
# Clinical Guidelines by Consensus

# ECG Reporting Standards & Guidance

## An approved method by the
## The Professional Body for Cardiac Scientists (SCST)

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**Clinical Guidelines by Consensus Recommendations for**

**ECG Reporting Standards and Guidance**

**An approved method by**

**The Professional Body for Cardiac Scientists (SCST)**

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## 1.Change History

| Version | Date | Author | Reason | Ratification required? |
|---|---|---|---|---|
| 1 | January 2019 | David Richley | Consensus Guidance to inform best practice | SCST Council |
| 1.1 | May 2020 | Harriet Walters & David Richley | Addition of section 5.8- Communication of ECG reports (subsequent sub-sections renumbered)<br>Addition of section 5.10 – Quality assurance, including level of knowledge required for independent reporting<br>Minor changes to pre-existing text to improve readability | SCST Council |
| 1.2 | September 2024 | David Richley & Harriet Walters | Addition of Appendix 2 Equality Impact Assessment<br>Minor changes to pre-existing text to improve readability | SCST Board |

## 2. Introduction and rationale

An electrocardiogram (ECG) is a graphical representation of the electrical activityof the heart. The information conveyed by an ECG may be invaluable in the diagnosis, prognosis and management of a wide range of conditions. While many clinicians may possess considerable skills in 12-lead ECG interpretation, others do not and information in graphical form may be of little value to them unless it is accompanied by a comprehensible report that describes and summarises the clinically important findings. We therefore recommend that every ECG that is filedin a patient's record should bear a report.

There are established guidelines, based on evidence and expert consensus, on how to record an ECG[1]. There exist authoritative published reference values anddiagnostic ECG criteria to guide ECG interpretation[2-5], and there is a consensus document that defines the minimum experience and training necessary to achievecompetence in interpreting ECGs[6]. However, there is no widely accepted guidance on how a standard 12-lead ECG should be reported.

There may be legitimate variation in conclusions reached from examining an ECG because many combinations of ECG features are open to different interpretations,depending partly on the clinical context. On the other hand, an interpretation may demonstrably be wrong. An interpretation may also be correct but incomplete and fail to convey information of importance.

This guidance has been developed to ensure that ECG reports:

- are of maximum clinical value
- minimise risks to patient care
- can be subjected to audit

There is considerable variation in the reference values, terminology and definitions used in the evaluation and description of ECGs. For consistency, SCST supports the recommendations issued by the American Heart Association in collaboration with partner organisations and published in a series of documents[2-5].

## 3. Method

There is readily available general guidance relating to standards of documentation,including clinical reports, filed in patients' health records. To research existing agreed guidance and recommendations specifically regarding the reporting of 12-lead ECGs, a keyword literature search was conducted using five databases: Allied and Complementary Medicine Database (AMED); Health Business Elite (HBE); Health Management Information Consortium (HMIC); Medline; and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), through the NICE-evidence online portal.

The key words used, in various combinations, were: 'electrocardiogram', 'ECG', 'EKG', 'reporting', 'guideline', 'interpretation' and 'standard'. The search returned no consensus guidelines for the reporting of 12-lead ECGs. The guidance on therecommended structure and style of ECG reports that follows is therefore originaland based on the most relevant literature available.

## 4. Standards

The following standards aim to ensure that ECG reporting complies with the principles of good clinical governance:

### 4.1. Standard 1: No report should omit any information that may be of importance

This standard aims to ensure that ECG reports convey all the important information contained in the ECG recording.

### 4.2. Standard 2: Every report should clearly identify the reporting clinician

It is common practice and consistent with the principles of good clinical governancethat reports contained in patients' health records should clearly identify the authorand there are recommendations on how this should be done[7]. It is important for both quality assurance and medicolegal reasons that the individual who has reported an ECG can clearly be identified. The name and job title of the author are minimal identifying details; the professional registration number, if applicable, should also be included. Printed or handwritten reports should also be signed by the reporting clinician to authenticate their identity.

# 5. Guidance

The following guidance on the approach to evaluating an ECG and on the structure, format and content of ECG reports aims to maximise compliance with standard 1 and ensure that no report is unclear or ambiguous or omits any important information.

## 5.1 Systematic analysis

To minimise the possibility that a report fails to convey clinically important information it is recommended that the ECG be systematically analysed before it is reported.

There is no single scheme that needs to be followed for the full and accurate analysis of an ECG, but any systematic evaluation should include assessment of:

- Ventricular rate
- Cardiac rhythm
- QRS axis
- QRS morphology
- P wave morphology and axis
- PR interval
- QT interval
- ST segments
- T wave morphology and axis
- Any other deflections or waveforms in the ECG

## 5.2 Implicit and explicit reporting

The elements of an ECG may be described explicitly and in detail or implicitly by,for example, stating that the ECG is normal, thereby implying that there is sinus rhythm with a heart rate of between 60 and 100 beats per minute, a QRS axis between -30 and +90 degrees and normal intervals and waveform morphologies.A report may be partly explicit in describing an abnormality, e.g. *right bundle branch block; ECG is otherwise normal*.

## 5.3 Primary and secondary ECG abnormalities

Abnormal ECG features that are inevitable secondary characteristics need not be described. For example, ST depression and T wave inversion invariably accompany the primary abnormality of left bundle branch block and therefore do not need to be described: their presence is implicit in the diagnosis of left bundle branch block. Similarly, T wave inversion in lead V1 when there is right bundle branch block need not be described, but T wave inversion elsewhere on the ECGthat is unrelated to the right bundle branch block should be. The absence of expected secondary abnormalities may indicate additional pathology and should be described.

## 5.4 Describing ECG patterns

Where abnormal ECG abnormalities clearly indicate the presence of a particular underlying pathological condition, it may be more helpful and appropriate to describe the pathological condition, e.g. left bundle branch block, rather than the ECG features that define it. When abnormal ECG patterns may have more than one possible cause, e.g. deep symmetrical T wave inversion from V1 to V3, the ECG abnormalities themselves should be described.

## 5.5 Abbreviations

Abbreviations, because they may be ambiguous or not understood, should be used only sparingly if at all. Only very commonly understood abbreviations such as VT should be used.

## 5.6 Elements of a report

An ECG report should address all the following elements either explicitly or implicitly.

### 5.6.1 Ventricular rate

The ventricular rate should be expressed in beats per minute. If the ventricular rate is irregular, it should be expressed as a mean value from a period of at least 6 seconds. If the atrial rate is different from the ventricular rate, and the rhythm is not atrial fibrillation or atrial flutter, the atrial rate should be described explicitly or implied, e.g. as in *atrial tachycardia with 2:1 block and a ventricular rate of 70 beats per minute*.

### 5.6.2 Rhythm

The cardiac rhythm should be described. If the atrial rhythm and ventricular rhythm are independent of each other, each should be described, e.g. *sinus bradycardia (atrial rate 50 beats per minute) with an atrioventricular (AV) nodal escape rhythm (ventricular rate 52 beats per minute).*

### 5.6.3 QRS axis

If the mean frontal plane QRS axis is between -30 and +90 degrees, the angle need not be described but it should be stated that the axis is normal. If the mean frontal plane QRS axis is abnormal it should be stated to a precision of +/- 15degrees; additionally, it should be stated whether there is a left, right, or extreme axis deviation.

### 5.6.4 QRS morphology

Abnormalities of the shape, amplitude or duration of the QRS complex shouldbe described, either by detailing the abnormality itself, e.g. *deep Q waves in leads II, III and aVF*, or by describing the cause of the abnormal QRS, e.g. *leftbundle branch block.*

### 5.6.5 P wave morphology

This should be described if it is abnormal, e.g. *broad, notched P waves in mostleads*.

Additionally, or alternatively, the cause of the abnormal P waves should bedescribed, e.g. *left atrial abnormality*.

### 5.6.6 PR interval

The PR interval should be stated if constant and outside the normal range, inwhich case it should also be described as abnormally short or long. If the PRinterval varies, the cause of the variation must be described (and will normallybe done in the process of describing the cardiac rhythm).

### 5.6.7 QT interval

The corrected QT interval (QTc) should be stated if it is outside the normal range, in which case it should also be described as abnormally short or long.

### 5.6.8 ST segments

Any abnormal displacement or shape of the ST segments should be described. It is conventional to express deviation of the ST segment in millimetres rather than millivolts, assuming normal standardisation of 10millimetres to a millivolt.

### 5.6.9 T waves

Any abnormality of T wave shape, amplitude or polarity should be described.

### 5.6.10 Pacing

In an ECG that shows pacemaker activity, there should be a description of thechamber(s) paced and any intrinsic cardiac activity, e.g. *atrial fibrillation with conducted and paced ventricular beats*. Any evidence of failure to sense or capture should be described.

### 5.6.11 Other deflections or waveforms

Other deflections or waveforms, including J waves, U waves and epsilon waves, should be described.

## 5.7 Report's conclusion

Most ECG reports, and all those describing multiple abnormalities, should contain a conclusion, and this should attempt to integrate the various findings. If there is more than one possible explanation for a specific ECG pattern the variouspossibilities should be outlined in the conclusion. If the ECG appearances are suggestive but not diagnostic of a specific diagnosis, this should be made clear. Ifthe conclusion, e.g. *acute anterior myocardial infarction*, is critically important it should be placed at the head of the report.

## 5.8 Communication of ECG reports

ECG reports are useful only if they are communicated or accessible to those who need them in an appropriately timely manner. It may be appropriate for most ECG reports to be stored in patients' records (which may be electronicor physical) and, where required, communicated to the requestor by secure mean, such as secure email. In some cases of clinical urgency this will not be adequate: for example, where an ECG report indicates that there has been an unsuspected acute myocardial infarction or symptomatic complete heart block. In such a situation it would be appropriate for the reporting clinician to make urgent contact with the person who requested the ECG, or another clinician if necessary, so that hospital admission can be arranged and treatment decisions taken without delay. In these circumstances it may still be appropriate for a full ECG report to be issued and filed or transmitted in the usual manner, but the urgent oral communication of the ECG findings must take priority.

Standard operating procedures (SOPs) may specify particular actions required locally regarding communicating ECG reports, which may include a graded response for the escalation of urgent and emergency clinical findings depending on the particular ECG features present.

## 5.9 Computer-generated reports

Many ECG machines can produce a computer-generated report. Research has shown that these reports may not be accurate and authoritative bodies have recommended that although computer generated reports may have an adjunctivevalue in making the interpreter aware of possibilities they had not considered, they should not be relied on when making clinical decisions[6,8]. ECGs bearing a computer-generated report should be subjected to the same scrutiny as those without a report and the report should be checked by a clinician. If the report is accurate and complete it should be signed by the clinician, who is then the de facto author of the report. If the report is considered inaccurate or incomplete it should be amended or deleted, in which latter case it should be replaced by the clinician's own report. The identity of the clinician who signs the report should be clear.

## 5.10 Quality assurance

### 5.10.1 Introduction

ECG reports that are inaccurate, incomplete, or unclear in meaning have the potential to do harm. It is therefore recommended that ECG reporting be subjected to quality assurance (QA). There is no single, comprehensive QA scheme that can be prescribed for ECG reporting, but it is recommended thatany scheme used addresses qualifications in ECG interpretation and the auditof reports.

### 5.10.2 Qualifications

Competence, both in interpretation and report-writing, is necessary for high quality ECG reports. This should be acquired through suitable training and study and be demonstrated by the acquisition of a relevant qualification. Suchtraining may be part of a broader scheme such as a medical or cardiology educational programme, provided that it includes ECG interpretation and reporting to an appropriate standard.

### 5.10.3 Audit

Training and qualifications, though important, do not guarantee competence in performance. It is essential to any comprehensive QA scheme in ECG reporting that there be regular formal audit. Periodic sampling and independent review of ECG reports helps to ensure consistency and high standards while identifying systematic problems and highlighting possible training needs. This document provides reporting standards and guidance which can be used as a basis for audit.

# 6.Conclusion

An ECG, to be of maximum diagnostic value, should be accompanied by a structured, accurate and informative report and the report's author should be clearly identifiable. This document provides guidance to help reporting clinicians to achieve these aims.

## 7.References


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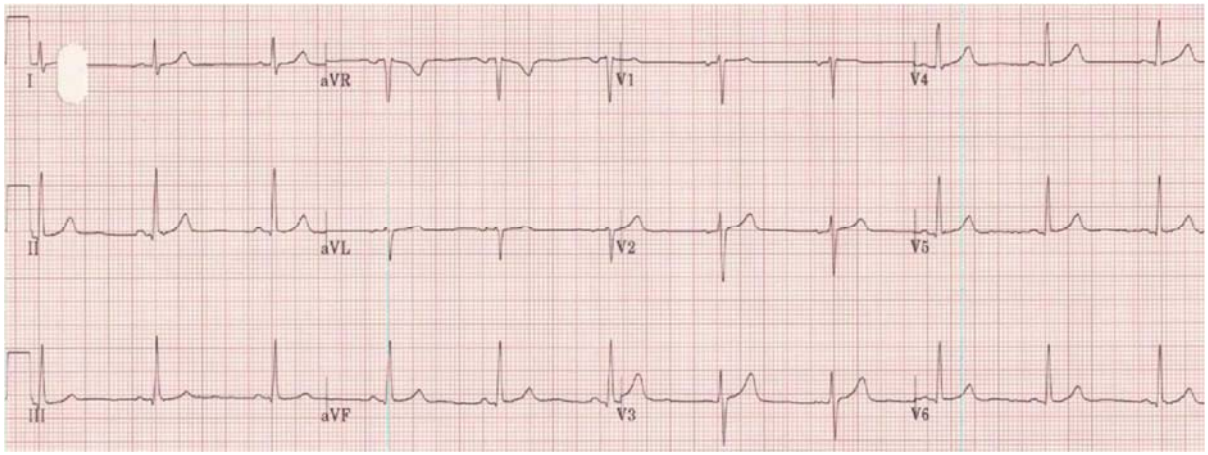
## Appendix: 1 Sample Reports

Two alternative sample reports for ECG 1 are provided below, each of them consistent with the guidance provided in this document. Report 1(a) is a detailed report ending with a conclusion that the ECG is normal. Report 1(b) merely states that the ECG is normal.

**ECG 1**

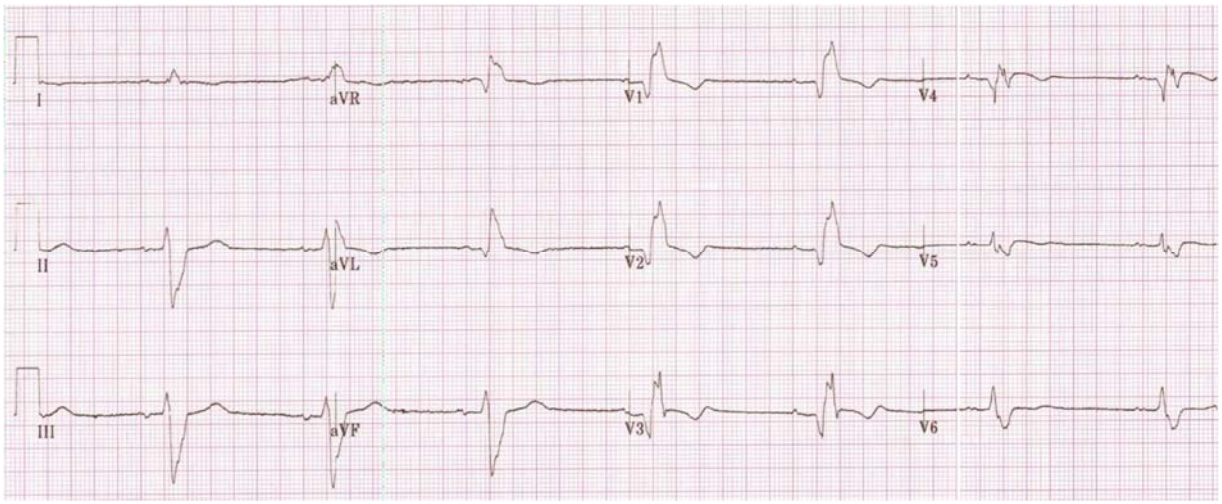



| Report 1(a) |
| --- |
| Sinus rhythm at 63 beats per minute.<br>QRS axis = +75°.<br>PR interval = 160 ms.<br>QRS duration = 80 ms.<br>QTc = 360 ms.<br>No ST/T abnormalities.<br>Normal QRS amplitudes.<br>No pathological Q waves.<br>**Conclusion: Normal ECG**<br>*Reported by:*<br>John Smith MSc<br>Registered Clinical Scientist<br>Registration number A12345<br>Signed |

| Report 1(b) |
| --- |
| **Normal ECG.**<br>*Reported by:*<br>John Smith MSc<br>Registered Clinical Scientist<br>Registration number A12345<br>Signed |

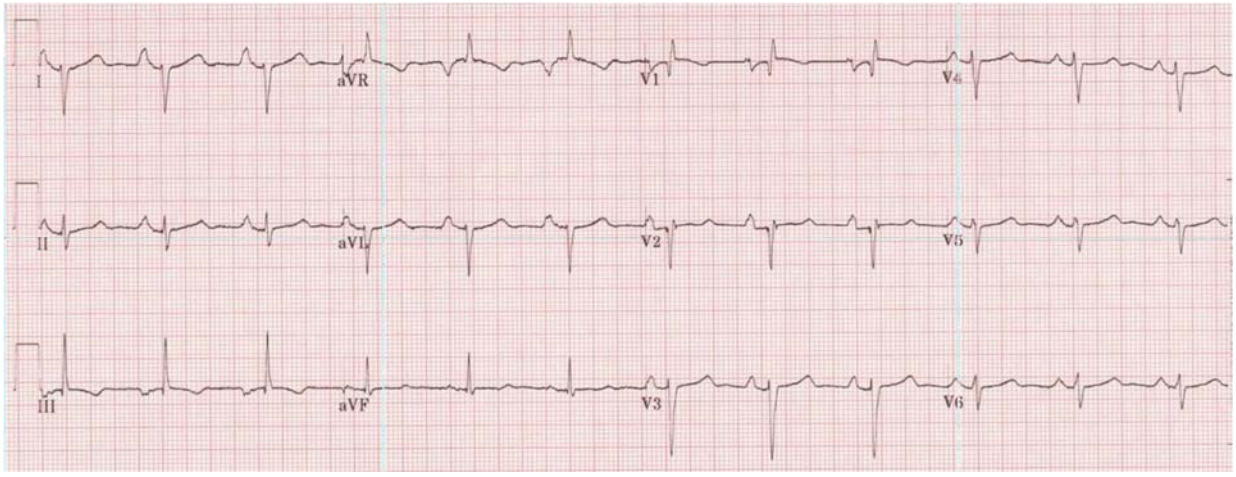
Sample report 2 below for ECG 2 details all the abnormalities present, providing possible explanations for them where appropriate and summarising them in a conclusion.

**ECG 2**




| **Report 2** |
| --- |
| Sinus bradycardia (42 beats per minute).<br>Left axis deviation (-75°), consistent with left anterior fascicular block.<br>Right bundle branch block.<br>Abnormal Q waves V1 – V4, suggestive of old anterior myocardial infarction<br>Inverted T waves I, aVL and V1 – V5.<br><br>**Conclusion: Probable old anterior myocardial infarction with right bundle branch block and left anterior fascicular block.**<br><br>*Reported by:*<br>John Smith MSc<br>Registered clinical scientist<br>Registration number A12345<br>Signed<br><br>18 September 2018 |

Sample report 3 for ECG 3 describes the rhythm and heart rate, then details the abnormalities, providing possible explanations where appropriate and ending with a conclusion which includes a probable clinical explanation for the ECG pattern.




**ECG 3**

| **Report 3** |
| --- |
| Sinus rhythm at 70 beats per minute.<br>Right axis deviation (+150°).<br><br>Dominant R wave in V1.<br>Q wave in V1 and V2.<br><br>Poor R wave progression with R=S in V6.<br>Tall P waves consistent with right atrial abnormality.<br>Inverted T wave in leads III and aVR.<br><br>**Conclusion: Right ventricular hypertrophy and right atrial abnormality, consistent with cor pulmonale.**<br><br>*Reported by:*<br>John Smith MSc<br>Registered clinical scientist<br>Registration number A12345<br><br>Signed<br><br>18 September 2018 |

## 2 Equality Impact Assessment

### Initial Screening for Equality Impact Assessment

| At this stage, the following questions need to be considered: | | | |
|---|---|---|---|
| 1 | What is the name of the policy, strategy or project?<br>ECG reporting standards and guidance; An approved method by the The Professional Body for Cardiac Scientists (SCST) | | |
| 2. | Briefly describe the aim of the policy, strategy, and project. What needs or duty is it designed to meet?<br>This clinical guideline by consensus aims to advise users of the considerations needed for reporting 12-lead electrocardiograms and provides a systematic method for constructing a 12-lead electrocardiogram report. | | |
| 3. | Is there any evidence or reason to believe that the policy, strategy or project could have an adverse or negative impact on any of the nine protected characteristics? | **Yes** | ~~**No**~~ |
| 4. | Is there evidence or other reason to believe that anyone with one or more of the nine protected characteristics have different needs and experiences that this policy is likely to assist i.e. there might be a *relative* adverse effect on other groups? | ~~**Yes**~~ | **No** |
| 5. | Has prior consultation taken place with organisations or groups of persons with one or more of the nine protected characteristics of which has indicated a pre-existing problem which this policy, strategy, service redesign or project is likely to address? | ~~**Yes**~~ | **No** |

## Equality Analysis

| Protected Characteristics | Examples of actual or potential negative or adverse impact and what steps have been or could be taken to address this |
|---|---|
| **Gender** – identify the impact/potential impact of the policy on women and men. | No known negative impact |
| **Pregnancy and maternity** | No known negative impact |
| **Gender Reassignment/ Transgender –** identify the impact/potential impact of the policy on transgender people<br><br>(Note an individual's assigned sex and gender does not align, meaning the person may be transgender). | No known negative impact |
| **Disability** - identify the impact/potential impact of the policy on disabled people (ensure consideration both physical and mental impairments) | Online-only format of the guideline may impact accessibility to individuals with impaired vision or difficulty in reading e.g. dyslexia. Steps that could be taken:<br>- Explore options to provide document in alternative reading formats upon request e.g. braille<br>- Create an audio recording of the document |
| **Age** – identify the impact/potential impact of the policy on different age groups | No known negative impact |
| **Race** – identify the impact/potential impact on different black and minority ethnic groups | No known negative impact |
| **Sexual orientation -** identify the impact/potential impact of the policy on<br>lesbians, gay, bisexual & heterosexual people | No known negative impact |
| **Marriage and civil partnership –** does the policy/strategy treat married and civil partnered people equally? | No known negative impact |
| **Religion/belief** – identify the impact/potential impact of the policy on people of different religious/faith groups and also upon those with no religion. | No known negative impact |
| **Sex -** does the policy/strategy treat people of all sexes equally?<br>Sex is defined as either of the two main categories (male and female) into which humans and most other living things are divided on the basis of their reproductive functions. | No known negative impact |

| | |
|---|---|
| **Socio-economically disadvantaged** – identify the impact on people who are disadvantaged due to factors like family background, educational attainment, neighbourhood, employment status can influence life chances | No known negative impact |
| **Rural communities** – identify the impact / potential impact on people living in rural communities | No known negative impact |