Journal of the American College of Cardiology
Vol. 48, No. 11, 2006

ISSN 0735-1097/06/$32.00
Published by Elsevier Inc.
doi:10.1016/j.jacc.2006.09.020

ACC/AHA/HRS CLINICAL DATA STANDARDS

ACC/AHA/HRS 2006 Key Data Elements and Definitions for Electrophysiological Studies and Procedures

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (ACC/AHA/HRS Writing Committee to Develop Data Standards on Electrophysiology)

ACC/AHA WRITING COMMITTEE FOR ELECTROPHISIOLOGY CLINICAL DATA STANDARDS

Alfred E. Buxton, MD, FACC, FAHA, *Chair*

Hugh Calkins, MD, FACC, FAHA, FHRS
David J. Callans, MD, FACC
John P. DiMarco, MD, PHD, FACC, FAHA, FHRS
John D. Fisher, MD, FACC, FHRS
H. Leon Greene, MD, FACC
David E. Haines, MD, FACC, FHRS
David L. Hayes, MD, FACC, FAHA, FHRS
Paul A. Heidenreich, MD, FACC
John M. Miller, MD, FACC
Athena Poppas, MD, FACC
Eric N. Prystowsky, MD, FACC, FAHA, FHRS
Mark H. Schoenfeld, MD, FACC, FAHA, FHRS
Peter J. Zimetbaum, MD, FACC

TASK FORCE MEMBERS

Paul A. Heidenreich, MD, FACC, *Chair*

David C. Goff, PHD, FAHA*
Frederick L. Grover, MD, FACC
David J. Malenka, MD, FACC*
Eric D. Peterson, MD, FACC
Martha J. Radford, MD, FACC, FAHA†
Rita F. Redberg, MD, MSC, FACC*

*Former Task Force Member
†Immediate past Chair

TABLE OF CONTENTS

This document was approved by the American College of Cardiology Board of Trustees in September 2006 and the American Heart Association Science Advisory and Coordinating Committee in September 2006. When citing this document, the American College of Cardiology and the American Heart Association would appreciate the following citation format: Buxton AE, Calkins H, Callans CJ, DiMarco JP, Fisher JP, Greene HL, Haines DE, Hayes DL, Heidenreich PA, Miller JM, Poppas A, Prystowsky EN, Schoenfeld MH, Zimetbaum PJ. ACC/AHA/HRS 2006 key data elements and definitions for electrophysiology studies and procedures: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (ACC/AHA/HRS Writing Committee to Develop Data Standards on Electrophysiology). J Am Coll Cardiol 2006;48:2360–96.

This article has been copublished in the December 5, 2006, issue of *Circulation*.

PREAMBLE

The American College of Cardiology (ACC) and the American Heart Association (AHA) recognize the importance of refining the lexicon used to describe the process and outcomes of clinical care, whether in randomized trials, observational studies, registries, or quality improvement initiatives. Broad professional agreement on a common vocabulary with common definitions will facilitate cross-study comparisons or, when advantageous, combining of data across studies and improving the assessment of any project's generalizability to clinical practice. To further efforts aimed at standardizing such a lexicon, the ACC and AHA have undertaken to develop and publish clinical data standards—sets of standardized data elements and corresponding definitions that can be used in a variety of data collection efforts for a range of cardiovascular conditions.

It is hoped that these clinical data standards will do the following:

1. improve cross-comparison of results and clinical outcomes between different trials and registries;
2. facilitate the development and conduct of future registries, at both hospital and national levels, by providing a list of major variables, outcomes, and definitions;
3. facilitate measurement for quality improvement programs; and
4. become the basis for a standardized medical documentation process with the anticipation that the medical record will progress to an electronic format.

The ACC/AHA Task Force on Clinical Data Standards makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group were required to complete and submit a disclosure form showing all such relationships that might be perceived as real or potential conflicts of interest. These statements are reviewed by the ACC/AHA Task Force on Clinical Data Standards, reported orally to all members of the writing panel at the first meeting, and updated as changes occur. Writing Committee members' relationships with industry are listed in Appendix C. Relationships with industry for official peer reviewers are listed in Appendix D.

The ACC/AHA Task Force on Clinical Data Standards selects cardiovascular conditions and procedures that would benefit from the creation of a data standard set. Experts in the subject are selected to examine/consider existing data standards and develop a comprehensive, yet not exhaustive, data standard set. Users should understand that when undertaking a data collection effort, only a subset of the elements contained in a clinical data standards listing may be needed or, conversely, they may want to consider whether it may be necessary to collect some elements not listed. For example, in the setting of a randomized clinical trial of a new drug, additional information would likely be required regarding study procedures and drug therapies.

The ACC and AHA aim to standardize the language used to describe cardiovascular diseases and procedures, enhance consistency in cardiology, and increase opportunities for sharing data across various data sources. The ultimate goal of ACC/AHA clinical data standards is to contribute to the infrastructure necessary for accomplishing the ACC/AHA's mission of fostering optimal cardiovascular care and disease prevention.

The ACC and AHA support their members' goal to improve cardiovascular care and disease prevention through professional education, promotion of research, development of guidelines and standards for cardiovascular care, and fostering policy that supports optimal patient outcomes. The ACC and AHA recognize the importance of the use of clinical data for patient management, in the assessment of patient outcomes, and in research efforts focused on improving clinical treatment of patients.

As a component of this objective, the ACC/AHA clinical data standards concentrate on the identification, definition, and standardization of data corresponding with various clinical topics in cardiology. The primary goal of clinical data standards is to assist in the collection of data by providing an initial platform of data elements and corresponding definitions applicable to various disease conditions in cardiology. These key elements and definitions are a compilation of variables applicable in the measurement of patient clinical management and outcomes, and for research and epidemiological assessments.

The Health Insurance Portability and Accountability Act (HIPAA) privacy regulations, which went into effect in April 2003, have heightened all practitioners' awareness of our professional commitment to safeguard our patients' privacy. Our goal is to treat every patient's health information with the same respect and courtesy as their person. The HIPAA privacy regulations (http://www.hhs.gov/ocr/combinedregtext.pdf, page 31) specify which information elements are considered "protected health information." These elements may not be disclosed to third parties (including registries and research studies) without the patient's written permission. Protected health information

may be included in databases used for health care operations under a data use agreement. Research studies using protected health information must be reviewed by an institutional review board or a privacy board.

We have included identifying information in all clinical data standards to facilitate uniform collection of these elements when appropriate. For example, a longitudinal clinic database may contain these elements, since access is restricted to the patient's caregivers. On the other hand, registries may not contain protected health information unless specific permission is granted by each patient. These fields are indicated as protected health information in the data standards.

Our understanding of the importance of data element standardization, the backbone of clinical care, clinical research, and quality performance measurement derives from experience with clinical care, clinical research, and quality performance measurement. In clinical care, caregivers communicate with each other through a common vocabulary. The integrity of clinical research depends in large part on firm adherence to pre-specified procedures for patient enrollment and follow-up; these procedures are guaranteed through careful attention to definitions enumerated in the study design and case-report forms. When data elements and definitions are standardized across studies, comparison, pooled analysis, and meta-analysis are enabled, thus deepening our understanding of individual clinical trials.

The recent development of quality performance measurement initiatives, particularly those for which comparison of providers is an implicit or explicit aim, has further raised awareness among the professional community about the importance of data standards. For the first time, a wide audience, including non-medical professionals such as payers, regulators, and consumers, may draw conclusions about care and outcomes. For understanding and comparison of care patterns and outcomes to be fair, the data elements that compose the descriptions of these patterns and outcomes of care must be clearly defined, consistently used, and properly interpreted by a broader audience than ever before.

Paul A. Heidenreich, MD, MS, FACC,
Chair, ACC/AHA Task Force on Clinical Data Standards

I. INTRODUCTION

The current era of clinical cardiac electrophysiology (EP) began in the late 1960s with the introduction and growth of EP laboratories. What began as a diagnostic field focused on improving our understanding of cardiac conduction defects, then spread into diagnostic studies of patients with tachyarrhythmias, both supraventricular and ventricular. This discipline has now evolved into one in which therapeutic ventures have displaced diagnosis as the major focus. Therapies directed by electrophysiologists encompass two major types: 1) catheter-based, for cure or palliation of tachyarrhythmias; and 2) device-based, for both bradyarrhythmias as well as tachyarrhythmias. More recently, EP has influenced the treatment of patients with heart failure, using unique pacing modalities. This discipline will continue to evolve, and one can foresee EP catheters and devices being utilized to deliver novel molecular and genetic therapies in the future.

Increasing emphasis is being placed on the outcomes of treatment. If we are to evaluate the results of new, as well as established, treatments, it is necessary to characterize patients accurately. This, in turn, requires the creation of databases that not only record patient attributes, but permit comparison between patient groups. Description of patient characteristics, as well as treatment outcomes, is vital not only to researchers, but to practitioners. Every physician involved in patient care is obligated to critically evaluate the results of the care they deliver. If we do not question the results of our interactions with patients, we will perpetuate misconceptions, repeat previous mistakes, and retard the advancement of medical science. It is in this spirit that we present this first edition of the ACC/AHA/HRS Electrophysiology Clinical Data Standards.

It is recognized that cardiac arrhythmias and electrophysiologic properties are influenced to a large extent by a patient's age. Normal values of electrophysiologic and electrocardiographic parameters for persons under 18 years of age differ from those of adults. The electrophysiologic parameters for persons under age 18 vary and change with growth. The normal values provided in this document apply to persons over age 18. Although certain arrhythmias may occur primarily or exclusively in the pediatric or adult populations, the committee feels there is merit in providing one document, for purposes of continuity and inclusiveness. In constructing this document we have tried to use terms general enough to make the document useful and appropriate for both pediatric and adult electrophysiologists.

This document is meant to serve two major purposes. The first goal is to serve as the basis for databases employed in clinical research as well as practice. Our intent was to be as inclusive as possible. We have tried to provide a comprehensive instrument that would prove useful to physicians and other professionals involved in the care of patients with cardiac arrhythmias or implanted rhythm management devices. The intent of this document is not to mandate data to be collected nor do we expect that all the data elements will be utilized in every setting. Rather, we expect practitioners will pick and choose data elements as appropriate for individual projects.

The second major goal of this project is to provide standard definitions of terms relevant to the care of patients with arrhythmias and implanted rhythm management devices. We anticipate this will facilitate communication and promote a common language to foster meaningful comparisons and assessment of analyses and outcomes. Some definitions are arbitrary because of a lack of sufficient data to provide a rational pathophysiologic basis. In such cases, we have tried to incorporate common usage, with the expecta-

tion that future work will result in data to eliminate such shortcomings.

The writing committee anticipates that the EP data standards will prove useful in several settings:

- *Clinical programs*, where many providers and health plans work together to achieve specific goals for the care of patients with arrhythmias and arrhythmia management devices. Data standards will assist in the organization and design of electronic medical information initiatives, such as electronic medical records, pharmacy and other clinical databases, or computerized decision support.
- *Clinical research*, including prospective registries and randomized controlled trials (RCTs). Meta-analyses of RCTs would be particularly strengthened by the use of standardized data for key variables.
- *Quality-performance measurement initiatives.* Data standards will especially facilitate interpretation for nonmedical users, such as payors, regulators, and consumers.

II. METHODOLOGY

A. Writing Committee Composition

The ACC/AHA Task Force on Clinical Data Standards selected members for the ACC/AHA/HRS Writing Committee to Develop Clinical Data Standards for Electrophysiology. The committee consisted of 14 members who are active in clinical research in adult EP, as well as heart failure and general cardiology. The committee included membership from across the U.S., so as to ensure balance in the selection of data elements and consideration of variations in practice. To ensure consistency between the clinical data standards and other ACC/AHA/HRS standards, the Task Force appointed representatives who had served on other ACC/AHA Guideline Writing Committees.

B. Review of Literature and Existing Data Definitions

The ACC/AHA/HRS Task Force on Clinical Data Standards supported gathering as many candidate data elements and definitions as possible, principally from large clinical trials and registries, such as MUSTT (Multicenter Unsustained Tachycardia Trial) (1) and COMPANION (Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure) (2). The Writing Committee compiled and reviewed case report forms, data elements, and definitions from national, international, and local cardiovascular data collection efforts. Examples of these data sources include the ACC National Cardiovascular Data Registry (NCDR) (http://www.accncdr.com/WebNCDR/Common/) and the ACC Key Data Elements and Definitions for Measuring the Clinical Management and Outcomes of Patients With Acute Coronary Syndromes (3). We also reviewed the ACC/AHA Clinical Data Standards on Heart Failure (4) and the ACC/AHA Clinical Data Standards on Atrial Fibrillation (5), as well as the ACC/AHA/ESC Atrial Fibrillation Guidelines (6).

The EP data standards are meant to provide data elements that parallel and complement other ACC and AHA standards, specifically the guidelines and the performance measures. These data were developed simultaneously with other data standards. Research articles, clinical trials, and reference sources were consulted as needed and are cited throughout this document.

C. Defining Data Elements

Members of the Writing Committee drafted definitions. Writers were encouraged to write definitions broad enough to be applicable in a variety of data collection settings, but specific enough that the data elements can be uniformly interpreted. In addition, the committee compiled a dictionary of common definitions for arrhythmias mentioned throughout this document (see Appendix A) to further supplement and support consistency in data collection of the elements and definitions contained in the main document. Data definitions were linked whenever possible to the evidence-based national guidelines. To ensure consistency across ACC/AHA clinical data standards, writers used an existing ACC/AHA definition verbatim unless there was a reason related to EP to change that definition.

D. Relation to Other Data Standards

This committee has reviewed the ACC/AHA Key Data Elements and Definitions for Measuring the Clinical Management and Outcomes of Patients With Atrial Fibrillation (5). That document addresses certain aspects of data collection in patients with atrial fibrillation in more detail than is covered in this document. The committee anticipates that for certain purposes, use of that document is more appropriate.

In an effort to maintain consistency of definitions across the data standards documents, the committee also reviewed the ACC Key Data Elements and Definitions for Measuring the Clinical Management and Outcomes of Patients With Acute Coronary Syndromes (3) and the ACC/AHA Key Data Elements and Definitions for Measuring the Clinical Management and Outcomes of Adults With Chronic Heart Failure (4).

E. Consensus Development

The ACC/AHA data standards are consensus, team-written documents that are based on judgments of experts in the field of cardiology. This Writing Committee met several times, both in person and through conference calls, over the course of several months to define and refine the data elements. Throughout the creation of the data element set, consensus was developed through discussions (either during face-to-face meetings or conference calls), e-mails, and sometimes written votes.

F. Peer Review, Public Comment, and Board Approval

The set of EP data elements was independently reviewed by official reviewers nominated by the ACC, the AHA,

and the Heart Rhythm Society (HRS), as well as the ACC/AHA Task Force on Clinical Data Standards and independent content reviewers. To increase its applicability further, this document was posted on the ACC Web site (www.acc.org) for a 30-day public comment period from March 23 through April 21, 2005. This document was approved for publication by the governing bodies of the ACC, the AHA, and the HRS.

The Writing Committee anticipates these data standards will require regular review and updating, just as is the case with guidelines and performance measures. At the anniversary of the data standards publication, the Writing Committee chair, in conjunction with the Writing Committee members, will review the data standards to ascertain whether or not modifications should be considered. To keep current, whenever a relevant guideline is updated the associated data standards will be reviewed and updated to reflect those changes.

III. ELECTROPHYSIOLOGY CLINICAL DATA STANDARDS ELEMENTS AND DEFINITIONS

A. Patient Demographics

Patient demographic information is used for patient identification for longitudinal care, for demographic grouping to assess issues of access and care quality for traditionally disadvantaged groups, and for risk adjustment. Association of any health information with unique patient identifiers and/or demographic information that can be linked to the individual patient (indicated by an asterisk) identifies the dataset as "protected health information." Unique patient identification information (Social Security number or medical record number) is necessary and appropriate for longitudinal clinical care, but given current legislation protecting patients' privacy (7), is not included in multi-institution registries unless appropriate informed consent is obtained from all patients. For other uses, patient privacy concerns may need to be considered by hospital privacy officers and/or institutional review board.

DATA ELEMENT	DEFINITION
*Date of birth	Patient date of birth (day, month, and year of patient's birth)
*Gender	Indicate the patient's gender at birth. Choose one of the following: • Male • Female
*Race	Patient's race as determined by the patient/family. • American Indian or Alaska Native • Asian • Black or African American • Native Hawaiian or Other Pacific Islander • White • Multi-racial • Other
*Hispanic ethnicity	As determined by the patient and/or family, is the patient's ethnicity Hispanic?
Insurance payor	Indicate the patient's primary insurance payor for this admission. Choose one of the following: • Government: Refers to patients who are covered by government-reimbursed care. In the U.S., this includes: — Medicare — Medicaid (including all state or federal Medicaid-type programs) — Champus — Veteran's Health Affairs — Department of Defense — Other federal group (specify) • Commercial: Refers to all indemnity (fee-for-service) carriers and Preferred Provider Organizations (PPOs). • HMO: Refers to a Health Maintenance Organization characterized by coverage that provides health care services for members on a pre-paid basis. • None: Refers to individuals with no or limited health insurance; thus, the individual is the payor regardless of ability to pay. Only mark "None" when "self" or "none" is denoted as the first insurance in the medical record.
Government payor type	If the patient's primary insurance payor for this encounter is "Government," choose the type of government insurance: • Medicare • Medicaid • Other
Presentation to health care facility	Type of presentation to healthcare facility: • Emergency admission for documented or suspected arrhythmia • Emergency admission for heart failure (HF) • Emergency admission for other cardiovascular problem • Emergency admission for non-cardiovascular problem (e.g., pneumonia) • Planned admission for management of documented or suspected arrhythmia • Planned admission for cardiovascular disease • Planned admission for non-cardiovascular disease • Regularly scheduled outpatient visit

DATA ELEMENT	DEFINITION
Presentation to health care facility (continued)	• Other outpatient visits, including urgent outpatient visits • Remote monitoring • Telephone contact • Electronic communication • Other (specify) Note if patient is a new patient or a prior patient with a new entry.
Outpatient	Was procedure done as outpatient?
Inpatient	• Hospital admission date • Hospital discharge date
Disposition after health care encounter	Indicate disposition after healthcare encounter: • Discharged to home or self care (routine discharge) • Discharged/transferred to another short-term general hospital for inpatient care • Discharged/transferred to skilled nursing facility • Discharged/transferred to an intermediate care facility • Discharged/transferred to another type of institution • Discharged/transferred to home under care of organized home health service organization • Left against medical advice or discontinued care • Discharged/transferred to home under care of a home intravenous drug therapy provider • Admitted as an inpatient to this hospital • Expired (or did not recover) • Hospice—home • Hospice—medical facility • Discharged/transferred to an inpatient rehabilitation facility including rehabilitation in distinct part units of a hospital. Specify date.
Date of EP study	Indicate the date of EP study and/or device-related procedure.

*Unique patient identifier.

B. Patient History

Information about patients' medical history is important in quality performance measurement, clinical research, and clinical care. The frequency, severity, and duration of symptoms associated with arrhythmias are of prime importance in determining appropriate therapy. History of non-cardiac conditions may denote absolute or relative contraindications to various therapies and may significantly impact outcome and prognosis. Inclusion of data elements pertinent to patient history is therefore important to clinical decision-making, to design of quality performance measures, and to risk-adjusted outcomes assessment. For most purposes, these data elements can be recorded as either present or absent. Year of onset may be helpful, especially when data collection is used for longitudinal clinical follow-up. More detailed information about severity of each condition (e.g., record of prior hospitalizations or specifics of therapy for the condition) might be considered for certain users.

In addition to general non-cardiac and cardiac history we have included space to record detailed history of arrhythmias. Previously documented arrhythmias may be important for determination of appropriate therapy, as well as carrying prognostic information. Knowledge of medications being taken at the time of spontaneous arrhythmia occurrence is important for several reasons:

- Medications may facilitate occurrence of arrhythmias, in association with QT prolongation, as well as re-entrant arrhythmias not related to QT prolongation.
- Medications may alter the clinical manifestations of arrhythmias, for example by slowing tachycardias, or by worsening atrioventricular or intraventricular conduction.

Other factors may be important to document, such as the standard electrocardiogram (ECG), both in sinus rhythm, as well as during tachycardias. The standard ECG may provide critical prognostic as well as diagnostic information.

DATA ELEMENT	DEFINITION
1. Presentations Associated With Arrhythmia	
No symptoms	The absence of symptoms that could result from an arrhythmia
Palpitations	Patient reports palpitations, felt either in the chest, throat, or neck, as described by the following: • Heartbeat sensations that feel like pounding or racing • An unpleasant awareness of heartbeat • Feeling skipped beats or a pause • Provide date of first documented episode of palpitations • Specify number of episodes. If multiple episodes have occurred, provide frequency.

Continued on next page

DATA ELEMENT	DEFINITION
Presyncope/near syncope	Patient reports presyncope/near syncope as described by the following: • Dizziness • Lightheadedness • Feeling faint • "Graying out" • Provide date of first documented isode of presyncope/near syncope. • Specify number of episodes. If multiple episodes have occurred, provide frequency.
Syncope	Sudden loss of consciousness with loss of postural tone, not related to anesthesia, with spontaneous recovery as reported by patient or observer. Patient may experience syncope when supine. • Provide date of first documented episode of syncope. • Specify number of episodes. If multiple episodes have occurred, provide frequency.
"Drop attack"	Abrupt loss of postural tone (collapse) without reported loss of consciousness. • Provide date of first documented episode of "drop attack." • Specify number of episodes. If multiple episodes have occurred, provide frequency.
Angina due to arrhythmia	History of angina before the current admission. "Angina" refers to evidence or knowledge of symptoms before this acute event described as chest pain or pressure, jaw pain, arm pain, or other equivalent discomfort suggestive of cardiac ischemia. Date of most recent episode may be helpful.
Dyspnea	Patient experiences frequent uncomfortable awareness of breathing in one or both of the following circumstances (specify): • Resting in a sitting position • Exerting him/herself Year of onset may be helpful.
Fatigue	Patient describes history of unusual tiredness and inability to perform usual activities. Year of onset may be helpful.
HF caused by arrhythmia	There are two common situations in which arrhythmias cause HF symptoms: 1. An acute arrhythmia may precipitate acute HF, most often with acute pulmonary edema. 2. A persistent arrhythmia may precipitate symptoms of chronic HF, with a more varied presentation.
Cardiac arrest due to arrhythmia	"[Sudden] cardiac arrest is the sudden cessation of cardiac activity so that the victim becomes unresponsive, with no normal breathing and no signs of circulation. If corrective measures are not taken rapidly, this condition progresses to sudden death. Cardiac arrest should be used to signify an event as described above, that is reversed, usually by CPR and/or defibrillation or cardioversion, or cardiac pacing. Sudden cardiac death should not be used to describe events that are not fatal." Specify whether cardiac arrest occurred out-of-hospital or in-hospital.
2. Arrhythmia History (see Appendix A for a supplemental dictionary of arrhythmia terms used throughout this section)	
Duration and frequency of arrhythmia	For each arrhythmia, provide the following information: • Provide date of first documented arrhythmia(s) • Specify number of episodes. If multiple episodes have occurred, provide frequency.
Sinus node function	Indicate the patient's medical history with respect to sinus node function. • Normal sinus rhythm (60 to 100 bpm and the cycle length does not vary by more than 10% or 120 ms) • Sinus arrhythmia • Wandering atrial pacemaker • Sinus bradycardia • Sinoatrial exit block — Mobitz I — Mobitz II • Sinus arrest/pause • Sinus node dysfunction (bradycardia) • Sick sinus syndrome • Sinus node dysfunction following cardiac surgery (transient or permanent) • Ectopic atrial rhythm • Other (specify) Specify date of first documented arrhythmia, number of episodes, and frequency.
Atrioventricular (AV) conduction	Indicate the patient's medical history with respect to AV conduction. • Normal AV conduction (PR interval 120 to 200 ms without pre-excitation, bundle branch, or fascicular block) • Short PR interval • PR prolongation (first-degree AV block) • Second-degree AV block — Mobitz I — Mobitz II • Advanced or high-degree AV block

DATA ELEMENT	DEFINITION
Atrioventricular (AV) conduction (continued)	• Third-degree AV block (complete heart block) • AV conduction abnormality following cardiac surgery (transient or permanent) • Congenital complete heart block • Isorhythmic dissociation • Paroxysmal AV block • Pre-excitation (Delta wave) • Other (specify) Specify date of first documented arrhythmia, number of episodes, and frequency.
Intraventricular conduction	Indicate the patient's medical history with respect to intraventricular conduction. • Normal (no history of intraventricular conduction) • Left anterior fascicular block • Left posterior fascicular block • Left bundle-branch block (LBBB) • Right bundle-branch block (RBBB) • Incomplete RBBB • Intraventricular conduction delay (IVCD), nonspecific • Intraventricular conduction abnormality following cardiac surgery (transient or permanent) • Other (specify) Specify date of first documented arrhythmia, number of episodes, and frequency.
Supraventricular tachycardias (SVT)	Indicate the patient's medical history with respect to SVT. • Normal (no history of SVT) • SVT — Recurrent: more than one episode of tachycardia — Persistent: episodes of tachycardia that require medical intervention (pharmacologic therapy, pacing, ablation, or cardioversion) for termination — Paroxysmal: episodes of tachycardia that terminate spontaneously — Incessant: episodes of tachycardia that resume immediately after termination • Atrial premature complexes (APC) • Atrial tachycardia (AT) — Focal ATs — Multifocal ATs • Atrial fibrillation (AF) — Initial episode of AF — Paroxysmal AF — Persistent AF — Permanent AF • Macro re-entrant AT — Cavotricuspid isthmus (CTI)-dependent AF (*also* typical or type I AF) — Non–CTI-dependent AF • Macro–re-entrant AT related to previous cardiac surgery • Sinus tachycardia (ST) • Inappropriate ST — Persistent — Intermittent/paroxysmal • Postural orthostatic tachycardia syndrome (POTS) • AV node re-entry — Slow-fast — Fast-slow — Slow-slow • Junctional tachycardia — Congenital junctional ectopic tachycardia (JET) — Postoperative junctional tachycardia — Focal junctional tachycardia — Non-paroxysmal junctional tachycardia (permanent form of junctional tachycardia [PJRT]) AV re-entrant tachycardia (concealed bypass tract) • Wolff-Parkinson-White (WPW) syndrome • Other (specify) Specify date of first documented arrhythmia, number of episodes, and frequency.
Ventricular tachycardias (VT)	Indicate the patient's medical history with respect to VT. • Normal (no history of VT)

Continued on next page

DATA ELEMENT	DEFINITION
Ventricular tachycardias (VT) (continued)	• VT — Spontaneous — Induced — Sustained — Nonsustained/unsustained — Bidirectional — Exercise-induced — Narrow complex VT, monomorphic — Sustained — Nonsustained/unsustained — Repetitive • VT, polymorphic — Sustained — Nonsustained/unsustained — Catecholaminergic • Premature ventricular complexes (PVC) • Ventricular couplet • Accelerated idioventricular rhythm • VT storm • Scar-based VT due to prior cardiac surgery • Adenosine-sensitive VT • Verapamil-sensitive VT • Ventricular flutter • Ventricular fibrillation (VF) • Torsades de pointes • Ventricular arrhythmias associated with long QT syndrome — Congenital — Acquired (specify heart block, medication, or other) • Ventricular arrhythmias associated with Brugada syndrome • Ventricular arrhythmias associated with short QT syndrome — QTc ≤300 ms — History of familial sudden death — Short refractory periods — Inducible VF • Fascicular tachycardia • Bundle branch re-entrant tachycardia • Idiopathic RBBB VT • Outflow tract VT — Right ventricular — Left ventricular • Other (specify) Specify date of first documented arrhythmia, number of episodes, and frequency.
3. History of Medication at Time of Arrhythmia	
Antiarrhythmic agents	Indicate if patient taking antiarrhythmic agent(s) (including digitalis, beta-adrenergic blocking agents, or calcium channel blockers) at time of arrhythmia. Specify drug(s).
Non-antiarrhythmic cardiovascular agents	Indicate if patient taking non-antiarrhythmic cardiovascular agent(s) at time of arrhythmia. Specify drug(s).
Non-cardiovascular drugs	Indicate if patient taking non-cardiovascular drug(s) at time of arrhythmia. Specify drug(s).
4. Specific ECG Patterns	
Simultaneous ECG leads	Multiple ECG lead recordings performed at the same time; indicate number of simultaneous ECG leads recorded.
P-wave duration	Time required for complete depolarization of both right and left atria. Duration of P-wave in milliseconds, measured from at least 3 simultaneous ECG leads, preferably including leads I, II, and V_1.
PR interval	Longest measured time from onset of P wave to onset of QRS complex in any given ECG lead.
QRS duration	Time required for complete depolarization of the right and left ventricles, measured in milliseconds from simultaneous (preferably 3 or more) ECG leads, including I, II, and V_1, from the onset to the termination of the QRS.
Epsilon wave	Delayed ventricular depolarization wave, usually seen in the early precordial leads (V_1 thorough V_3) as a notch or fragmented potential at the end of the QRS or early during the ST-segment. It signifies delayed (slowed or fractionated) ventricular depolarization (in the right ventricle and seen with right ventricular cardiomyopathy [arrhythmogenic right ventricular dysplasia or cardiomyopathy]). It correlates with the late potentials seen on the signal-averaged ECG, and it has also been called a "ventricular post-excitation wave."

DATA ELEMENT	DEFINITION
History of prolonged QT interval	History of ECG findings of prolonged QT interval.
Long QT	Prolongation of the corrected QT interval (QT_c) beyond 440 ms for adult males, 460 ms for adult females, and 500 ms in the presence of ventricular depolarization abnormalities (i.e., bundle branch blocks or IVCDs more than 120 ms.
5. History of Previous Therapeutic Strategies	
Previously used therapeutic strategies for AF	Indicate the types of therapeutic strategies that have been used previously. Rate control: • Pharmacologic (specify individual drugs used) • Nonpharmacologic — Ablation of AV junction with implantation of pacemaker — Modification of AV node function • Hybrid* • None Rhythm control: • Pharmacologic (specify individual drugs used) • Nonpharmacologic — Pulmonary vein (PV) focus — Segmental PV isolation — Ostial PV isolation — Extra-ostial PV isolation — Linear ablation — Substrate modification — AV junction ablation — AV junction modification • Specify energy source used for ablation — Radiofrequency — Cryo-ablation — Ultrasound • Hybrid* • None *Hybrid is defined as concurrent use of: • Pharmacologic and nonpharmacologic therapies or • Two or more nonpharmacologic therapies
Previously used therapeutic strategies for other arrhythmias	Indicate the types of therapeutic strategies that have been used previously. Pharmacologic: —Indicate number of drug trials —Indicate drugs tried Device: —Device type (specify—See "History of pacemaker insertion" and "History of ICD insertion") Ablation: —Number of ablation procedures —Ablation target(s) —Energy source(s)—radiofrequency, cryo, utrasound Hybrid therapy (combination of 2 or more of pharmacologic, device, or ablation) No previous therapy
6. Pacemaker/Implantable Cardioverter-Defibrillator (ICD) History	
History of pacemaker insertion	Indicate if the patient has had a pacemaker inserted. If yes, specify type: • Single chamber (atrial) • Single chamber (ventricular) • Dual chamber (both atrial and ventricular) • Biventricular of any type (specify) Specify indication (all that apply): • Sinus node dysfunction • AV block • AF • Neurocardiogenic syncope (carotid sinus hypersensitivity and vasovagal syncope) • Hypertrophic cardiomyopathy • Medically refractory HF • SVT (historically) • Other (specify) Venous access: • Subclavian • Axillary

Continued on next page

DATA ELEMENT	DEFINITION
History of pacemaker insertion (continued)	• Internal jugular • External jugular • Cephalic • Femoral Lead positions: • Atrial: — Right atrial appendage — Right atrial free wall — Right atrial septum — Adjacent to coronary sinus ostium • Ventricular: — Right ventricular apex — Right ventricular inflow — Right ventricular outflow • Epicardial • Subcutaneous array Coronary sinus: • Tributaries that allow atrial stimulation • Tributaries that allow ventricular stimulation Specify if capable of: • Burst pacing • Anti-tachycardia pacing Specify date of current implant. Specify manufacturer and model number.
Current pacing mode	Indicate the current pacing mode (8): • VVI • VVIR • DDD • DDDR • DDI • DDIR • AAI • AAIR • VDD • VDDR • DVI • DVIR • VOO • DOO • VOOR • DOOR • AOOR • Other (specify)
History of ICD insertion	Indicate if the patient has or has had an ICD inserted. If yes, specify type: • Single chamber • Dual chamber • Biventricular Specify indication: • AF • Secondary prevention of cardiac arrest • Primary prevention of cardiac arrest • High risk for VT (e.g., ischemic heart disease, hypertrophic cardiomyopathy, Brugada syndrome, long QT syndrome, HF) • Syncope with inducible VT Specify if capability exists: • Burst pacing • Anti-tachycardia pacing • Cardioversion
Current ICD Mode	• VVEV • VVED • DDED • AAEV • DDHD • Other (specify ICD mode as programmed)

DATA ELEMENT	DEFINITION
7. Other Cardiovascular History	
History of symptoms representative of angina	Previous angina may include: • Stable angina • Unstable angina Dates should be sought for the onset of either stable or unstable angina.
History of HF	Physician documentation or report of any of the following symptoms of HF prior to this care encounter described as dyspnea, fluid retention, or low cardiac output secondary to cardiac dysfunction; or the description of rales, jugular venous distension, or pulmonary edema. A previous hospital admission with principal diagnosis of HF is considered evidence of HF history.
HF status (NYHA functional classification)	New York Heart Association (NYHA) functional class as reported by a physician: • Class I: Patients with cardiac disease but without resulting limitations of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea. • Class II: Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, or dyspnea. • Class III: Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea. • Class IV: Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms are present even at rest or minimal exertion.
HF stage	• **A** = Patient at high risk for developing HF but who has no structural disorder of the heart. • **B** = Patient with a structural disorder of the heart but who has never developed symptoms of HF. • **C** = Patient with past or current symptoms of HF associated with structural heart disease. • **D** = Patient with end-stage disease who requires specialized treatment strategies such as mechanical circulatory support, continuous inotropic infusions, cardiac transplantation, or hospice care.
Evidence for ischemic heart disease	Any of the following conditions indicates ischemic heart disease: • At least one major epicardial coronary artery with more than 70% obstruction by coronary angiography. • History of acute myocardial infarction associated with wall motion abnormality by echocardiography or gated blood pool imaging. • Stress testing (with or without imaging) diagnostic of coronary artery disease.
History of myocardial infarction	Previous myocardial infarction prior to this encounter as determined by the following (indicate all that apply): • Hospital admission for acute myocardial infarction • ECG report indicating previous (old) or acute myocardial infarction • Increase in biochemical marker (creatine kinase or troponin) consistent with myocardial infarction • Patient reports history of acute myocardial infarction or heart attack Date of the first and the most recent episode may be helpful.
History of hypertension	Indicate if the patient has hypertension as documented by: • History of hypertension diagnosed and treated with medication, diet, and/or exercise. • Blood pressure >140 mm Hg systolic or 90 mm Hg diastolic on at least 2 occasions. • Blood pressure >130 mm Hg systolic or 80 mm Hg diastolic on at least 2 occasions for patients with diabetes or chronic kidney disease (9). More than one of the above may apply. The year of onset (first diagnosis) may be helpful.
Evidence for hypertensive cardiomyopathy	One of the following conditions must be met: • Untreated systolic blood pressure >160 mm Hg or diastolic >105 mm Hg for at least 3 months. • Hypertension requiring at lest 2 drugs for control for at least 5 years. • Presence of diabetes and hypertension, treated or untreated. • Documented left ventricular hypertrophy (preferably by echocardiography or magnetic resonance imaging [MRI]). • Absence of other etiologies for HF.
History of congenital heart disease	Patient has documented history of congenital heart disease confirmed by echocardiography, computed tomography, MRI, or catheterization. Specify type of lesion or types of lesions, specify surgical repair or percutaneous intervention, and date(s).
Evidence for myocardial infiltrative or storage disease	• Systemic amyloidosis by biopsy. • Hemochromatosis by biopsy or by serum markers in the presence of clinical evidence of multi-organ involvement.
Evidence for myocardial infiltrative or storage disease (continued)	• Sarcoidosis with clinical or biopsy evidence for multi-organ involvement and reduced left ventricular systolic function. • HF in a patient with a storage disease known to involve the myocardium, including Fabry disease, Gaucher disease, or the glycogen storage diseases. • Other (specify)

Continued on next page

DATA ELEMENT	DEFINITION
Evidence for toxic cardiomyopathy	• Alcohol abuse present for at least 5 years as defined by either heavy alcohol consumption (i.e., 75 g/day at least 5 days/week) or alcohol dependence (i.e., American Psychiatric Association's DSM-IV definition). • Cocaine use. • Temporally related exposure to a drug or substance known to cause cardiomyopathy, including chemotherapeutic agents(s) and radiation to the chest. • Other (specify)
Evidence for inflammatory myocarditis	• Biopsy-proven myocarditis. • Chagas disease by serologic tests for *T. cruzi* infection • Sarcoidosis with biopsy evidence or diagnostic pulmonary radiographic appearance with reduced left ventricular systolic function. • Other (specify)
Evidence for valvular heart disease	Primary valvular disease: • Moderately severe or severe, or 3+ or 4+ aortic insufficiency. • Moderately severe or severe, or 3+ or 4+ mitral insufficiency with echocardiographic evidence that mitral insufficiency is a primary abnormality and not secondary to ventricular dilation. • Moderately severe or severe aortic stenosis defined by estimated aortic valve area by catheterization or Doppler echocardiography of $\leq$1.0 cm^2. • Moderately severe or severe mitral stenosis defined by estimated mitral valve area by catheterization or echocardiography of $<$1.0 cm^2. • Other (specify pulmonic or tricuspid disease) Contributory valvular disease: • Valve disease that is felt to be significant but does not fulfill the aforementioned definitions.
Evidence for ventricular dysfunction due to tachyarrhythmias	HF attributed to sustained (usually >1 week) tachycardia (usually more than 120 bpm, cycle length <500 ms) that is not attributable to any other cause and shows evidence for improvement after correction of tachycardia.
Evidence for primary myocardial hypertrophic or other muscle disease	• Evidence of hypertrophy by echocardiography or MRI not attributable to hypertension — Specify: symmetric, asymmetric, or apical — Specify: obstructive or nonobstructive • Congenital muscular dystrophy • Other (specify)
Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C)	Inherited cardiomyopathy characterized by ventricular arrhythmia and right ventricular dysfunction (10).
Evidence for idiopathic cardiomyopathy	HF and reduced systolic function without evidence for any of the aforementioned etiologies or other disease known to cause cardiomyopathy.
8. History of Invasive Cardiac Interventions/Surgery	
History of percutaneous coronary revascularization procedure	Previous percutaneous coronary intervention of any type (balloon angioplasty, atherectomy, stent, or other), done prior to the current encounter. Date of most recent intervention may be helpful.
History of coronary artery bypass graft (CABG) surgery	CABG prior to the current encounter. Year of most recent intervention may be helpful.
History of other cardiac surgery	Indicate if patient has a history of other cardiac surgery. Specify type of surgery and date performed.
History of intervention for congenital heart disease	Indicate if patient has a history of intervention for congenital heart disease. Specify defect: • Atrial septal defect, ventricular septal defect, patent ductus arteriosus, artrioventricular septal defect • Tetralogy of Fallot; D and L transportation of the great arteries, Ebstein's anomaly, functional single ventricle • Aortic, mitral, and pulmonary stenosis • Persistent left superior vena cava • Other (specify) Date of intervention may be helpful.
History of valve intervention	Indicate each valve repair, valvuloplasty, or valve replacement in patient history. Indicate location, type, and date of intervention.
9. Non-Cardiovascular History	
History of diabetes mellitus	Indicate if patient has a history of diabetes, regardless of duration of disease, need for antidiabetic agents, or a fasting blood sugar >7 mmol/l or 126 mg/dl. Indicate if currently taking insulin. The year of onset (first diagnosis) may be helpful.
History of chronic liver disease	Indicate if patient has a history of documented cirrhosis or chronic liver disease.

DATA ELEMENT	DEFINITION
History of cerebrovascular disease	Indicate if the patient has a history of cerebrovascular disease, documented by any one of the following: • Cerebrovascular accident (CVA): patient has a history of stroke (i.e., loss of neurological function with residual symptoms at least 72 h after onset). • Reversible ischemic neurological deficit (RIND): patient has a history of loss of neurological function with symptoms at least 24 h after onset but with complete return of function within 72 h. • Transient ischemic attack (TIA): patient has a history of loss of neurological function that was abrupt in onset but with complete return of function within 24 h. • Noninvasive/invasive carotid test with >75% occlusion. • Previous carotid artery surgery.
History of peripheral vascular/arterial disease	Peripheral arterial disease can include the following: • Claudication, either with exertion or at rest. • Amputation for arterial vascular insufficiency. • Vascular reconstruction, bypass surgery, or percutaneous intervention to the extremities. • Documented aortic aneurysm. • Positive noninvasive test (e.g., ankle brachial index <0.8).
History of pulmonary hypertension	A mean pulmonary artery pressure ≥25 mm Hg measured at rest by right-heart catheterization. Specify primary or secondary.
History of chronic renal insufficiency	Patient has reduced glomerular filtration rate (GFR) for at least 3 months. Degree of renal insufficiency may be further defined according to degree of depression in GFR: • Mild renal insufficiency: GFR 60 to 89 ml/min/1.73 m^2. • Moderate renal insufficiency: GFR 30 to 59 ml/min/1.73 m^2. • Severe renal insufficiency: GFR 15 to 29 ml/min/1.73 m^2. • Renal failure: GFR <15 ml/min/1.73 m^2, or patient requires chronic dialysis treatment. Note: GFR may be estimated using the serum creatinine − GFR = $186 \times (P_{Cr})^{-1.154} \times (age)^{-0.203} \times$ (0.742 if female) × (1.210 if black). Year of onset (first diagnosis) may be helpful.
History of dyslipidemia	Indicate if the patient has a history of dyslipidemia diagnosed and/or treated by a physician or other provider. Criteria can include documentation of: • Total cholesterol >200 mg/dl, or • Low-density lipoprotein (LDL) ≥130 mg/dl, or • High-density lipoprotein (HDL) <35 mg/dl, or • Lipid-lowering therapy initiated. • Hypertriglyceridemia
History of sleep apnea	Indicate if patient has a history of sleep apnea as defined below: • Obstructive sleep apnea: recurrent collapse of the pharynx during sleep • Central sleep apnea: transient cessation of neural drive to respiratory muscles • Mixed
History of lung disease	Documented history of chronic lung disease (e.g., chronic obstructive pulmonary disease, chronic bronchitis) or currently being chronically treated with inhaled or oral pharmacological therapy (e.g., beta-adrenergic agonist, anti-inflammatory agent, leukotriene receptor antagonist, or steroid). Year of onset (first diagnosis) may be helpful.
History of musculo-skeletal disease	Documented history of primary musculo-skeletal disease, including muscular dystrophy, myasthenia gravis, dermatomyositis, or myotonic dystrophy.
History of allergies to medications	Significant side effect attributed to drug and requiring permanent discontinuation of drug. List drug and significant side effect. Record date first noted.
10. Family History	
Family history of arrhythmias	Family history of early onset of atrial or ventricular arrhythmias or conduction system disease preceding or unassociated with structural heart disease. Specific arrhythmia(s) or conduction problem(s) should be stated.
Family history of recurrent syncope	Family history of recurrent syncope.
Specific familial arrhythmia syndromes	Indicate if patient has a family history of arrhythmia syndromes, such as long QT syndrome, Brugada, and so on. Specify genotype, if known.
Family history of sudden cardiac death	Family history (parent or sibling) of sudden cardiac death, defined as natural death due to cardiac causes, heralded by abrupt loss of consciousness, occurring before 75 years of age. The time and mode of death are unexpected even though preexisting heart disease may have been known to be present. Traumatic death subsequently proven to be due to sudden loss of control due to a cardiac problem is included.
Family history of ischemic heart disease	Any direct blood relatives (parents, siblings, children) with coronary artery disease (defined below) before age 55 for men and 65 years for women: • Angina • Myocardial infarction

Continued on next page

DATA ELEMENT	DEFINITION
Familial cardiomyopathy	• Possible familial cardiomyopathy: presence of otherwise unexplained cardiomegaly, diagnosis of HF, AF or life-threatening ventricular arrhythmias, conduction system disease, or sudden death in first-degree relative under 60 years of age. • Probable familial cardiomyopathy: presence of aforementioned in two relatives under 60 years of age who are related to each other and the patient.

C. Physical Examination

DATA ELEMENT	DEFINITION
Height	Patient's height in centimeters or inches
Weight	Patient's weight in kilograms or pounds.
Heart rate	Heart rate (bpm) recorded closest to the time of presentation to the health care facility and/or on discharge (for inpatient). Heart rate may be ascertained from electrocardiographic tracing or from record of physical examination.
Systolic and diastolic blood pressure	Systolic and diastolic blood pressure (mm Hg) recorded closest to the time of presentation to the health care facility. Patient position (supine, sitting, other) should be noted.
Third heart sound (S_3)	Presence or absence of a third (mid-diastolic) heart sound.
Fourth heart sound (S_4)	Presence or absence of a fourth (late-diastolic) heart sound.
Heart murmur	Presence or absence of heart murmur(s). Timing (systolic, diastolic), quality (harsh, blowing, ejection, etc.), and intensity of each murmur should be noted. Intensity is usually graded on a 1 to 6 scale for systolic murmurs and a 1 to 4 scale for diastolic murmurs.
Lung (pulmonary) examination	Lung (pulmonary) findings by auscultation: • Clear or normal • Rales (height of rales when patient sitting upright should be noted) • Decreased breath sounds or dullness • Rhonchi • Wheezing Other findings (e.g., pleural rub) may also be noted.

D. Laboratory Data

Many routine and specialized laboratory tests may be relevant to management and tracking of patients with cardiac arrhythmias. Ejection fraction may influence the hemodynamic consequences of arrhythmias, both supraventricular and ventricular, and has a significance influence on prognosis. Ejection fraction may relate to risk of toxicity associated with pharmacologic antiarrhythmic therapy. Thus, accurate quantification of ejection fraction, as well as the presence of other manifestations of ventricular dysfunction, such as ventricular aneurysms, may be important to document in patients with arrhythmias. Evaluation of myocardial ischemia and coronary anatomy is usually not necessary in patients with supraventricular arrhythmias and conduction abnormalities, unless indicated by clinical presentation. However, with the exception of patients who have one of the well-recognized syndromes associated with idiopathic ventricular tachycardia, most patients with ventricular arrhythmias should have evaluation for ischemia. Ischemia may directly cause certain ventricular tachyarrhythmias. Furthermore, correction of ischemia may lessen the frequency and severity of ventricular arrhythmias and improve the overall prognosis.

DATA ELEMENT	DEFINITION
Ejection fraction (EF)	Number measured or estimated. Indicate date of EF measurement. • Quantitative measurement of EF is preferred over qualitative measurement. • Quantitative: — EF, measured in percent. — When a quantitative range is given, the midpoint of the range. • Qualitative: — Normal (corresponds to left ventricular EF [LVEF] >50%). — Mildly diminished (corresponds to LVEF 41% to 49%). — Moderately diminished (corresponds to LVEF 26% to 40%). — Severely diminished (corresponds to LVEF 25% or less). When multiple determinations are present, the hierarchy should be: • MRI • Radionuclide ventriculography

DATA ELEMENT	DEFINITION
Ejection fraction (EF) (continued)	• Contrast ventriculography • Echocardiography • Gated myocardial perfusion imaging • Other Specify imaging technique and date of most recent measurement.
Wall motion abnormalities	Specify whether: • General or • Regional (akinesis, hypokinesis, dyskinesis, aneurysm) Identify segment Specify imaging technique and date of most recent exam.
Right ventricular size and function	Description of right ventricular size and function. Specify whether normal or abnormal. Specify technique and date of most recent exam.
Complete blood count (CBC)	Indicate value and date performed.
Hemoglobin	Serum hemoglobin (mg/dl)/hematocrit. Normal range: M: 14 to 18 g/dl; F: 12 to 16 g/dl
Platelet count	Indicate value and date performed. Normal range: 1.3 to 4.0 $\times$ 10^5/mm^3
Red blood count	Indicate value and date performed. Normal range: 4.15 to 4.90 $\times$ 10^6/mm^3
White blood count	Indicate value and date performed. Normal range: 4.3 to 10.8 $\times$ 10^3/mm^3
Blood urea nitrogen (BUN)	Indicate value and date performed. Normal range: 10 to 20 mg/dl
Serum creatinine	Serum creatinine level (mg/dl or mmol/l). Normal range: $<$1.5 mg/dl
Serum albumin	Indicate value and date performed. Normal range: 3.5 to 5.5 g/dl
Potassium	Serum potassium (mg/dl or mmol/l) Normal range: 3.5 to 5.0 mmol/l
Sodium	Indicate value and date performed. Normal range: 136 to 145 mmol/l
Calcium	Indicate value and date performed. Normal range: 9 to 10.5 mg/dl
Magnesium	Indicate value and date performed. Normal range: 1.5 to 2.0 mEq/l
Glucose (fasting)	Indicate value and date performed. Normal range: 3.9 to 5.5 mmol/l
Hemoglobin A-1-C	Indicate value and date performed. Normal range: 3.8% to 6.4%
Total cholesterol	Indicate value and date performed.
HDL cholesterol	Indicate value and date performed.
LDL cholesterol	Indicate value and date performed.
Triglycerides	Indicate value and date performed.
Thyroid stimulating hormone (TSH)	Indicate value and date performed. Normal range: 0.4 to 5.0 mU/l
International Normalized Ratio (INR)	Measure INR for assessment of anticoagulation status/prothrombin time.
Goal INR	Indicate the listed Goal INR for the patient — 2.5 to 3.5 — 2.0 to 3.0 — Other (specify goal INR range and reason)
Brain-natriuretic peptide (BNP) or N-terminal BNP	Indicate value and date performed.
Inflammatory markers	Indicate value and date performed. Examples of inflammatory markers may be C-reactive protein, interleukin 6 (IL-6), tumor necrosis factor, sedimentation rate, and so on.

E. Invasive Diagnostic Procedures

DATA ELEMENT	DEFINITION
Coronary angiography performed	Coronary angiography with or without left heart catheterization. Documented findings may include: • Stenosis of any epicardial coronary artery (right, left anterior descending, circumflex) or major branch (diagonal, marginal). • Degree (percentage) of stenosis should be specified. Coronary arteries may have insignificant or no stenosis. • Greatest stenosis assessed in bypass graft. • Congenital anomaly of coronary arteries; specify whether present or absent. Indicate date of most recent exam.
Left heart catheterization	Left heart catheterization, with or without coronary angiography or ventriculography. Documented findings may include: • Left ventricular end-diastolic pressure (mm Hg). Pressure from left ventricular catheter at end-diastole. • Left ventriculography EF. Percentage 5% to 90% from left ventricular injection. Indicate date of most recent exam.
Right heart catheterization	Right heart catheterization, with or without angiography. Documented findings may include: • Right atrial pressure (mm Hg): mean right atrial pressure. • Pulmonary artery systolic pressure (mm Hg): systolic pulmonary pressure from pulmonary artery catheter. • Pulmonary artery diastolic pressure (mm Hg): diastolic pulmonary pressure from pulmonary artery catheter. Mean pulmonary artery occlusion pressure from pulmonary artery catheter (wedge pressure, mm Hg). Indicate date of most recent exam.
Congenital heart disease diagnosis	Diagnosis of congenital anomaly confirmed by angiography, saturation runs, and/or pressure measurements.

F. Noninvasive Diagnostic Procedures

DATA ELEMENT	DEFINITION
1. Echocardiography	
ECG	Indicate type of echocardiogram performed (check all that apply): • Transthoracic echocardiogram (TTE) • Transesophageal echocardiogram (TEE) • Intra-cardiac echocardiography Indicate date of most recent exam.
Assessment of inter- and intra-ventricular dyssynchrony on echocardiography	Echocardiographic modality to assess left ventricular dyssynchrony. Specify what method used to judge dyssynchrony: • Tissue Doppler imaging • Strain rate • Other (specify)
Left atrial (LA) size—M-mode on echocardiography	LA size, using the "leading edge to leading edge" method, in centimeters, measured from M-mode in the parasternal long-axis view at the end of ventricular systole. It is often classified as follows: • Normal size: ≤4.0 cm. • Mild enlargement: 4.1 to 4.5 cm. • Moderate enlargement: 4.6 to 5.5 cm. • Severe enlargement: >5.5 cm.
LA volume on echocardiography	On 2-dimensional imaging (2D), using the LA areas traced in the 4- and 2-chamber views as calculated by the standardized methods (e.g., Simpson's method of disks).
Left ventricular diastolic diameter on echocardiography	Left ventricular diameter measured at end ventricular diastole (in centimeters). Indicate whether by M-mode or 2D.
Left ventricular systolic diameter on echocardiography	Left ventricular diameter measured at the end of ventricular systole, in centimeters. Indicate whether by M-mode or 2D.
Left ventricular diastolic function on echocardiography	Assessment in normal sinus rhythm from a 2D apical view (either 2- or 4-chamber) of left ventricular inflow pattern, pulmonary venous inflow pattern, or tissue Doppler imaging. Categories include: • Normal • Impaired relaxation (Grade I) • Pseudonormal (Grade II) • Restrictive, reversible (Grade III) • Restrictive, irreversible (Grade IV) • Not obtained
Left ventricular wall thickness on echocardiography	Left ventricular end-diastolic thickness of septal and posterior walls as measured in the parasternal long-axis view (in centimeters). Indicate whether by M-mode or 2D.
Thrombus with location on echocardiography	Clot within the cavities of the cardiac structures. Presence is considered to be definite if 3 of the following 5 criteria are present: • Clear borders

DATA ELEMENT	DEFINITION
Thrombus with location on echocardiography (continued)	• Echogenicity from the surrounding structures • Independent mobility • Longest diameter >15 mm • Seen in more than one echocardiographic plane Indicate location (check all that apply): • LA appendage • Left atrium • Right atrium • Right atrial appendage • Left ventricle • Right ventricle
Spontaneous echo contrast with location	Dynamic, swirling smoke-like echoes, usually within the left atrium or the LA appendage, but also occasionally seen in other chambers. These echoes represent a marker of stasis and are distinct from "white noise artifact." Indicate location, noting all that apply: • LA appendage • Left atrium • Right atrium • Left ventricle • Right ventricle Grade as "present" or "absent."
2. Electrocardiography	
Heart rate on electrocardiogram	Heart rate in beats per minute (bpm) as measured on electrocardiogram.
ECG pattern of previous myocardial infarction	• Indicate if pathologic Q waves are present, characterized as Q waves more than 40 ms in duration and/or greater than or equal to one-quarter the R-wave amplitude. • Indicate if there is a loss of R waves consistent with prior infarction • Indicate region of infarction by ECG (check all that apply): — Inferior — Posterior — Septal — Anterior — Lateral
ECG pattern of left ventricular hypertrophy (LVH)	Specify criteria. The following criteria have been validated prospectively in clinical studies: • Sokolow-Lyon Voltage: SV_1 + RV_5 or RV_6 >35 mm (does not require gender or age adjustment), or R wave in aVL ≥11 mm. • Cornell Voltage: RaVL + SV_3 >20 mm in women or 28 mm in males. • Cornell Product: Cornell voltage times the QRS duration >2,440 ms (in women, 6 mm is added to their Cornell voltage). • Romhilt-Estes Score: LVH is likely with 4 or more points. LVH is present with 5 or more points: — Amplitude of R or S wave in limb leads >2.0 mV, or S wave in V_1 or V_2 >3.0 mV, or R wave in V_5 or V_6 >3.0 mV = 3 points. — ST-segment changes with or without digitalis = 1 or 2 points, respectively. — LA abnormality = 3 points. — Left-axis deviation −30° or more = 2 points. — QRS duration >90 ms = 1 point. — Intrinsicoid deflection in V_5 or V_6 = 0.05 to 0.07 s.
ECG pattern of right ventricular hypertrophy (RVH)	ECG manifestations of RVH are variable, and must include a QRS duration of <0.12 s and at least one or more of the following. The criteria may be altered in the presence of severe chronic lung disease. • Right-axis deviation (≥110°) • Dominant R wave: — R/S ratio in V_1 or V_3R >1, or R/S ratio in V_5 or V_6 ≤1 — R wave in V_1 ≥7 mm — R wave in V_1 + S wave in V_5 or V_6 >10.5 mm — rSR′ in V_1 with R′ >10 mm — qR complex in V_1 • Secondary ST-T changes in right precordial leads • Right atrial abnormality • Onset of intrinsicoid deflection in V_1 between 0.035 and 0.055 s
ECG pattern of complete bundle branch block	Specify if any of the following are present: • RBBB • LBBB • Nonspecific IVCD
ECG pattern of WPW	Indicate if characteristic delta wave is present.
ECG pattern of atrial abnormality	Indicate if left, right, or biatrial abnormality is present.

Continued on next page

DATA ELEMENT	DEFINITION
QT interval on ECG	• Measurement of the average QT interval and heart rate over at least 3 complexes of ECG recording of multiple (at least 3) ECG leads. • QT is measured from the earliest onset of the QRS in multiple leads to the latest termination of the T wave in these leads. (The U wave should be excluded from the measurement. For patients with large U waves that interrupt the termination of the T wave, the T wave should be extrapolated as the tangent to the maximum downstroke to the isoelectric baseline.) Alternatively, if only a single ECG lead is recorded at a time, the QT interval is the longest QT measured in any lead. • The correction of the QT interval for heart rate (QT_c) can be performed by many techniques, but the simplest and most widely used is the Bazett formula: QT_c = measured QT/[square root of the preceding RR interval in seconds].
QT dispersion	Difference between the longest and shortest individually measured QT_c interval in each of the 12 leads of the standard ECG (or, in some cases, in precordial mapping).
3. Exercise Testing	
Normal exercise test	• Normal exercise tolerance • No evidence of exercise-induced ischemia • No arrhythmia induced
Exercise test	Indicate the following: • Type of exercise or stress • Type of imaging agent
Exercise protocol	State protocol employed (e.g., Bruce, etc.). Specify if treadmill, supine bicycle, and so on.
Exercise test imaging modalities	Indicate imaging modality used (check all that apply): • Perfusion imaging — Thallium — Other • RNA imaging: state rest and exercise EF • Echocardiographic imaging: state rest and exercise EF and whether regional wall motion abnormalities appeared during exercise.
Length of exercise	State duration in minutes and seconds.
Distance walked—6-min walk	Distanced walked during 6-min walk, in feet or meters.
Maximum heart rate and blood pressure	State maximum heart rate and blood pressure achieved in beats per minute. Indicate what percent of age-related target heart rate achieved.
Maximal (symptom limited) or submaximal test	Indicate whether exercise test was maximal or submaximal.
Metabolic equivalents (METS) achieved	Indicate the level and number of METS achieved.
Evidence of ischemia on exercise test	Indicate evidence of ischemia (check all that apply): • ECG: ST-T wave abnormalities (specify type) • Angina provoked during exercise • Hypotensive response during exercise. State whether blood pressure fell at peak exercise • Ischemia-mediated arrhythmias occurred (e.g., polymorphic VT/VF)
Arrhythmia occurred on exercise test	Specify type of arrhythmia and indicate whether it occurred during or after exercise.
4. Other Noninvasive Diagnostic Procedures	
MRI	MRI (may include angiography) of the chest. Steady-state, free-procession cine MRI for calculation of EF. MRI may also be used to define cardiac anatomy, as well as evaluate myocardial perfusion and viability.
Radionuclide ventriculography (RVG)	Cardiac blood pool imaging (first pass or gated equilibrium) with or without stress. Documented findings may include: LVEF: 5% to 90% for left ventricle. Right ventricular EF: 5% to 90% for right ventricle.
Myocardial perfusion imaging	Radionuclide myocardial perfusion imaging (planar or single-photon emission computed tomography) with or without stress. Documented findings may include: • Stress-induced perfusion abnormalities. • Fixed perfusion abnormalities. • Perfusion imaging LVEF: 5% to 90% for left ventricular from perfusion (technetium) imaging.
Computed axial tomography (CT scan)	CT scan can be either cine CT for left ventricular function, electron beam CT for coronary calcium content, or high-resolution CT for vascular anatomy (coronary anatomy, PVs). Specify.
Microvolt T-wave alternans (MTWA)	Report the following findings: • Treadmill test or atrial pacing • Results — Positive: MTWA present at heart rate <110 bpm (cycle length: 545 ms) — Negative: MTWA not present at heart rate <110 bpm (cycle length: 545 ms) — Indeterminate: unable to achieve target heart rate or stable tracing

DATA ELEMENT	DEFINITION
Continuous ambulatory ECG monitor	Report the following findings: • Specify type of ambulatory ECG monitor used (e.g., looping event monitor, implantable looping event monitor, Holter monitor, etc.) • Duration of monitoring (usually 24 to 48 h for Holter monitor) • Quality of tracings • Utilization of patient diary • Correlation between symptoms and rhythm • Frequency of ventricular ectopy: per hour or per 24 h • Specify whether uniform or multiform ectopy • Mean 24-h heart rate, as well as minimum and maximum for patients in AF • Number of pauses >2.4 s • Specify arrhythmias documented
Heart rate variability	Two types of recordings should be used whenever possible: 1. Short-term recordings of 5 min made under physiologically stable conditions processed by frequency domain methods and/or 2. Nominal 24-h recordings processed by time-domain methods (See Appendix B for frequency and time domain units.)
Signal-averaged ECG (SAECG)	Report the following findings: • Specify high pass filter setting (25 or 40 Hz) • Filtered QRS duration (in milliseconds) • Duration of terminal filtered QRS with amplitude <40 mV (in milliseconds) • Root mean square amplitude of terminal 40 ms (in mV) • Mean noise level (in mV)
Baroreflex sensitivity (BRS)	Report BRS value (in milliseconds per mm Hg).
Heart rate turbulence (HRT)	A measure of the autonomic response to alteration in blood pressure following a PVC. HRT correlates with BRS and may be measured from ambulatory ECG recordings. HRT is characterized by two parameters: turbulence onset (TO) and turbulence slope (TS).
Tilt table tests	Report the following findings: • Degree of head-up tilt (60°, 70°, 75°, 80°) • Duration of head-up tilt • Provocative pharmacological testing (adenosine/nitroglycerine/other, specify) • Test results (positive/negative/equivocal): — A positive test for neurocardiogenic syncope characterized by either: 1) a drop in systolic blood pressure <80 mm Hg with a slowing or no changes in heart rate accompanied by typical symptoms (vasodepressor response), or 2) a slowing in sinus rate or sinus arrest (asystole, cardioinhibitory response). — A positive test for POTS is characterized by an orthostatic rise in heart rate of >30 bpm above baseline or >120 bpm within the first 10 min of head-up tilt without significant fall in systolic blood pressure (<10 mm Hg), accompanied by typical symptoms. — A negative test is defined as completion of the testing protocol without significant hypotension or typical symptoms. — An equivocal test is defined as failure to induce syncope or meet the aforementioned criteria. • Response to carotid sinus massage.

G. Electrophysiology Study

Not all elements of the electrophysiologic evaluation may be necessary or appropriate for every patient.

DATA ELEMENT	DEFINITION
1. Indications for Diagnostics	
Evaluation of specific arrhythmia	Indicate the type of arrhythmia prompting the electrophysiology (EP) study: • Bradyarrhythmia • Tachyarrhythmia
Evaluation of prior antiarrhythmic treatment	Indicate prior antiarrhythmic treatment: • Antiarrhythmic drug • Catheter ablation • Arrhythmia surgery • Pacemaker function • Cardioverter/defibrillator function • Other (specify)

Continued on next page

DATA ELEMENT	DEFINITION
Evaluation of event/symptoms suggesting arrhythmia	Indicate the event/symptom which prompted the EP study: • Cardiac arrest • Syncope • Palpitations
Evaluation of risk for ventricular tachyarrhythmia	Programmed stimulation to evaluate the presence of inducible VT or VF.
2. Description of Procedure	
Catheters used	Indicate type of catheters used in procedure.
Catheter insertion	Indicate where catheters were inserted: • Vein (specify) • Artery (specify) • Transcutaneous
Catheter placement	Indicate cardiac chamber where catheters were placed: • Right atrium • Right ventricle • Left atrium • Left ventricle • Coronary sinus (CS) • Other cardiac veins • His bundle position • Pericardium • PV • Vena cava • Pulmonary artery • Other (specify)
Antiarrhythmic medications present at time of procedure	Indicate if the following medications are present at time of procedure: • Digitalis • Beta-adrenergic blocking agents • Calcium channel blocking agents • Primary antiarrhythmic medications If the patient is not receiving any drug at the actual time of procedure, indicate time duration discontinued prior to procedure.
Drugs administered for sedation/general anesthesia	Specify drugs administered for sedation or for general anesthesia.
Drugs administered for therapy/diagnostics	Indicate therapeutic and/or diagnostic drugs administered, such as isoproterenol, epinephrine, dopamine, aminophylline, atropine, adenosine, beta-blockers, ibutilide, verapamil, procainamide, and so on.
3. Diagnostic Evaluation (see Appendix A for a supplemental dictionary of arrhythmia terms used throughout this section)	
a. Sinus Node Function	
Sinus node function	• Sinus node recovery time — Maximal time, in milliseconds, from last paced atrial depolarization to first sinus return cycle, at any pace cycle length. Stimulation and measurement are performed as close to sinus node as possible. • Corrected sinus node recovery time (sinus node recovery time minus sinus cycle length) • Other
Arrhythmias observed—sinus node function	• Physiological ST • Inappropriate ST • Sinus node re-entry tachycardia • Sinus node exit block • Sinus arrest • Other (specify)
b. Atrial Function	
Intra-atrial conduction	Indicate sites measured. Local activation time is measured form a reference point, such as P-wave onset, to the first intrinsicoid deflection on the local electrogram.
Refractory period—Atrial function	• Effective refractory period: the longest S_1S_2 interval during atrial pacing, or A_1S_2 interval during sinus rhythm, at which S_2 does not depolarize the atrium. • Functional refractory period: the shortest obtainable A_1A_2 interval at any specified recording site. • Relative refractory period: the longest S_1S_2 interval at which A_1A_2 exceeds S_1S_2.
Atrial stimulation performed	• Straight pacing cycle lengths (enter values) • Atrial extrastimuli (specify number delivered) and drive cycle lengths • Sites stimulated (e.g., high right atrium, CS, other)

DATA ELEMENT	DEFINITION
Arrhythmias observed—Atrial function	Specify arrhythmia observed: • AF (specify): — Focal — Re-entrant — Both focal and re-entrant — Other (specify) — Unknown: current understanding of the mechanism of AF is incomplete. Multiple mechanisms may be responsible for AF in any individual patient. Different mechanisms may be responsible for initiation versus maintenance of the arrhythmias. • Focal AT (specify mechanism) • Multi-focal AT • Macro–re-entrant AT — CTI dependent — Non-CTI dependent • Other (specify) Specify cycle length and morphology
How was arrhythmia induced—Atrial function	Specify how arrhythmia was induced. • Straight pacing • For programmed stimulation, state drive cycle length(s) and number of extrastimuli • Stimulation site • Whether isoproterenol or other pharmacologic agents were required for induction • Arrhythmia occurred spontaneously • Not inducible
Duration of arrhythmia—Atrial function	State duration, as appropriate, in number of complexes, or seconds to minutes, or sustained (>30 s or requiring termination in <30 s because of hemodynamic compromise).
How did the arrhythmia terminate—Atrial function	Specify how arrhythmia was terminated: • Self-terminated • Pacing • Extrastimuli • Drug (specify) • Cardioversion • Ablation
c. AV Node Function	
Atrio-His (AH) interval	This measurement is obtained using the AH interval identified on the His bundle electrogram. The AH interval is measured from the first rapid deflection of the atrial electrogram to the earliest onset of His bundle activation.
Anterograde refractory period—AV node function	• Effective: the longest A_1A_2 interval measured on the His bundle electrogram at which A_2 does not conduct to the His bundle. Programmed atrial stimulation is done during sinus rhythm or atrial pacing at a fixed cycle length for 8 beats. • Functional: the shortest obtainable H_1H_2 interval during programmed atrial stimulation. • Relative: the longest A_1A_2 interval at which H_1H_2 is greater than A_1A_2.
Retrograde refractory period of the ventriculoatrial conduction system	• Effective: the longest V_1V_2 interval introduced during programmed ventricular stimulation at which V_2 does not conduct to the atrium. • Functional: the shortest obtainable A_1A_2 interval during programmed ventricular stimulation.
Wenckebach cycle length	• Anterograde cycle length: during atrial pacing with progressive shortening of the drive cycle length by 10 to 20 ms, the longest pacing cycle length with Wenckebach AV node conduction. • Retrograde cycle length: during ventricular pacing with progressive shortening of the drive cycle length by 10 to 20 ms, the longest pacing cycle length with Wenckebach ventriculo-atrial conduction. • When determining the Wenckebach cycle length, the stimulation site should be specified.
Arrhythmias observed—AV node function	Specify arrhythmia observed: • AV node re-entry — Slow-fast (typical) — Fast-slow (atypical) — Slow-slow • Non–re-entrant tachycardia related to dual pathways • Focal junctional tachycardia • Nonparoxysmal junctional tachycardia
How was arrhythmia induced—AV node function	Specify how arrhythmia was induced. • Straight pacing • For programmed stimulation, state drive cycle length(s) and number of extrastimuli • Stimulation site • Whether isoproterenol or other pharmacologic agents were required for induction
Duration of arrhythmia—AV node function	State duration, as appropriate, in number of complexes, or seconds to minutes, or sustained (>30 s or requiring termination in <30 s because of hemodynamic compromise).

Continued on next page

DATA ELEMENT	DEFINITION
How did the arrhythmia terminate—AV node function	Specify how arrhythmia was terminated: • Self-terminated • Pacing • Extrastimuli • Drug (specify) • Cardioversion • Ablation
d. His-Purkinje System Function	
His-ventricular (HV) interval	The HV interval is measured from the earliest onset of activation of the His bundle to the earliest onset of ventricular activation using any intracardiac recording or surface ECG lead.
Refractory period—His-Purkinje system	Specify type of refractory period: • Anterograde effective: the longest H_1H_2 interval during programmed atrial stimulation at which H_2 does not conduct to the ventricle. • Functional: the shortest obtainable V_1V_2 interval during programmed atrial stimulation. • Relative: the longest H_1H_2 interval at which V_1V_2 exceeds H_1H_2.
Intra or infra-Hisian block	Block within or below the His bundle recording may occur during sinus rhythm, atrial pacing, or programmed atrial stimulation. Block during atrial pacing may be physiologic or pathologic. Block that occurs with the sudden onset of rapid pacing is typically physiologic. Infra-Hisian block that occurs during atrial pacing with progressive shortening of the pacing cycle length is typically pathologic. Under certain circumstances when paroxysmal intra- or infra-Hisian block is strongly suspected but baseline evaluation is not markedly abnormal, function of the His-Purkinje system may be evaluated (incremental pacing and programmed stimulation) under pharmacologic stress using agents such as procainamide.
e. Accessory Pathway (Bypass Tract) Function	
Accessory pathway (bypass tract)	Specify number and location of accessory pathway(s). For each accessory pathway, indicate: • Proximal insertion site • Distal insertion site • Anterograde conduction is present (yes/no) • Retrograde conduction is present (yes/no) • Accessory pathway(s) having decremental conduction properties (specify anterograde, retrograde, which bypass tract?)
Block cycle length—Accessory pathway	Indicate the block cycle length of the accessory pathway: • Anterograde: during incremental atrial pacing, the longest A_1A_1 interval without 1:1 conduction over the accessory pathway. • Retrograde: during incremental ventricular pacing, the longest V_1V_1 interval without 1:1 conduction over the accessory pathway.
Effective refractory period of accessory pathway	Indicate the effective refractory period of the accessory pathway: • Anterograde: the longest A_1A_2 interval, measured at an atrial site closest to the atrial insertion of the accessory pathway at which A_2 does not conduct over the accessory pathway. • Retrograde: the longest V_1V_2 interval at which V_2 does not conduct over the accessory pathway. • Functional: during programmed ventricular stimulation, the shortest obtainable A_1A_2 interval resulting from conduction over a bypass tract.
Shortest pre-excited RR interval during AF	During spontaneous or provoked AF, specify the shortest observed consecutive pre-excited RR interval.
Arrhythmias observed—Accessory pathway	Specify arrhythmia observed: • Orthodromic SVT • Antidromic SVT • Other: passive bystander pathway For each observed tachycardia, specify: • Cycle length • QRS morphology • Tachycardia duration (nonsustained vs. sustained) • Anterograde pathway • Retrograde pathway
How was arrhythmia induced—Accessory pathway	Specify how arrhythmia was induced. • Straight pacing • For programmed stimulation, state drive cycle length(s) and number of extrastimuli • Stimulation site • Whether isoproterenol or other pharmacologic agents were required for induction
Duration of arrhythmia—Accessory pathway	State duration, as appropriate, in number of complexes, or seconds to minutes, or sustained (>30 s or requiring termination in <30 s because of hemodynamic compromise).
How did the arrhythmia terminate—Accessory pathway	Specify how arrhythmia was terminated.

DATA ELEMENT	DEFINITION
f. Ventricular Function	
Intraventricular conduction	Specify sites measured. Local activation time is measured from a reference point, such as QRS complex onset, to the first intrinsicoid deflection on the local electrogram during sinus rhythm or tachycardia.
Refractory period—Ventricle	• Effective: the longest S_1S_2 interval during ventricular pacing, or V_1S_2 interval during sinus rhythm at which S_2 does not depolarize the ventricle. • Functional: the shortest obtainable V_1V_2 interval at any specified recording site. • Relative: the longest S_1S_2 interval at which V_1V_2 is greater than S_1S_2.
Ventricular stimulation performed	• Straight pacing cycle length ___ (enter values) • Ventricular extrastimuli (specify number delivered) and drive cycle lengths • Long-short stimulation • Sites stimulated (right ventricular apex, right ventricular outflow tract, right ventricle septum, left ventricle)
Arrhythmias observed—Ventricle	• Specify arrhythmia observed: • Non-sustained VT uniform • Non-sustained VT polymorphic • Sustained VT uniform • Sustained VT polymorphic • VF • Ventricular flutter • Other (specify) Specify cycle length and morphology.
How was arrhythmia induced—Ventricle	Specify how arrhythmia was induced. • Straight pacing • For programmed stimulation, state drive cycle length(s) and number of extrastimuli • Stimulation site • Whether isoproterenol or other pharmacologic agents were required for induction
Duration of arrhythmia—Ventricle	State duration, as appropriate, in number of complexes, or seconds to minutes, or sustained (>30 s or requiring termination in <30 s because of severe hemodynamic compromise).
How did the arrhythmia terminate—Ventricle	Specify how arrhythmia was terminated. • Self-terminated • Pacing • Extrastimuli • Drug (specify) • Cardioversion • Ablation
4. Therapeutic Procedures	
a. Indication for Therapeutic Procedures	
Indications for catheter ablation	The reason for undergoing attempted ablative therapy (may be more than one): • Symptoms • Desire for drug-free lifestyle • Stroke prophylaxis • Sudden death prophylaxis • Frequent ICD discharges
Catheter ablation performed	Indicate whether ablation was performed.
Targeted substrate for ablation	1. Inappropriate ST • Sinus node 2. AF • PV focus • Segmental PV isolation • Ostial PV isolation • Extra-ostial PV isolation • Linear ablation • Substrate modification • AV junctional ablation • AV junctional modification 3. Atrial tachycardia • Right atrial focal • LA focal • Linear ablation of CTI • Substrate modification (includes linear ablations between scars and anatomical boundaries) 4. Accessory pathway • Right free wall • Left free wall • Anteroseptal

Continued on next page

DATA ELEMENT	DEFINITION
Targeted substrate for ablation (continued)	• Mid septal • Right posteroseptal • Left posteroseptal • Epicardial, including: — Within coronary venous system, including CS diverticulum — Appendage to ventricular connections • Decremental atriofascicular or antrioventricular • Nodofascicular and nodoventricular • Fasciculoventricular 5. AV nodal re-entry • Slow AV nodal pathway • Fast AV nodal pathway 6. Right VT (may choose more than one) • Focal outflow • Focal other • Re-entrant slow conduction zone • Substrate modification 7. Left VT (may choose more than one) • Focal outflow • Focal other • Left fascicle • Re-entrant slow conduction zone • Substrate modification
Ablation procedure	1. Targeting method (may choose more than one) • Activation mapping • Pace mapping • Entrainment mapping • Anatomic fluoroscopy-based • Three-dimensional (3D) electroanatomical mapping • 3D non-contact mapping • Intracardiac echo-guided anatomical ablation • Other, specify 2. Energy source • Radiofrequency, standard (4- or 5-mm tip) • Radiofrequency, large tip (8- or 10-mm tip) • Radiofrequency, cooled, closed loop • Radiofrequency, cooled, open perfused • Cryothermic • Ultrasound • Laser • Microwave • Other, specify 3. Number of ablative lesions 4. Procedure times • Total procedure time (minutes): time from first needle insertion to place catheters to time of last catheter removal (excluding removal of temporary pacing catheters for heart block) • Observation time (minutes) post-ablation • Total fluoroscopy time (total time on pedal, minutes)
b. Outcome of Ablation	
Inappropriate ST	Indicate inappropriate ST: • Normalization of sinus node function (see Appendix A) • Sinus bradycardia (inappropriate for conditions) or arrest • Persistent inappropriate sinus tachycardia • Persistent symptoms despite good electrophysiologic outcome
AF	Indicate AF: • Acute outcome: — Termination of fibrillation during ablation (location) — Non-inducibility of fibrillation — Electrical PV isolation (specify which vein[s]) — Voltage reduction inside isolated regions to <0.1 mV • Long-term outcome: — Method of assessment (symptoms, event monitor, 24-h monitor, pacemaker log) — Absence of symptoms (palpitations, lightheadedness, dyspnea, etc.) — Absence of ECG evidence of fibrillation

DATA ELEMENT	DEFINITION
AT	Indicate AT: • Absence of spontaneous/inducible tachycardia • Persistence of spontaneous/inducible tachycardia
Accessory pathway	Indicate accessory pathway: • Anterograde conduction (delta wave, intracardiac preexcitation): — Elimination of anterograde conduction — Persistence of anterograde conduction • Retrograde conduction: — Elimination of retrograde conduction — Persistence of retrograde conduction ▪ Without SVT ▪ With SVT
AV junction	Indicate AV junction: • Slow pathway ablation: — Elimination of slow pathway conduction — Persistence of slow pathway conduction ▪ Without echoes ▪ With echoes (specify number) but no SVT ▪ Persistence of spontaneous or inducible SVT • Fast pathway ablation: — Elimination of fast pathway conduction — Persistence of fast pathway conduction ▪ AV nodal ablation — Elimination of conduction ▪ With escape rhythm >40 bpm ▪ Without escape rhythm >40 bpm • His bundle ablation: — Elimination of ectopic focus/tachycardia — Persistence of ectopic focus/tachycardia — Elimination of conduction
Right VT	Indicate right ventricular tachycardia: • Absence of spontaneous/inducible VT • Persistence of spontaneous/inducible VT (specify which) — Sustained or non-sustained
Left VT	Indicate left VT: • Absence of spontaneous/inducible VT of any kind • Persistence of spontaneous/inducible VT (specify which) — Sustained or non-sustained — Mappable or non-mappable
5. Other EP Procedures	
a. Pacemaker/ICD Implantation	
Pacemaker implantation	1. Specify indication (all that apply): • Sinus node dysfunction • AV block • AF • Neurocardiogenic syncope (carotid sinus hypersensitivity and vasovagal syncope) • Hypertrophic cardiomyopathy • Medically refractory congestive HF • Supraventricular tachyarrhythmias (historically) 2. Specify type of pacemaker implanted: • Single chamber (atrial) • Single chamber (ventricular) • Dual chamber (both atrial and ventricular) • Biventricular of any type 3. Venous access: • Subclavian • Axillary • Internal jugular • External jugular • Cephalic • Femoral • Other

Continued on next page

DATA ELEMENT	DEFINITION
Pacemaker implantation (continued)	4. Endocardial Lead Positions: • Atrial: — Right atrial appendage — Right atrial free wall — Right atrial septum — Adjacent to coronary sinus ostium — Other • Ventricular: — Right ventricular apex — Right ventricular inflow — Right ventricular outflow — Other 5. Epicardial lead positions: • Right atrial • LA • Right ventricle • Left ventricle 6. Coronary sinus: • Tributaries that allow atrial stimulation • Tributaries that allow ventricular stimulation — Unsuccessful catheterization of coronary sinus or target branch — Stable electrode position in vein branch — Consistent left ventricular capture without diaphragmatic stimulation 7. Specify if capable of: • Burst pacing • Anti-tachycardia pacing Specify date of current implant. Specify manufacturer and model number.
Defibrillator implantation	Specify indication: • AF • Secondary prevention of cardiac arrest • Primary prevention of cardiac arrest. High risk for VT (e.g., ischemic heart disease, hypertrophic cardiomyopathy, Brugada syndrome, long QT syndrome, HF) • Syncope with inducible VT Specify type of defibrillator implanted: • Single chamber • Dual chamber • Biventricular Subcutaneous array Specify if capability exists: • Burst pacing • Anti-tachycardia pacing • Cardioversion
b. Lead Extraction	
Indications	Specify indications for lead extraction: • Infection • Lead malfunction • Venous obstruction • Other (specify)
Make and model number of extracted device/lead(s)	• Specify extracted device make and model number • Specify extracted lead(s) make and model number
Location of device/lead(s) extracted	• Specify location (insertion site/chamber of heart) of device generator • Specify location (insertion site/chamber of heart) of lead(s) extracted
Method of extraction	Indicate combination of methods of extraction: • Laser sheaths • Electrosurgical dissection sheaths (EDS) • Mechanical sheaths (steel, polypropylene, or polytetraflouroethylene) • Femoral extraction tools and/or snares • Locking stylets • Other (specify)
c. Cardioversion	
Indications	Specify indication(s) for cardioversion and type of arrhythmia.

DATA ELEMENT	DEFINITION
Type of cardioversion	Indicate the type of cardioversion used: • External—Patch position: — Anterior—Posterior — Anterior—Lateral — 4 patches (2 defibrillators in tandem) — Other (specify) • Internal—Lead position: — Right atrium — Other (specify) • Specify waveform — Monophasic, all types — Rectilinear biphasic — Truncated exponential biphasic — Other, specify • Pharmacologic: — Procainamide (specify total dose and route) — Ibutilide (specify total dose and route) — Propafenone (specify total dose and route) — Amiodarone (specify total dose and route) — Verapamil (specify total dose and route) — Diltiazem (specify total dose and route) — Other (specify drug, total dose, and route) • Hybrid (electric plus pharmacologic), as noted above.
Number of shocks delivered	Indicate the number of shocks delivered during current session.
Maximal energy used	Indicate maximal energy used in current session.
Cardioversion attempt	1. Medication: list generic name for medication used to attempt cardioversion for a patient from AF to normal sinus rhythm. Indicate route of administration (intravenous or oral) and total daily dose and units. (Include total dose until cardioversion or accepted failure.) 2. Internal cardioversion: for pharmacologic cardioversion, time frame for assessment will depend on medication and route of administration (e.g., success for intravenous ibutilide may be within an hour from the end of infusion, whereas success for oral amiodarone may be within several days). 3. External cardioversion: electric shock delivered to external parts. 4. Success of cardioversion: absence of AF or atrial flutter for at least 10 s following shock delivery or at any time following antiarrhythmic administration.
Complications of cardioversion	Include all complications occurring from the initiation of cardioversion attempt to 30 days after cardioversion. Specify complication and categorize into: • Anesthesia-related • Thromboembolic • Arrhythmic • Pulmonary edema/HF • Other
Pattern of recurrence	After successful conversion. • Immediate recurrence of AF (returns in <2 min) • Subacute recurrence of AF (returns between 2 min and 14 days) • Late recurrence of AF (returns after 14 days)

H. Complications/Adverse Events

DATA ELEMENT	DEFINITION
Adverse events resulting from EP study and/or ablation	Indicate adverse event(s) which occurred during or following EP study and/or ablation. Specify time of occurrence relative to EP study/ablation: • AV fistula • Bleeding requiring transfusion • Cardiac arrest • Cardiac valve injury — Specify affected valve • Conduction block: — Ongoing — Resolved • CVA/TIA • Death • Deep venous thrombosis

Continued on next page

DATA ELEMENT	DEFINITION
Adverse events resulting from EP study and/or ablation (continued)	• Drug reaction—anaphylaxis (specify drug implicated as cause of reaction) • Endocarditis • Esophageal fistula • Hematoma • Myocardial infarction • Pericardial effusion without tamponade • Pericardial tamponade • Peripheral embolus • Peripheral nerve injury • Pneumothorax • Phlebitis • Phrenic nerve paralysis • Pulmonary embolism • PV stenosis • Sepsis • Other (specify) • Major complication is one which requires intervention, prolongs hospital stay, or results in permanent impairment.
Adverse events resulting from pacemaker/ICD implantation	Indicate adverse events occurring during or following pacemaker/ICD implantation. Specify time of occurrence relative to pacemaker/ICD implantation: • Arteriovenous fistula • Cardiac arrest • Cardiac valve injury — Specify affected valve • CVA/TIA • Coronary venous dissection • Death • Drug reaction (predominantly antibiotic reaction if antibiotics administered during and/or after procedure) • Hemothorax • Infection related to device • Intravenous contrast reaction (if contrast agents used for venous puncture) • Lead dislodgement • Lymphatic fistula/chylothorax • Myocardial infarction • Pocket hematoma • Post-procedure bleeding • Pneumothorax • Pericardial tamponade • Other (specify)
Adverse events resulting from lead extraction	Indicate adverse events occurring during or following lead extraction. Specify time of occurrence relative to lead extraction: • Bleeding • Death • Drug reaction (predominantly antibiotic reaction if antibiotics administered during and/or after procedure) • Hemothorax • Intravenous contrast agents • Pneumothorax • Pericardial tamponade • Tricuspid valve damage • VT • VF • Vascular tear/laceration or perforation • Other (specify)

I. Patient Management as a Result of Electrophysiology Studies

DATA ELEMENT	DEFINITION
Observation and reassurance	No specific antiarrhythmic therapy warranted.
Pharmacologic therapy recommended	Indicate the pharmacologic therapy recommended as a result of the EP study: • Antiarrhythmic drugs. Indicate specific drugs (i.e., digitalis, beta-blocker, calcium channel blocker, primary antiarrhythmic agents). • Nonantiarrhythmic drugs (i.e., aspirin, oral anticoagulation, etc.)

DATA ELEMENT	DEFINITION
Pharmacologic therapy recommended (continued)	• Anti-ischemic therapy • Other (specify)
Evaluation for myocardial ischemia recommended	Indicate if EP study suggested need for evaluation for ischemia.
Ablation recommended	Indicate if ablation was recommended as a result of EP study. Indicate patient response to ablation recommendation: • Yes, patient agreed to ablation • No, patient declined to have ablation
Surgery recommended	Indicate if surgery was recommended as a result of EP study. Specify type: • Myocardial revascularization • Arrhythmia surgery • Other (specify) Indicate patient response to surgery recommendation: • Yes, patient agreed to surgery • No, patient declined to have surgery
Pacemaker implant recommended	Indicate if a pacemaker implantation was recommended as a result of EP study (e.g., sinus node dysfunction, AV conduction disturbance, syncope, prevention of AF, etc.). Indicate patient response to pacemaker implant recommendation: • Yes, patient agreed to pacemaker implantation • No, patient declined to have pacemaker implanted
Defibrillator implant recommended	State indication for ICD (e.g., VT-sustained, cardiac arrest, primary prevention, AF, etc.) Indicate patient response to defibrillator implant recommendation: • Yes, patient agreed to defibrillator implantation • No, patient declined to have defibrillator implanted
Biventricular pacer recommended	State indication for biventricular device (e.g., LBBB, IVCD, pace-dependent, etc.). Indicate patient response to biventricular pacer implant recommendation: • Yes, patient agreed to biventricular pacemaker implantation • No, patient declined to have biventricular pacemaker implanted
Biventricular ICD recommended	State indication for biventricular device (e.g., LBBB, IVCD, pacer-dependent, etc.). Indicate patient response to biventricular ICD implantation recommendation: • Yes, patient agreed to biventricular ICD implantation • No, patient declined to have biventricular ICD implanted
Epicardial pacer lead recommended	State indication for epicardial pacer lead. Indicate patient response to epicardial pacer lead recommendation: • Yes, patient agreed to epicardial pacer lead • No, patient declined to have epicardial pacer lead

J. Discharge Information

DATA ELEMENT	DEFINITION
Nonantiarrhythmic cardiac medication(s) prescribed at discharge	Indicate specific nonantiarrhythmic cardiac medication(s) prescribed at discharge (i.e., aspirin, statins, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers)
Antiarrhythmic drug(s) prescribed at discharge	Indicate specific antiarrhythmic drug(s) prescribed at discharge (i.e., digitalis, beta-blocker, calcium channel blocker, primary antiarrhythmic agents)

K. Follow-Up

DATA ELEMENT	DEFINITION
Recurrence of arrhythmia	State arrhythmias that occurred during follow-up and time of occurrence in relation to EP study.
Syncope after treatment	Indicate if patient experienced syncope after treatment commenced.
Resuscitated cardiac arrest—Follow-up	Indicate if patient experienced sudden loss of consciousness requiring direct current cardioversion to restore consciousness or stable blood pressure and rhythm.
Spontaneous sustained VT—Follow-up	Indicate if patient experienced spontaneous occurrence of VT >30 s in duration or requiring termination due to hemodynamic compromise; assessed through electrocardiographic monitoring.

Continued on next page

DATA ELEMENT	DEFINITION
Spontaneous sustained VT morphologies and rates—Follow-up	Indicate spontaneous sustained VT morphology: • Uniform: — Describe bundle branch block type pattern — Describe frontal plane QRS axis — Describe rate or cycle length • Polymorphic: — Describe rate or cycle length
Symptoms occurring during spontaneous sustained VT—Follow-up	• Palpitation • Dyspnea • Diaphoresis • Lightheadedness • Chest discomfort • Syncope • None
Cardioverter/defibrillator discharges—Follow-up	Therapy delivered by an implanted caridoverter/defibrillator, either antitachycardia pacing or shock. Indicate diagnosis from stored electrograms.
Implanted device lead complications	Indicate complications occurring as a result of implanted device lead(s): • Lead dislodgement • Lead malfunction (specify type) • Phrenic nerve stimulation • Endocarditis or other infection • Other (specify)
12-lead ECG—Follow-up	State when and if 12-lead ECG performed and whether changed from baseline.
Cardiac procedures since last contact—Follow-up	Indicate cardiac procedures performed since last contact: • CABG • Angioplasty • Other cardiac surgery (specify)
New myocardial infarction—Follow-up	Indicate if myocardial infarction has occurred since last contact.
New onset angina or change in pattern of previously stable angina—Follow-up	Indicate date of symptom onset or documentation.
New-onset HF—Follow-up	Indicate date of symptom onset or documentation.
Heart transplantation—Follow-up	Indicate date of heart transplantation.
Interim hospitalization—Follow-up	Indicate hospitalizations since last contact for: • HF • Myocardial infarction • Ischemia • Cardiac arrhythmia (new or recurrent—identify which)
Death	Indicate classification of death: • Sudden cardiac: — Witnessed instantaneous in a previously stable patient. This may occur with or without preceding signs or symptoms, or may occur immediately following sudden dyspnea, lightheadedness, or palpitations. — Unwitnessed. Patient found dead who at time of last witnessed contact was in usual state of health without medical complaints or obvious difficulty. This applies to patients dying during sleep. Note: Whereas most sudden deaths seem to result from cardiac arrhythmias, sudden death may also result from non-cardiac processes (e.g., acute pulmonary embolus, rupture of abdominal aortic aneurysm). In most cases, documentation of the actual cause of death is missing. • Non-sudden cardiac. Includes deaths of patients in acute pulmonary edema; with severe, progressive HF; cardiogenic shock; or after recent cardiac surgical procedure. • Non-cardiac. Vascular death (thromboembolic event, acute hemorrhage, CVA, dissecting aneurysm), or non-cardiovascular death (e.g., trauma, renal failure, cancer, sepsis, suicide). • Unknown. No information available regarding death event.

L. Medical Care Resource Utilization

DATA ELEMENT	DEFINITION
Hospital admission	Official admission to a hospital or other acute health care facility. Include dates of admission and discharge.

REFERENCES

1. Buxton AE, Fisher JD, Josephson ME, et al. Prevention of sudden death in patients with coronary artery disease: the Multicenter Unsustained Tachycardia Trial (MUSTT). Prog Cardiovasc Dis 1993;36: 215–26.
2. Bristow MR, Saxon LA, Boehmer J, et al. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. N Engl J Med 2004;350:2140–50.
3. Cannon CP, Battler A, Brindis RG, et al. American College of Cardiology key data elements and definitions for measuring the clinical management and outcomes of patients with acute coronary syndromes. A report of the American College of Cardiology Task Force on Clinical Data Standards (Acute Coronary Syndromes Writing Committee). J Am Coll Cardiol 2001;38:2114–30.
4. Radford MJ, Arnold JM, Bennett, SJ, et al. ACC/AHA key data elements and definitions for measuring the clinical management and outcomes of patients with chronic heart failure: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Writing Committee to Develop Heart Failure Clinical Data Standards). J Am Coll Cardiol 2005;46: 1179–1207.
5. McNamara RL, Brass LM, Drozda JP Jr., et al. ACC/AHA key data elements and definitions for measuring the clinical management and outcomes of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Writing Committee to Develop Data Standards on Atrial Fibrillation). J Am Coll Cardiol 2004;44:475–95.
6. Fuster V, Ryden LE, Asinger RW, et al. ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation: executive summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines and Policy Conferences (Committee to Develop Guidelines for the Management of Patients With Atrial Fibrillation): developed in collaboration with the North American Society of Pacing and Electrophysiology. J Am Coll Cardiol 2001;38:1231–66.
7. 104th Congress. Health Insurance Portability and Accountability Act of 1996. February 21, 1996; Public Law 104-191.
8. Bernstein AD, Daubert J-C, Fletcher RD, et al. The revised NASPE/BPEG generic code for antibradycardia, adaptive-rate, and multisite pacing. Pacing Clin Electrophysiol 2002;25:260–4.
9. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003;42:1206–52.
10. Richardson P, McKenna W, Bristow M, et al. Report of the 1995 World Health Organization/International Society and Federation of Cardiology Task Force on the Definition and Classification of Cardiomyopathies. Circulation 1996;93:841–2.

APPENDIX A. Arrhythmia Definitions

Term	Definition
Bradycardias	
Sinus Node Function	
Sinus arrhythmia	Sinus arrhythmia characterized by the following: • Normal P-wave morphology/axis • Gradual phasic change in PP interval of more than 10% or 120 ms. Note that P-wave morphology may change when sinus rate alters.
Wandering atrial pacemaker	Atrial rhythm with at least 3 distinct P-wave morphologies at rates between 50 and 100 bpm (cycle length between 1,200 and 600 ms).
Sinus bradycardia	Sinus bradycardia characterized as sinus rate less than 60 beats per minute (bpm) (cycle length, >1000 msec) with normal P wave axis. Note that P wave morphology may be atypical at slow rates.
Sinoatrial exit block	Sinoatrial exit block characterized by the following: <u>Mobitz I</u>: • Normal P-wave morphology/axis — Pauses with no visible sinus P waves • Progressive decrease in PP interval before pause • Constant PR interval • PP interval of pause less than twice the PP interval preceding pause • PP interval following pause greater than twice PP interval preceding pause <u>Mobitz II</u>: • Normal P-wave morphology/axis — Pauses with no visible sinus P waves • Constant PP interval before and after pause • Pause is an integral multiple (within 100 ms) of normal PP interval
Sinus arrest/pause	Pause without a P wave, >2.0 s during sinus rhythm; PP interval of pause not a multiple of basic PP interval
Sinus node dysfunction (bradycardia)	Sinus node dysfunction manifested as, for example: • Sinus rate inappropriately slow for the conditions. • Sinus arrest, sinoatrial exit block • Prolonged pauses (analogous to sinus node recovery time >1,500 ms or a corrected sinus node recovery time greater 550 ms) following cessation of supraventricular tachyarrhythmias.
Sick sinus syndrome	Sick sinus syndrome encompasses multiple supraventricular arrhythmias, which may include one or more of the following: persistent, severe (50 bpm or less), or unexpected sinus bradycardia; sinus pauses; failure of sinus rhythm to resume after cardioversion or spontaneous termination of atrial tachyarrhythmias; sinoatrial exit block; bradycardia-tachycardia syndrome. Marked sinus bradycardia may precipitate atrial fibrillation.
Ectopic atrial rhythm	An atrial rhythm arising from a site other than the sinus node with a rate between 60 and 100 bpm (cycle length 1,000 to 600 ms).

Continued on next page

JACC Vol. 48, No. 11, 2006
December 5, 2006:2360–96

APPENDIX A. Continued

Term	Definition
Atrioventricular (AV) Conduction	
Short PR interval	PR interval <120 ms.
PR prolongation (first-degree AV block)	PR interval >200 ms.
Second-degree AV block	Second-degree AV block characterized by the following: • Mobitz I: progressive PR prolongation and shortening of RR interval until P wave is blocked. Pause after blocked P wave is less than twice the PP interval. PR following block is shorter than PR immediately preceding block. • Mobitz II: regular sinus/atrial rhythm with intermittent nonconducted P waves. Constant PR interval in the conducted beats.
Advanced or high-degree AV block	Second-degree AV block often characterized by multiple, successive non-conducted P waves and otherwise not consistent with Mobitz I or II that is ongoing or frequently recurring.
Third-degree AV block (complete heart block)	Third-degree AV block is characterized by independent atrial and ventricular complexes with atrial rate usually exceeding ventricular rate.
Isorhythmic dissociation	Independent atrial and ventricular rhythms at nearly identical rates. Junctional rhythm should be excluded.
Paroxysmal AV block	Abrupt, prolonged temporary advanced AV block in the midst of otherwise normal AV conduction (without change in PR interval), initiation of block by conducted or blocked atrial premature depolarization, ventricular premature depolarization pause, or a change in sinus rate (acceleration or deceleration). Resumption of conduction usually initiated by an escape impulse.
Pre-excitation	An electrocardiogram (ECG) pattern characterized by a short PR interval, a widened QRS complex, and a delta wave. A pre-excitation pattern on the ECG is evidence of the presence of an anomalous AV connection, which results in ventricular activation prior to what would have occurred through the normal His-Purkinje system. The PR interval is typically <120 ms.
Delta wave	Slurred (low dV/dt), early activation of the QRS complex seen as a manifestation of ventricular pre-excitation. The delta wave is produced by AV conduction over an accessory pathway. The QRS during sinus rhythm (usually more than 120 ms in duration) represents fusion of ventricular depolarization over 2 or more conduction pathways—the accessory pathway(s) and the normal conduction system. The size of the delta wave can vary, depending on how much of the depolarization occurs over each pathway.
Intraventricular Conduction	
Left anterior fascicular block	Left anterior fascicular block is characterized by all of the following: • Left-axis deviation with frontal QRS axis between −45° and −90° • Q wave in lead aVL • rS in inferior leads • QRS duration is <120 ms
Left posterior fascicular block	• Right-axis deviation with frontal QRS axis between +90° and +180° • rS in leads I and aVL and qR in inferior leads (Q waves ≤40 ms). • QRS duration <120 ms • Exclude other causes of right-axis deviation
Left bundle-branch block (LBBB)	• QRS duration 120 ms or longer • Delayed onset of intrinsicoid deflection in 1, V_5, and V_6 >60 ms • Broad and notched or slurred R waves in I, aVL, V_5, and V_6 • rS or QS complexes in right precordial leads • ST-segment and T waves in opposite polarity to the major QRS deflection
Right bundle branch block (RBBB)	• QRS duration ≥120 ms • rsR′ or rSR′ complexes in V_1 and V_2 • Delayed onset of intrinsicoid deflection in V_1 and V_2 >50 ms • Broad, slurred S wave in 1, V_5, and V_6 • Secondary ST-T wave changes
Incomplete RBBB	QRS morphology similar to RBBB with QRS duration <120 ms.
Intraventricular conduction delay, nonspecific	QRS duration of 110 ms or more with morphology different from LBBB or RBBB.
Tachycardias	
Supraventricular Tachycardias	
Supraventricular tachycardia (SVT)	An SVT is a tachycardia that emanates from or requires participation of supraventricular tissue. These tachycardias can be either persistent or paroxysmal. • Atrial tachycardias other than atrial fibrillation and flutter • AV node re-entry • AV re-entry Note: The term PAT (paroxysmal atrial tachycardia) is no longer appropriate.

APPENDIX A. Continued

Term	Definition
Atrial premature complexes	A depolarization of the atrium which occurs with a coupling interval shorter than that resulting from the intrinsic heart rhythm.
Atrial tachycardia	A usually regular cardiac arrhythmia arising from the atrium with a rate >100 bpm (cycle length <600 ms). • Focal atrial tachycardias are characterized by usually regular atrial activation from atrial areas with centrifugal spread, with rates usually between 100 to 250 bpm (rarely at 300 bpm). They may arise from right or left atrial sites. • Multifocal atrial tachycardia—an irregular tachycardia characterized by 3 or more different P-wave morphologies at different rates, most commonly associated with underlying pulmonary disease.
Atrial fibrillation (AF)	A cardiac arrhythmia arising from the atrium with an atrial rate >300 bpm and an irregularly irregular ventricular response in the presence of conduction. AF can be further characterized as: • First detected AF • Paroxysmal AF: AF is self-terminating within 7 days of recognized onset. • Persistent AF: AF is not self-terminating within 7 days, or is terminated electrically or pharmacologically. • Permanent AF: cardioversion failed or not attempted.
Macro–re-entrant atrial tachycardia	A cardiac arrhythmia arising in the atrium which has a regular rate typically between 250 and 350 bpm (cycle length 240-170 ms) in the absence of antiarrhythmic drugs. • Cavotricuspid isthmus (CTI)-dependent atrial flutter (*also* typical or type I atrial flutter): a re-entrant tachycardia following a counterclockwise (typical) or clockwise (reverse typical) rotation pattern around the tricuspid annulus resulting in a sawtooth pattern of atrial activation on inferior ECG leads. This is amenable to curative catheter ablation of the CTI. • Non-CTI dependent atrial flutter: macro–re-entrant tachycardias dependent upon an atrial scar that creates conduction block and a central obstacle for re-entry. Prior cardiac surgery involving the atrium is a common cause.
Sinus tachycardia (ST)	A cardiac arrhythmia emanating from the sinus node at a rate <100 bpm (cycle length: <600 ms) which demonstrates a gradual onset and termination and is in keeping with the level of physical, emotional, pathological, or pharmacological stress.
Inappropriate sinus tachycardia	Increase in sinus rate unrelated to, or out of proportion with, the level of physical, emotional, pathological, or pharmacological stress. Can be persistent or intermittent/paroxysmal.
Postural orthostatic tachycardia syndrome	Orthostatic rise in heart rate of >30 bpm above baseline or >120 bpm within the first 10 min of head-up tilt, accompanied by palpitations, and no significant (<10 mm Hg) fall in systolic blood pressure.
AV node re-entry	A regular SVT which results from re-entry within the AV node and/or perinodal atrial tissue. Subclasses are: • Slow-fast • Fast-slow • Slow-slow
Junctional tachycardia	A supraventricular arrhythmia that arises from the atrioventricular junction, has a rate >60 bpm (cycle length: <1,000 ms), and may demonstrate dissociation from atrium or ventricle. Within this category are discrete subsets with distinctly different natural histories: • Congenital junctional ectopic tachycardia: observed exclusively in the pediatric population, characterized by high heart rates and refractoriness to drug therapy. This condition may be associated with high mortality if not diagnosed or if recognized late and not treated appropriately. • Postoperative junctional tachycardia: similar to congenital junctional ectopic tachycardia, but observed in pediatric patients after cardiac surgery. • Focal junctional tachycardia: a rare, highly symptomatic tachycardia found in young adults, often exercise-related, with rates of 110 to 250 bpm. May cause tachycardia-related myopathy. • Non-paroxysmal junctional tachycardia: a benign tachycardia with rates of 60 to 120 bpm and a typical "warm-up" and "cool-down" pattern. It may indicate underlying conditions such as digitalis toxicity. • Other
AV re-entrant tachycardia (AVRT)	A re-entrant arrhythmia whose circuit involves the atrium, the AV node, the ventricles, and one or more accessory AV connections. AVRT can be further classified as orthodromic AVRT, in which conduction through the AP occurs from the ventricle to the atrium, or antedromic AVRT, in which conduction through the AP occurs from the atrium to the ventricle.
Wolff-Parkinson-White syndrome	Patients with tachycardia in association with ventricular pre-excitation.

Continued on next page

APPENDIX A. Continued

Term	Definition
Ventricular Tachycardias	
Ventricular tachycardia (VT)	VT is a cardiac arrhythmia of 3 or more consecutive complexes in duration emanating from the ventricles at a rate >100 bpm (cycle length: <600 ms). Types of VT: • Spontaneous: spontaneous occurrence of VT as assessed through electrocardiographic recording. • Induced: VT induced through programmed ventricular stimulation, or delivery of external energy, such as radiofrequency current. • Sustained: VT >30 s in duration or requiring termination due to hemodynamic compromise in <30 s. • Nonsustained/unsustained: 3 or more beats in duration, terminating spontaneously in <30 s. • Bidirectional: VT with a beat-to-beat alternans in the QRS frontal plane axis, often associated with digitalis toxicity. • Exercise-induced: VT initiated through exercise. • Narrow complex: A VT with a QRS duration is shorter than 120 ms.
VT, monomorphic	• Sustained: VT with a stable single QRS morphology. • Nonsustained/unsustained: nonsustained VT with a single QRS morphology. • Repetitive: Paroxysmal and frequent (often incessant) nonsustained VT, usually in the absence of structural heart disease, with a single morphology and normal intervening sinus beats.
VT, polymorphic	Types of polymorphic VT: • Sustained: VT with a changing or multiform QRS morphology at cycle length >180 ms. • Nonsustained/unsustained: nonsustained VT with a changing QRS morphology at cycle length >180 ms. • Catecholaminergic: polymorphic VT associated with syncope and/or cardiac arrest triggered by emotion or exercise in patients whose baseline ECG is normal.
Premature ventricular complexes (PVC)	A depolarization of the ventricle which occurs with a coupling interval shorter than that resulting from the intrinsic heart rhythm.
Ventricular couplet	Two consecutive PVCs separated by a maximum interval <600 ms.
Accelerated idioventricular rhythm	Ectopic ventricular rhythm with ≥3 consecutive ventricular premature beats occurring at a rate <100 bpm (cycle length: >600 ms) but faster than the normal ventricular intrinsic escape rate of 30 to 40 bpm (cycle length: 2,000 to 1,500 ms).
VT storm	History of VT storm as manifested by one of the following: • Incessant VT, typically present in >50% of a 24-h period. • A series of VT episodes triggering implantable cardioverter-defibrillator discharges within a short time period (e.g., 20 discharges within 30 min).
Adenosine-sensitive VT	VT responsive to adenosine therapy for termination.
Verapamil-sensitive VT	Idiopathic VT responsive to verapamil administration and may exhibit either RBBB or LBBB morphology, though term usually applied to left ventricular septal tachycardias
Ventricular flutter	A regular (cycle length variability 30 ms or less) ventricular arrhythmia approximately 300 bpm (cycle length: 200 ms) with a monomorphic appearance; no isoelectric interval between successive QRS complexes.
Ventricular fibrillation	Rapid, usually more than 300 bpm (cycle length: 180 ms or less), grossly irregular ventricular rhythm with marked variability in QRS cycle length, morphology, and amplitude.
Torsades de pointes	Patient has documented history of torsades de pointes as characterized by VT associated with a long QT or QT_c, and electrocardiographically characterized by twisting of the peaks of the QRS complexes around the isoelectric line during the arrhythmia: • Typical, initiated following "short-long-short" coupling intervals. • Short coupled variant initiated by normal-short coupling.
Ventricular arrhythmias associated with long QT syndrome	Polymorphic VT consistent with torsades de pointes. • Congenital • Acquired — Heart block — Medication — Other
Ventricular arrhythmias associated with Brugada syndrome	Polymorphic VT in the absence of structural heart disease and associated with a baseline ECG pattern during sinus rhythm showing RBBB with ST segment elevation in leads V_1 through V_3.
Ventricular arrhythmias associated with short QT syndrome	Patient has documented history of ventricular arrhythmias associated with short QT syndrome as characterized by one of the following: • QT_c ≤300 ms • History of familial sudden death • Short refractory periods • Inducible ventricular fibrillation

APPENDIX A. Continued

Term	Definition
Fascicular tachycardia	A tachycardia that emanates from or requires participation of the distal fascicles (right or left bundle branches).
Bundle branch reentrant tachycardia	VT due to re-entry involving the His-Purkinje system, usually with LBBB morphology; this usually occurs in the setting of cardiomyopathy.
Idiopathic RBBB VT	VT in the absence of structural heart disease with RBBB morphology, typically responsive to verapamil, also referred to as left ventricular septal tachycardia.
Outflow tract VT	Types of outflow tract VT: • Right ventricular: focal VT emanating from the right ventricular outflow tract unrelated to structural heart disease. • Left ventricular: focal VT emanating from the left ventricular outflow tract unrelated to structural heart disease.

APPENDIX B. Heart Rate Variability Time and Frequency Domain Units

Heart Rate Variability Time Domain Units

Time Domain	Definition	Unit
rMSSD	Root mean square of successive N-N interval difference	ms
NN 50	Number of pairs of adjacent NN intervals differing by more than 50 ms in the entire recording	none
pNN 50	NN50 count divided by the total number of all NN intervals	%
SDNN	Standard deviation of all N-N intervals	ms
SDNN index	The average of the standard deviations of N-N intervals for each 5 minutes of the entire recording	ms
SDANN	Standard deviation of the 5-min average of N-N intervals of the entire recording	ms
HRV index	Total number of all NN intervals divided by the height of the histogram of all NN intervals measured on a discrete scale with bins of 7.8125 ms	none
SDSD	Standard deviation of differences between adjacent NN intervals	ms

Heart Rate Frequency Domain Units

Frequency Domain*	Definition	Unit
Total power	The energy in the heart period power spectrum up to 0.40 Hz	ms^2
Ultra low-frequency (ULF) power	The energy in the heart period power spectrum up to 0.0033 Hz	ms^2
Very low-frequency (VLF) power	The energy in the heart period power spectrum between 0.0033 and 0.04 Hz	ms^2
Low-frequency (LF) power	The energy in the heart period power spectrum between 0.04 and 0.15 Hz	ms^2
High-frequency (HF) power	The energy in the heart period power spectrum between 0.15 and 0.40 Hz	ms^2
LF/HF ratio	The ratio of low- to high-frequency power	ms^2
Alpha	Slow of log (power) on log (frequency) between 0.01 and 0.0001 Hz on a log-log plot	ms^2

*Short-term recording: 5 min; entire recording: 24 h.

APPENDIX C. Relationships With Industry—ACC/AHA/HRS Writing Committee to Develop Data Standards on Electrophysiology

Committee Member	Research Grant	Speakers Bureau/Honoraria/ Expert Witness	Stock Ownership	Consultant/ Advisory Board/ Steering Committee
Dr. Alfred E. Buxton	None	None	None	None
Dr. Hugh Calkins	• Diosense	None	None	• Prorhythm • Diosense
Dr. David J. Callans	• Siemens-Acuson • St. Jude Medical	• Siemens-Acuson	None	None
Dr. John P. DiMarco	• Guidant • Novartis • Medtronic • St. Jude Medical	• Guidant • St. Jude Medical	None	None

Continued on next page

APPENDIX C. Continued

Committee Member	Research Grant	Speakers Bureau/Honoraria/ Expert Witness	Stock Ownership	Consultant/ Advisory Board/ Steering Committee
Dr. John D. Fisher	• Aryx • AstraZeneca • Guidant • Sanofi-Aventis • St. Jude Medical	None	None	Medtronic
Dr. H. Leon Greene	None	None	None	None
Dr. David E. Haines	None	None	None	None
Dr. David L. Hayes	• Guidant • Medtronic • St. Jude Medical	• Sorin/ELA	None	• Guidant • Medtronic • Sorin/ELA
Dr. Paul A. Heidenreich	None	None	None	None
Dr. John M. Miller	None	None	None	None
Dr. Athena Poppas	• Philips-Agilent	None	None	None
Dr. Eric N. Prystowsky	• Guidant	• Sanofi-Aventis	• CardioNet	• Guidant • Bard Ep • Sanofi-Aventis • CardioNet • Procter & Gamble • Stereotaxis
Dr. Mark H. Schoenfeld	None	None	None	None
Dr. Peter J. Zimetbaum	None	None	None	None

APPENDIX D. Peer Reviewer Relationships With Industry—ACC/AHA/HRS 2006 Key Elements and Data Definitions for Electrophysiology Studies and Procedures

Committee Member*†	Representation	Research Grant	Speakers Bureau/Honoraria/ Expert Witness	Stock Ownership	Consultant/ Advisory Board/ Steering Committee
Dr. Anne B. Curtis	Official Reviewer—HRS	None	None	None	• Medtronic
Dr. Richard L. Page	Official Reviewer—AHA	None	• AstraZeneca • Hewlett-Packard • Procter & Gamble • Sanofi-Aventis	None	• AstraZeneca • Cardiome Pharma Corp. • Procter & Gamble
Dr. Cynthia M. Tracy	Official Reviewer—ACCF Board of Govenors	None	None	None	None

This table represents the relationships of peer reviewers with industry that were disclosed at the time of peer review of this guideline. It does not necessarily reflect relationships with industry at the time of publication. *Participation in the peer review process does not imply endorsement of the document. †Names are listed in alphabetical order.