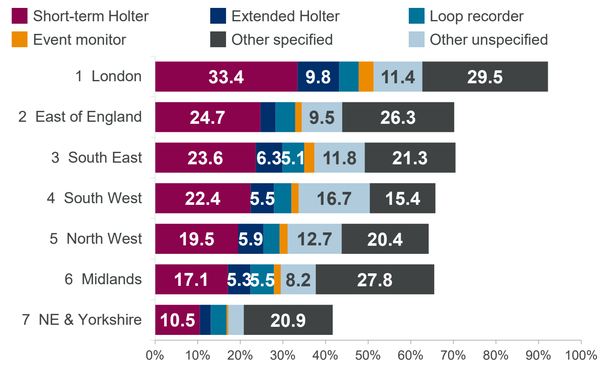
Monitoring rate: % of region's patients with a major arrhythmia

1	London	57.8%
2	East of England	48.2%
3	South East	48.0%
4	South West	47.5%
5	North West	46.1%
6	Midlands	45.6%
7	NE & Yorkshire	34.9%
E	England	46.5%

Lightest shade 35%, darkest 58%

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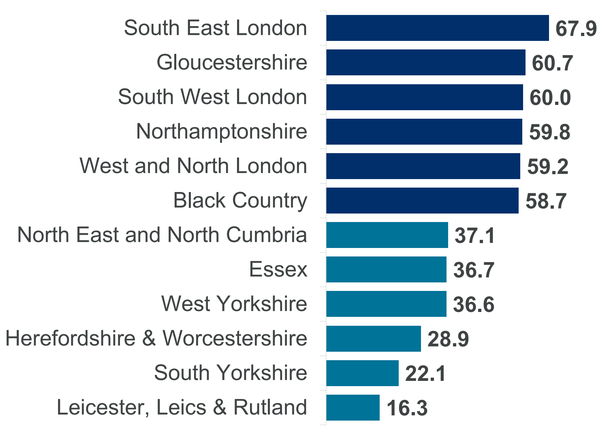
Device mix by region (% of the region's major-arrhythmia patients; devices overlap)



Device mix differs by region: Short-term Holter was recorded for 33.4% of major-arrhythmia patients in London vs 10.5% in NE & Yorkshire.

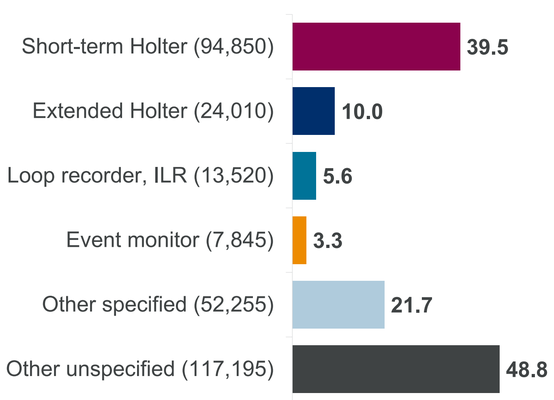
Regional gap of 22.9 points in major-arrhythmia patients: London 57.8% vs NE & Yorkshire 34.9%.

Figure 5: Six highest and lowest ICBs (3)



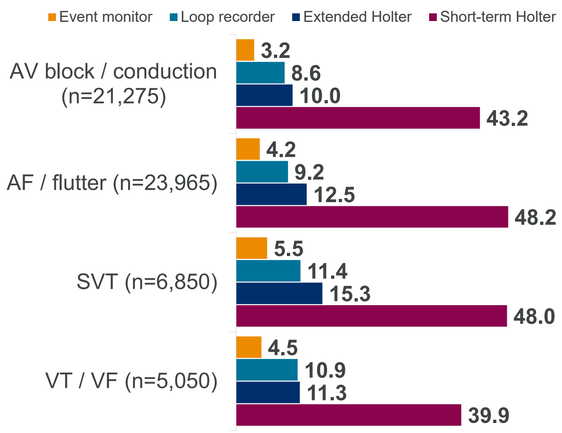
ICB monitoring varies 4.2-fold: South East London 67.9% vs Leicester, Leics & Rutland 16.3%.

Figure 6: ACM modality, all monitored patients (n=240,345)



Short-term Holter leads named devices (39.5%); devices overlap (shares sum to 129%).

Figure 7: Monitoring modality by arrhythmia class (2)



Among named devices, short-term Holter leads in every class (39.9–48.2% of monitored); loop recorders 8.6–11.4%.

Table 4: Device use by cluster vs guidance (2)

Device	Brady.	Palp.	Breath.	Chest	Syncope
Short-term Holter	**48.0**	**54.5**	35.7	37.2	**43.6**
Extended Holter	10.7	**15.5**	8.7	9.6	11.6
Loop recorder	6.2	**8.6**	2.9	3.5	**12.1**
Event monitor	3.1	**4.6**	3.2	3.3	**3.6**

Values = % of each cluster's monitored patients; devices overlap. Shaded = listed in guidance (bradycardia: Holter mapped, no specific rule; none for breathing disorder or chest pain). Brady. = bradycardia, Palp. = palpitations, Breath. = breathing disorder.

Among named devices, short-term Holter is used most in every cluster, even where guidance lists longer monitoring.

Table 5: Guideline alignment by cluster (2)

Cluster	Listed device types	% with listed device	Aligned with guidance
Palpitations	Short-term Holter, extended Holter, event monitor, loop recorder	29.2–44.6	**Partial**
Breathing disorder	None specified (all types)	31.1	n/a
Chest pain	12-lead ECG	18.7–26.6	**Low**
Neurologic/ Syncope	Short-term Holter, event monitor, loop recorder	15.5–21.1	**Low**
Bradycardia	24/48 h Holter (no specific rule)	18.5	**Low**

% = patients with the symptom who had a listed device ÷ all patients with the symptom; ranges reflect device-code overlap (lower bound rated). Aligned ≥50%; Partial 25–49%; Low <25% (study thresholds, not guideline targets; HES does not record symptom frequency). Named codes only: extended monitoring under other or unspecified codes is not captured, and U19.5 does not specify duration. Chest pain 12-lead ECG = resting-ECG codes (U19.9, ± U19.8). Not all symptomatic patients require ambulatory monitoring. 12-lead ECGs are incompletely recorded in HES (e.g. A&E and primary care), so the chest pain rating is likely to understate use.

29.2–44.6% of patients with palpitations and 15.5–21.1% with syncope had a listed device.

GUIDANCE FOR AMBULATORY ECG

Palpitations: 12-lead ECG first [1]. Episodes <24 h apart: 24-h Holter; >24 h apart: monitor long enough to detect AF (7-day Holter, patch, event recorder). Zio XT an option [2]. Infrequent: Implantable loop recorder after exhaustive monitoring [3].

Syncope: Several times a week: Holter up to 48 h; every 1–2 weeks: External event recorder; rarer, or missed: Implantable loop recorder [4]; ESC Class I if unexplained after negative work-up [5].

Chest pain: 12-lead ECG for suspected ACS; no ambulatory monitoring listed [6].

Bradycardia: No specific recommendation; 24–48 h Holter mapped.

Breathing disorders: No ACM-specific recommendation identified.

DISCUSSION

- The high proportion without a recorded ACM, and short-term Holter as the most common named modality, highlight where monitoring may differ from guidance. As HES does not record symptom frequency or the reason for test choice, these patterns merit further investigation.
- In practice, other specified and unspecified codes (U19.8, U19.9) can include 12-lead ECGs, and the extended Holter code (U19.5) does not specify recording duration, covering anything from 72-hour Holter to 14-day patch monitoring. Within these constraints, HES analyses provide national context for the data collection requested in NICE HealthTech guidance (HTG562), and more specific OPCS-4 coding would further strengthen this evidence base.
- **Future work**: sensitivity analysis on named codes, downstream utilisation, repeat testing and time to diagnosis by first-monitor strategy, and subgroups at elevated risk.

CONCLUSIONS

- **Two-thirds of symptomatic, arrhythmia-naïve patients (67.1%), and over half of those with a major arrhythmia (53.5%), had no ACM recorded in HES. Among named modalities, short-term Holter was the most common in every symptom cluster, including palpitations and syncope, where NICE lists longer options for infrequent symptoms.**
- **Among patients with a major arrhythmia, monitoring varied 1.7-fold across NHS regions and 4.2-fold across ICBs. Across the cohort, monitoring was lowest at age 75+ (28.7%). This substantial geographical variation points to opportunities for more consistent, guideline-informed monitoring pathways, and more specific coding of monitoring beyond 48 hours would support their evaluation.**

REFERENCES

[1] NICE NG196. Atrial fibrillation: diagnosis and management. 2021. nice.org.uk/guidance/ng196. [2] NICE HTG562 (formerly MTG52). Zio XT for detecting cardiac arrhythmias. 2020. nice.org.uk/guidance/htg562. [3] British Heart Rhythm Society. Standards and guidelines. bhrs.com/clinical-resources/standards. [4] NICE CG109. Transient loss of consciousness ('blackouts') in over 16s. 2010, updated 2023. nice.org.uk/guidance/cg109. [5] Brignole M, et al. 2018 ESC Guidelines for the diagnosis and management of syncope. *Eur Heart J*. 2018;39(21):1883–1948. doi:10.1093/eurheartj/ehy037. [6] NICE NG185. Acute coronary syndromes. 2020. nice.org.uk/guidance/ng185. Links accessed October 2026.

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ABBREVIATIONS

ACM = Ambulatory Cardiac Monitoring; ACS = Acute Coronary Syndrome; AF = Atrial Fibrillation; AV = Atrioventricular; BHRS = British Heart Rhythm Society; COPD = Chronic Obstructive Pulmonary Disease; ECG = Electrocardiogram; ESC = European Society of Cardiology; HES = Hospital Episode Statistics; h = hour; HSCIC = Health and Social Care Information Centre; HTG = HealthTech Guidance (NICE); ICB = Integrated Care Board; ILR = Implantable Loop Recorder; NE = North East; NHS = National Health Service; NICE = National Institute for Health and Care Excellence; ONS = Office for National Statistics; OPCS-4 = OPCS Classification of Interventions and Procedures, version 4; OS = Ordnance Survey; SVT = Supraventricular Tachycardia; VF = Ventricular Fibrillation; VT = Ventricular Tachycardia.

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LIMITATIONS

- Other specified (21.7%) and unspecified (48.8%) U19 codes were common among monitored patients and can include 12-lead ECGs; monitoring rates may be overestimated, and regional variation may partly reflect coding practice.
- HES does not record symptom frequency or the reason a modality was chosen, so alignment with guidelines cannot be assessed for individual patients.
- Overlapping categories (ethnicity, symptoms, risk factors, arrhythmia classes, devices) can sum to over 100%; definitions are code-based.
- Regional counts (108,055) exceed the overall total (105,185); England uses the overall row.

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