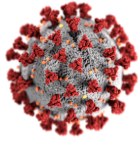


Event: Arrhythmia
Outcome/covariate: outcome
Version: 1
Status: final

Contributing authors

authors	Role	Date
Ruth Engelen	Medical/draft v0.1	24-6-2020
Miriam Sturkenboom	Epi review	09-07-2020
Leila Belbachir	Medical review	12-08-2020
Corinne Willame	Algorithm proposal	02-09-2020
Miriam Sturkenboom	Final codes	14-02-2021
Carlos Durán	Review narrow/broad assignments	25-03-2021
Miriam Sturkenboom	Inclusion of codes used in final ACCESS report	20-8-2021



1. Event definition

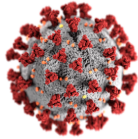
To understand the definition of an arrhythmia it is important to know how the activation of the heart works when there are no abnormalities. In the normal situation the sinus node sends a depolarization wave over the atrium and depolarizing atrioventricular (AV) node propagating over His-Purkinje system, which eventually leads to depolarised ventricles in a systematic way. In the normal situation a heart beats between 60 to 100 times per minute. A cardiac arrhythmia is an abnormality or perturbation in the normal activation or beating of the heart myocardium.

The pathogenesis of these arrhythmias can be divided in three mechanisms: the enhanced or suppressed automaticity, triggered activity or re-entry. Heart ischemia, scarring, electrolyte disturbance, heart medications, old age and other factors can cause enhanced or suppressed automaticity. The suppression of the automaticity of the sinus node can lead to sinus node dysfunction or sick sinus syndrome (SSS). Atrial and ventricular arrhythmias can be a result of enhanced automaticity. Triggered activity can occur after earlier and delayed depolarisations that can lead to spontaneous multiple depolarisations, which then can lead to precipitating ventricular arrhythmias. The re-entry mechanism can be divided into the micro level re-entry and the macro level re-entry and includes bidirectional conduction and unidirectional block. The micro level re-entry occurs with ventricular tachycardia from conduction around the scar or myocardial infarction. Macro level re-entry occurs via conduction through Wolff-Parkinson-White (WPW) syndrome concealed accessory pathways.^[1]

There are different types of cardiac arrhythmias and they can be classified by the origin in the heart of the arrhythmia: ventricular or supraventricular or whether there is an increase or decrease in the heart rate: tachycardia or bradycardia.^[1] Ventricular arrhythmia's caused by heart disease can be very dangerous and require immediate medical attention.

The different arrhythmias that are originated in the atria are the following: ^[2]

- Premature atrial contractions or PACs are harmless. These arrhythmias occur most of the time in healthy people and do not give any symptoms. When they do give symptoms it can feel like a fluttering in the chest or a sensation of a skipped beat. This can be triggered by stress, exercise, caffeine or nicotine.
- Supraventricular arrhythmias are tachycardia's that start in the atria or the atrioventricular node. These can be divided in different types as well:
 - o Atrial fibrillation (AF) is characterized by a fast, irregular rhythm originating in the atria. This occurs when the electrical signal does not begin in the sinus node where it should start. This leads to activation of the atria in a not systematic way. Most of the time it is caused by an underlying condition that interferes with the heart's ability to conduct electrical impulses. Complications of long-term AF are stroke and heart failure.
 - o Atrial flutter is the electrical signals of the heart spreading in a fast and regular rhythm. In contrary to AF where the electrical signals are spreading through a fast and irregular rhythm.



- Paroxysmal supraventricular tachycardia (PSVT) is a very fast heart rate that begins and ends suddenly. There is re-enter of the electrical signals to the atria, which leads to a fast heart rate. It is usually not dangerous.
- Wolff-Parkinson-White (WPW) syndrome is a special type of PSVT. A condition in which the heart's electrical signals travel along an extra pathway from the atria to the ventricles. The ventricles can contract very fast because of this and it can be life threatening.

The different arrhythmias that are originated in the ventricles are the following: ^[2]

- Ventricular tachycardia is a contraction of the ventricles in a fast and regular rhythm; this can last for a few seconds or for much longer.
- Ventricular fibrillation (V-fib) is caused by disorganized electrical signals that lead to a lower ejection fraction. A person may lose consciousness within seconds and may die within minutes if not treated.
- Torsades des Pointes is a form of ventricular fibrillation characterized by a prolonged QT interval on the ECG. Certain medicines and imbalanced amounts of potassium, calcium or magnesium in the bloodstream can cause this condition.
- Premature ventricular complexes (PVCs) is the same as PACs but than in the ventricles. It is harmless and generally people do not get any symptoms.

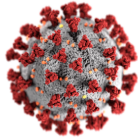
Sinus irregularities are the following: ^[2]

- Sinus arrhythmia is harmless. It is a name for changes in the heart rate that occur during breathing. It is common in children and adults.
- Sinus tachycardia occurs because of the sinus node that sends out electrical signals faster than usual. It can be caused by excitement, certain medications, fever, exercise, dehydration and an overly active thyroid gland.
- Sick sinus syndrome, also known as SSS, is a syndrome where the sinus node doesn't fire signals properly, so the heart rate slows down. Sometimes the rate changes back and forth between a bradycardia and tachycardia.

Brady-arrhythmia is when the heart rate is going to slow. It can occur in patients that have a bundle branch block. This means that the electrical signal travelling along each ventricle, called the bundle branches, is delayed or blocked. When this happens, the ventricles do not contract on the exact same time. This means that the heart has to pump more to get the same ejection fraction as when the ventricles to contract at the same time. The cause of bundle branch block is often an existing heart condition.^[2]

Symptoms people can experience having arrhythmias: ^[1, 3]

- Palpitations, that can be frequent, infrequent or continuous
- If the arrhythmia leads to a lower blood pressure and less ejection fraction it can cause light-headedness, dizziness or syncope
- Anxiety
- Blurred vision
- Chest pain
- Difficulty breathing
- Fatigue



- Diaphoresis

2. Synonyms / lay terms for the event

If we only focus on the arrhythmias in general than these are the synonyms:

- Cardiac Dysrhythmia
- Cardiac Arrhythmia
- Cardiac Arrhythmias
- Arrhythmia
- Arrythmia

3. Laboratory tests that are specific for event

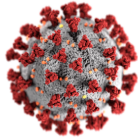
Blood tests that are drawn when a patient comes with symptoms of arrhythmia are the ones to assess different heart conditions:^[6]

- Cardiac enzyme tests:
 - Troponin, when it's elevated it's specific for diagnosis.
 - Creatinine kinase (CK), it can be elevated between 24 hours after a myocardial infarction. It isn't very specific.
 - CK-MB is a subtype of CK; it rises between 4-6 hours after a myocardial infarction.
 - Myoglobin, this protein stores oxygen and can be elevated after a myocardial infarction.
- Full blood count (FBC) to diagnose or exclude an infection or anaemia
- Thyroid function tests, including T3, T4 and TSH. If the thyroid doesn't function normal (hypothyroidism or hyperthyroidism) it can lead to bradycardia or tachycardia/palpitations.
- Lipid profile, including total cholesterol, LDL, HDL, triglycerides and non-HDL. These results can give the risk of having a heart attack or other heart diseases that can lead to arrhythmia.
- Liver tests, including ASAT, ALAT, bilirubin, gamma GT and alkaline phosphatase. When the cardiac output is decreased, because of arrhythmia or another cardiac disease, it can lead to impaired organ perfusion, which can be associated with an increased function of the liver.
- Clotting screen, blood clotting can be a complication of atrial fibrillation.
- BNP tests, if elevated it can be a sign of heart failure.
- Urea and electrolytes test: level of sodium, potassium, chloride, magnesium and calcium.

4. Diagnostic tests that are specific for event

The diagnostic tests that can be used to diagnose an arrhythmia are the following:^[5]

- Electrocardiogram (ECG), this measures the timing and duration of each electrical phase in your heartbeat.
- Holter monitor is a portable ECG that can be worn for 24 hours. It records your heart's activity during a regular day.
- Event recorder is helpful to record sporadic arrhythmias. This is a portable ECG device and whenever a patient experiences symptoms they can press a button to record the heart rate.



- Echocardiogram can produce images of your heart's size, structure and motion using sound waves.
- Implantable loop recorder is only used when the arrhythmias happen very infrequent. It is a device implanted under the skin and can detect abnormal heart rhythms.
- Stress test is a test that can be used when arrhythmias are present after a trigger. During this test the patient has to exercise on a treadmill or stationary bicycle while the heart activity is monitored. A drug can also be used to stimulate the heart.
- Tilt table test is a test usually done when a patient has symptoms of fainting. The heart rate and blood pressure is monitored when the patient is laying flat on a table. The table is then tilted as if you were standing up. The blood pressure and heart rate will be monitored again in this position to see whether there is a big difference.
- Electrophysiological testing and mapping is a procedure where they go to spots within the heart with catheters tipped with electrodes to map the spread of electrical impulses through the heart. This allows us to find the location that leads to the arrhythmias.

5. Drugs that are used to treat event

Drugs to treat arrhythmia are antiarrhythmic medications. It depends on the subtype of arrhythmia that the patient has on which one to choose to treat with. The drugs that are used can be divided in the ones for ventricular arrhythmias and supraventricular arrhythmias and acute or long-term treatment.^[4]

Ventricular arrhythmia:

Acute treatment:

If it is a threatening arrhythmia like ventricular fibrillation or ventricular tachycardia it is important to follow some procedures mentioned below. Medication wise it is possible to give procainamide, sotalol or amiodarone intravenous in case it is a ventricular tachycardia. In case of Torsades des Pointes, treatment with electrolytes can be helpful, like potassium and magnesium intravenous.

Long-term treatment:

Beta-blockers are the first choice to treat ventricular arrhythmias (tachycardia) over a longer period of time.

Supraventricular arrhythmia:

Acute treatment:

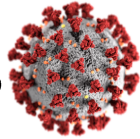
If a patient is hemodynamic stabile, has a regular small QRS complex tachycardia it can be treated initially with vagal manoeuvres (see the procedures). If this doesn't give the effect you want, it is possible to treat it with intravenous adenosine, diltiazem/verapamil or a beta-blocker.

Long-term treatment:

Treatment with anti-arrhythmic is a possible maintenance therapy to reduce the frequency of the arrhythmias and to reduce the heart frequency during the attacks.

Treatment for bradycardias:

If the patient is hemodynamic stabile it is important to retrieve a higher heartbeat by giving atropine or isoprenaline. These are temporary solutions. In the longer term someone often needs a pacemaker.



6. Procedures used specific for event treatment

Procedures that can be done to treat arrhythmia: ^[5]

Treating tachycardia:

- Vagal manoeuvres are manoeuvres that affect the n. vagus, this nerve often causes a bradycardia. Examples of these manoeuvres are: holding your breath and straining, put your face in ice water or coughing.
- Cardioversion can be done to atrial fibrillation or ventricular fibrillation. It is a procedure where a shock is delivered to your heart through paddles or patches on your chest. The current affects the electrical impulses in your heart and can restore a normal rhythm.
- Radiofrequency catheter ablation is a procedure where one or more catheters are lead to your heart. Electrodes at the catheter tips can use heat, extreme cold or radiofrequency energy to damage (ablate) heart tissue and create an electrical block along the pathway that's causing your arrhythmia.

Implantable devices

- The pacemaker is an implantable, permanently device that helps control abnormal heart rhythms. This device is placed under the skin under the collarbone where an insulated wire extends from the device to the heart. If the pacemaker detects an abnormal heart rate, it emits electrical impulses that stimulate the heart to beat at a normal rate.
- Implantable cardioverter-defibrillator (ICD) is especially recommended to a patient with ventricular fibrillation or tachycardia, which can lead to sudden cardiac arrest. It is a similar unit to the pacemaker. One or more electrode-tipped wires from the ICD run through veins to the heart. The ICD continuously monitors your heart rhythm. If it detects an abnormal heart rate, it sends out low -or high-energy shocks to reset the heart to a normal rhythm.

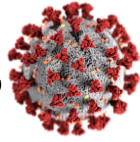
Maze procedure is a surgery where they create a pattern or maze of scar tissue in the atria. These scars don't conduct electricity and therefore interferes with stray electrical impulses that cause some types of arrhythmia. It is usually reserved to patients that don't react to other treatments.

Coronary bypass surgery is a procedure a patient undergoes when having a severe coronary artery disease in addition to arrhythmias. This procedure improves the blood flow to your heart.

7. Setting (outpatient specialist, in-hospital, GP, emergency room) where condition will be most frequently /reliably diagnosed

Patients with arrhythmias can present themselves in a setting at outpatient specialists, in hospital, GP or at the emergency room depending on the symptoms they experience and the type of arrhythmia they have.

8. Diagnosis codes or algorithms used in different papers to extract the events in Europe/USA: seek literature for papers that have studied this event, and see how they extracted/measured the event.



ICD-9- CM:

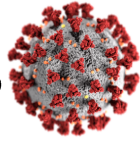
- 426.7: anomalous atrioventricular excitation
- 427.0: supraventricular tachycardia
- 427.1: paroxysmal ventricular tachycardia
- 427.2: paroxysmal tachycardia, unspecified
- 427.31: atrial fibrillation
- 427.32: atrial flutter
- 427.42: ventricular flutter
- 427.61: supraventricular premature beats
- 427.69: premature ventricular contraction
- 427.8: other specified cardiac dysrhythmias
- 427.81: sinoatrial node dysfunction

ICD-10-CM:

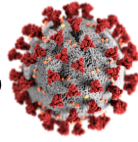
- I48: atrial fibrillation and flutter
- I48.3 typical atrial flutter
- I48.4: atypical atrial flutter
- I48.2: chronic atrial fibrillation
- I48.9: unspecified atrial fibrillation and flutter
- I48.91: unspecified atrial fibrillation
- I48.0: paroxysmal atrial fibrillation
- I48.1: persistent atrial fibrillation
- I48.92: unspecified atrial flutter
- I49.0: ventricular fibrillation and flutter
- I49.02: ventricular flutter
- I49.01: ventricular fibrillation
- I47.0: re-entry ventricular arrhythmia
- I49.3: ventricular premature depolarization

9. Codes used in ACCESS

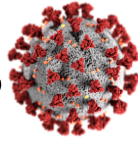
Coding system	Code	Code name	Concept	Concept name	Algorithm
ICD10/CM	I44	Atrioventricular and left bundle-branch block	C0494595	Atrioventricular and left bundle-branch block	narrow
ICD10/CM	I45				narrow
ICD10/CM	I45.0	Bundle Branch Block			narrow
ICD10/CM	I45.1	Bundle Branch Block			narrow
ICD10/CM	I45.2	Bundle Branch Block			narrow
ICD10/CM	I45.3	Bundle Branch Block			narrow
ICD10/CM	I45.4	Bundle-branch block NOS	C0006384	Bundle-Branch Block	narrow



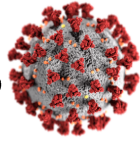
ICD10/CM	I45.5	Other specified heart block	C0348624	Other specified heart block	narrow
ICD10/CM	I45.6	Anomalous atrioventricular excitation	C0392470	Anomalous atrioventricular excitation	narrow
ICD10/CM	I45.6	Wolff-Parkinson-White syndrome	C0043202	Wolff-Parkinson-White Syndrome	narrow
ICD10/CM	I45.9	Conduction disorder, unspecified	C0264886	Conduction disorder of the heart	narrow
ICD10/CM	I45.9	Conduction disorder, unspecified	C0264886	Conduction disorder of the heart	narrow
ICD10/CM	I45.9	Conduction disorder, unspecified	C0264886	Conduction disorder of the heart	narrow
ICD10/CM	I46	Cardiac arres			narrow
ICD10/CM	I47	Paroxysmal tachycardia	C0039236	Tachycardia, Paroxysmal	narrow
ICD10/CM	I47.0	Re-entry ventricular arrhythmia	C0349069	Re-entry ventricular arrhythmia	narrow
ICD10/CM	I47.1	Supraventricular tachycardia	C0039240	Supraventricular tachycardia	narrow
ICD10/CM	I47.2	Ventricular tachycardia	C0042514	Tachycardia, Ventricular	narrow
ICD10/CM	I47.9	Paroxysmal tachycardia, unspecified	C0039236	Tachycardia, Paroxysmal	narrow
ICD10/CM	I48	Atrial fibrillation and flutter	C0155709	Atrial fibrillation and flutter	narrow
ICD10/CM	I49				
ICD10/CM	R00.0	Tachycardia, unspecified	C0039231	Tachycardia	narrow
ICD10/CM	R00.0	Tachycardia, unspecified	C0039231	Tachycardia	narrow
ICD10/CM	R00.1	Bradycardia, unspecified	C0428977	Bradycardia	narrow
ICD9CM	426	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
ICD9CM	427	Cardiac dysrhythmias	C0003811	Cardiac Arrhythmia	narrow
ICD9CM	785.0	Tachycardia, unspecified	C0039231	Tachycardia	narrow
ICD9CM	785.0	Tachycardia, unspecified	C0039231	Tachycardia	narrow
ICPC	K04	Tachycardia, unspecified			NArrow
ICPC	K78	Atrial fibrillation/flutter	C0155709	Atrial fibrillation and flutter	narrow
ICPC	K79	Paroxysmal tachycardia	C0039236	Tachycardia, Paroxysmal	narrow
ICPC	K80	Ectopic beats all types	C0003811	Cardiac Arrhythmia	narrow
ICPC	K84	OTHER HEART DISEASE			Narrow
RCD2	2422.	O/E - pulse rate - bradycardia	C0428977	Bradycardia	narrow
RCD2	2426.	O/E - pulse rate tachycardia	C0039231	Tachycardia	narrow
RCD2	2426.	O/E - pulse rate tachycardia	C0039231	Tachycardia	narrow
RCD2	3282.	ECG: ventricular tachycardia	C0344428	ECG: ventricular tachycardia	narrow
RCD2	G56..	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
RCD2	G56..	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
RCD2	G56..	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
RCD2	G5650	Bundle branch block unspecif.	C0006384	Bundle-Branch Block	narrow
RCD2	G5653	Other bilateral BBB	C0155706	Other bilateral bundle branch block	narrow
RCD2	G567.	Anomalous A-V excitation	C0392470	Anomalous atrioventricular excitation	narrow
RCD2	G5674	Wolff-Parkinson-White syndrome	C0043202	Wolff-Parkinson-White Syndrome	narrow
RCD2	G567z	Anomalous A-V excitation NOS	C0392470	Anomalous atrioventricular excitation	narrow



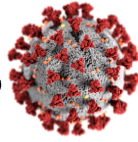
RCD2	G56z.	Conduction disorders unsp.	C0264886	Conduction disorder of the heart	narrow
RCD2	G56z.	Conduction disorders unsp.	C0264886	Conduction disorder of the heart	narrow
RCD2	G56z.	Conduction disorders unsp.	C0264886	Conduction disorder of the heart	narrow
RCD2	G56zz	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
RCD2	G56zz	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
RCD2	G56zz	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
RCD2	G57..	Cardiac dysrhythmias	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57..	Cardiac dysrhythmias	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57..	Cardiac dysrhythmias	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57..	Cardiac dysrhythmias	C0003811	Cardiac Arrhythmia	narrow
RCD2	G570.	Paroxysmal supravent.tachycard	C0030590	Paroxysmal supraventricular tachycardia	narrow
RCD2	G570z	Paroxysm.supravent.tachyc. NOS	C0030590	Paroxysmal supraventricular tachycardia	narrow
RCD2	G571.	Paroxysmal ventric. tachycard.	C0042514	Tachycardia, Ventricular	narrow
RCD2	G572.	Paroxysmal tachycardia unsp.	C0039236	Tachycardia, Paroxysmal	narrow
RCD2	G5720	Essential paroxysmal tachyc.	C0039236	Tachycardia, Paroxysmal	narrow
RCD2	G5721	Bouveret-Hoffmann syndrome	C0039236	Tachycardia, Paroxysmal	narrow
RCD2	G572z	Paroxysmal tachycardia NOS	C0039236	Tachycardia, Paroxysmal	narrow
RCD2	G573.	Atrial fibrillation/flutter	C0155709	Atrial fibrillation and flutter	narrow
RCD2	G5730	Atrial fibrillation	C0004238	Atrial Fibrillation	narrow
RCD2	G5731	Atrial flutter	C0004239	Atrial Flutter	narrow
RCD2	G5732	Paroxysmal atrial fibrillation	C0235480	Paroxysmal atrial fibrillation	narrow
RCD2	G573z	Atrial fibrillat./flutter NOS	C0155709	Atrial fibrillation and flutter	narrow
RCD2	G574.	Ventricular fibrillat./flutter	C0155710	Ventricular fibrillation and flutter	narrow
RCD2	G5740	Ventricular fibrillation	C0042510	Ventricular Fibrillation	narrow
RCD2	G5741	Ventricular flutter	C0152173	Ventricular Flutter	narrow
RCD2	G574z	Ventric.fibrillat./flutter NOS	C0155710	Ventricular fibrillation and flutter	narrow
RCD2	G5761	Supraventricular ectopic beats	C0033036	Atrial Premature Complexes	narrow
RCD2	G5762	Ventricular ectopic beats	C0151636	Premature ventricular contractions	narrow
RCD2	G5763	Atrial premature depolarizatn	C0033036	Atrial Premature Complexes	narrow
RCD2	G5765	Ventricul premat depolarizatn	C0151636	Premature ventricular contractions	narrow
RCD2	G577.	Sinus arrhythmia	C0003813	Sinus Arrhythmia	narrow
RCD2	G57y3	Sick sinus syndrome	C0037052	Sick Sinus Syndrome	narrow
RCD2	G57y4	Sinoatrial node dysfunct. NOS	C0428908	Sinus Node Dysfunction (disorder)	narrow
RCD2	G57y7	Sinus tachycardia	C0039239	Sinus Tachycardia	narrow
RCD2	G57y9	Supraventric. tachycardia NOS	C0039240	Supraventricular tachycardia	narrow
RCD2	G57yA	Re-entry ventricul arrhythmia	C0349069	Re-entry ventricular arrhythmia	narrow



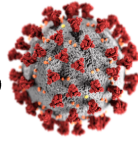
RCD2	G57z.	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57z.	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57z.	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
RCD2	G57z.	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
RCD2	Gyu5a	[X]Oth spcf cardiac arrhythmia	C0348626	Other specified cardiac arrhythmias	narrow
RCD2	Gyu5a	[X]Oth spcf cardiac arrhythmia	C0348626	Other specified cardiac arrhythmias	narrow
RCD2	Gyu5U	[X]O+unsp atrioventriclr block	C0348621	Other and unspecified atrioventricular block	narrow
RCD2	Gyu5W	[X]O+unsp rt bundle-brnch blk	C0348623	Other and unspecified right bundle-branch block	narrow
RCD2	Gyu5X	[X]Other specified heart block	C0348624	Other specified heart block	narrow
RCD2	R050.	[D]Tachycardia, unspecified	C0039231	Tachycardia	narrow
RCD2	R050.	[D]Tachycardia, unspecified	C0039231	Tachycardia	narrow
RCD2	Ryu06	[X]Bradycardia, unspecified	C0428977	Bradycardia	narrow
SCTSPA	3424008	taquicardia	C0039231	Tachycardia	narrow
SCTSPA	3424008	taquicardia	C0039231	Tachycardia	narrow
SCTSPA	5370000	aleteo auricular	C0004239	Atrial Flutter	narrow
SCTSPA	6285003	taquiarritmia	C0080203	Tachyarrhythmia	narrow
SCTSPA	6374002	bloqueo de rama	C0006384	Bundle-Branch Block	narrow
SCTSPA	6456007	taquicardia supraventricular	C0039240	Supraventricular tachycardia	narrow
SCTSPA	6624005	taquiarritmia ventricular	C0042514	Tachycardia, Ventricular	narrow
SCTSPA	11092001	taquicardia sinusal	C0039239	Sinus Tachycardia	narrow
SCTSPA	12026006	taquicardia paroxística	C0039236	Tachycardia, Paroxysmal	narrow
SCTSPA	17338001	extrasístoles ventriculares	C0151636	Premature ventricular contractions	narrow
SCTSPA	17869006	excitación auriculoventricular anómala	C0392470	Anomalous atrioventricular excitation	narrow
SCTSPA	23265007	fibriloaleteo ventricular	C0155710	Ventricular fibrillation and flutter	narrow
SCTSPA	25569003	taquicardia ventricular	C0042514	Tachycardia, Ventricular	narrow
SCTSPA	36083008	síndrome de disfunción sinusal	C0037052	Sick Sinus Syndrome	narrow
SCTSPA	44808001	trastorno de conducción cardíaca	C0264886	Conduction disorder of the heart	narrow
SCTSPA	44808001	trastorno de conducción cardíaca	C0264886	Conduction disorder of the heart	narrow
SCTSPA	44808001	trastorno de conducción cardíaca	C0264886	Conduction disorder of the heart	narrow
SCTSPA	48867003	bradicardia	C0428977	Bradycardia	narrow
SCTSPA	49436004	fibrilación auricular	C0004238	Atrial Fibrillation	narrow
SCTSPA	53488008	arritmia	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	53488008	arritmia	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	53488008	arritmia	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	53488008	arritmia	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	60299007	extrasístoles auriculares	C0033036	Atrial Premature Complexes	narrow
SCTSPA	60423000	disfunción del nódulo sinoauricular	C0428908	Sinus Node Dysfunction (disorder)	narrow
SCTSPA	63593006	extrasístoles supraventriculares	C0033036	Atrial Premature Complexes	narrow



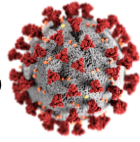
SCTSPA	67198005	taquicardia supraventricular paroxística	C0030590	Paroxysmal supraventricular tachycardia	narrow
SCTSPA	71908006	fibrilación ventricular	C0042510	Ventricular Fibrillation	narrow
SCTSPA	71908006	fibrilación ventricular	C0042510	Ventricular Fibrillation	narrow
SCTSPA	72654001	arritmia supraventricular	C0428974	Supraventricular arrhythmia	narrow
SCTSPA	73712003	latidos auriculares ectópicos	C0033036	Atrial Premature Complexes	narrow
SCTSPA	74390002	patrón de Wolff-Parkinson-White	C0043202	Wolff-Parkinson-White Syndrome	narrow
SCTSPA	81216002	aleteo - fibrilación auricular	C0155709	Atrial fibrillation and flutter	narrow
SCTSPA	86651002	frecuencia del pulso aumentada	C0039231	Tachycardia	narrow
SCTSPA	86651002	frecuencia del pulso aumentada	C0039231	Tachycardia	narrow
SCTSPA	111288001	aleteo ventricular	C0152173	Ventricular Flutter	narrow
SCTSPA	155362008	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
SCTSPA	155362008	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
SCTSPA	155362008	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
SCTSPA	155369004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	155369004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	155369004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	155369004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	164895002	taquicardia ventricular en el electrocardiograma	C0344428	ECG: ventricular tachycardia	narrow
SCTSPA	195048003	bloqueo de rama no especificado	C0006384	Bundle-Branch Block	narrow
SCTSPA	195050006	otro bloqueo bilateral de rama	C0155706	Other bilateral bundle branch block	narrow
SCTSPA	195061003	excitación auriculoventricular anómala, SAI	C0392470	Anomalous atrioventricular excitation	narrow
SCTSPA	195066008	trastornos de la conducción no especificados	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195066008	trastornos de la conducción no especificados	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195066008	trastornos de la conducción no especificados	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195068009	trastornos de la conducción, SAI	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195068009	trastornos de la conducción, SAI	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195068009	trastornos de la conducción, SAI	C0264886	Conduction disorder of the heart	narrow
SCTSPA	195074009	taquicardia paroxística supraventricular, SAI	C0030590	Paroxysmal supraventricular tachycardia	narrow
SCTSPA	195076006	taquicardia paroxística no especificada	C0039236	Tachycardia, Paroxysmal	narrow
SCTSPA	195077002	taquicardia paroxística esencial	C0039236	Tachycardia, Paroxysmal	narrow
SCTSPA	195078007	síndrome de Bouveret-Hoffmann	C0039236	Tachycardia, Paroxysmal	narrow
SCTSPA	195079004	taquicardia paroxística, SAI	C0039236	Tachycardia, Paroxysmal	narrow
SCTSPA	195080001	fibrilación y aleteo auriculares	C0155709	Atrial fibrillation and flutter	narrow
SCTSPA	195082009	fibrilación y aleteo auricular, SAI	C0155709	Atrial fibrillation and flutter	narrow
SCTSPA	195083004	fibrilación y aleteo ventricular	C0155710	Ventricular fibrillation and flutter	narrow
SCTSPA	195084005	fibrilación y aleteo ventricular, SAI	C0155710	Ventricular fibrillation and flutter	narrow



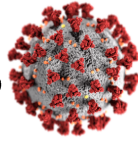
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SCTSPA	195100002	disfunción del nodo sinusal, SAI	C0428908	Sinus Node Dysfunction (disorder)	narrow
SCTSPA	195104006	taquicardia supraventricular, SAI	C0039240	Supraventricular tachycardia	narrow
SCTSPA	195105007	arritmia ventricular por reentrada	C0349069	Re-entry ventricular arrhythmia	narrow
SCTSPA	195107004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
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SCTSPA	195107004	arritmia cardíaca, SAI	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	195581009	[X]otros tipos de bloqueo auriculoventricular y los no especificados	C0348621	Other and unspecified atrioventricular block	narrow
SCTSPA	195583007	[X]otros tipos de bloqueo de rama derecha del haz y los no especificados	C0348623	Other and unspecified right bundle-branch block	narrow
SCTSPA	195584001	[X]otro bloqueo cardíaco especificado	C0348624	Other specified heart block	narrow
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SCTSPA	195587008	[X]otras arritmias cardíacas especificadas	C0348626	Other specified cardiac arrhythmias	narrow
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SCTSPA	207003004	[D]frecuencia cardíaca rápida	C0039231	Tachycardia	narrow
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SCTSPA	233901002	taquicardia del haz de His	C0039235	Tachycardia, Ectopic Junctional	narrow
SCTSPA	251115003	patrón Wolff-Parkinson-White	C0043202	Wolff-Parkinson-White Syndrome	narrow
SCTSPA	251155001	taquicardia ectópica de la unión auriculoventricular	C0039235	Tachycardia, Ectopic Junctional	narrow
SCTSPA	251175005	complejos ventriculares prematuros	C0151636	Premature ventricular contractions	narrow
SCTSPA	282825002	fibrilación auricular paroxística	C0235480	Paroxysmal atrial fibrillation	narrow
SCTSPA	284470004	contracción auricular prematura	C0033036	Atrial Premature Complexes	narrow
SCTSPA	287057009	complejo auricular prematuro	C0033036	Atrial Premature Complexes	narrow
SCTSPA	406461004	latidos auriculares ectópicos	C0033036	Atrial Premature Complexes	narrow
SCTSPA	419166005	taquicardia ectópica de la unión auriculoventricular	C0039235	Tachycardia, Ectopic Junctional	narrow
SCTSPA	426749004	fibrilación auricular crónica	C0694539	Chronic atrial fibrillation	narrow
SCTSPA	440059007	fibrilación auricular persistente	C2585653	Persistent atrial fibrillation	narrow
SCTSPA	698247007	arritmia cardíaca	C0003811	Cardiac Arrhythmia	narrow
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SCTSPA	698247007	arritmia cardíaca	C0003811	Cardiac Arrhythmia	narrow
SCTSPA	720448006	aleteo auricular típico	C3264370	Typical atrial flutter	narrow
SCTSPA	1,59649E+16	aleteo auricular atípico	C3264372	Atypical atrial flutter	narrow
SNOMEDCT_US	3424008	Tachycardia	C0039231	Tachycardia	narrow
SNOMEDCT_US	3424008	Tachycardia	C0039231	Tachycardia	narrow



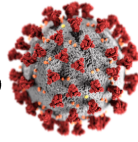
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SNOMEDCT_US	6285003	Tachyarrhythmia	C0080203	Tachyarrhythmia	narrow
SNOMEDCT_US	6285003	Heart rate fast	C0039231	Tachycardia	narrow
SNOMEDCT_US	6285003	Heart rate fast	C0039231	Tachycardia	narrow
SNOMEDCT_US	6374002	Bundle branch block	C0006384	Bundle-Branch Block	narrow
SNOMEDCT_US	6456007	Supraventricular tachycardia	C0039240	Supraventricular tachycardia	narrow
SNOMEDCT_US	6624005	Ventricular tachyarrhythmia	C0042514	Tachycardia, Ventricular	narrow
SNOMEDCT_US	11092001	Sinus tachycardia	C0039239	Sinus Tachycardia	narrow
SNOMEDCT_US	12026006	Paroxysmal tachycardia	C0039236	Tachycardia, Paroxysmal	narrow
SNOMEDCT_US	17338001	Ventricular premature beats	C0151636	Premature ventricular contractions	narrow
SNOMEDCT_US	17869006	Anomalous atrioventricular excitation	C0392470	Anomalous atrioventricular excitation	narrow
SNOMEDCT_US	23265007	Ventricular flutter-fibrillation	C0155710	Ventricular fibrillation and flutter	narrow
SNOMEDCT_US	25569003	Ventricular tachycardia	C0042514	Tachycardia, Ventricular	narrow
SNOMEDCT_US	36083008	Sick sinus syndrome	C0037052	Sick Sinus Syndrome	narrow
SNOMEDCT_US	44808001	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	44808001	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	44808001	Conduction disorder of the heart	C0264886	Conduction disorder of the heart	narrow
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SNOMEDCT_US	48867003	Bradycardia	C0428977	Bradycardia	narrow
SNOMEDCT_US	49436004	Atrial fibrillation	C0004238	Atrial Fibrillation	narrow
SNOMEDCT_US	53488008	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	53488008	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	60299007	Atrial ectopic	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	60423000	Sinus node dysfunction	C0428908	Sinus Node Dysfunction (disorder)	narrow
SNOMEDCT_US	63593006	Supraventricular premature beats	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	67198005	Paroxysmal supraventricular tachycardia	C0030590	Paroxysmal supraventricular tachycardia	narrow
SNOMEDCT_US	71792006	Sinus arrhythmia	C0003813	Sinus Arrhythmia	narrow



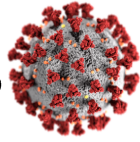
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SNOMEDCT_US	72654001	Supraventricular arrhythmia	C0428974	Supraventricular arrhythmia	narrow
SNOMEDCT_US	73712003	Ectopic atrial beats	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	74390002	Wolff-Parkinson-White pattern	C0043202	Wolff-Parkinson-White Syndrome	narrow
SNOMEDCT_US	81216002	Atrial fibrillation and flutter	C0155709	Atrial fibrillation and flutter	narrow
SNOMEDCT_US	86651002	Pulse fast	C0039231	Tachycardia	narrow
SNOMEDCT_US	86651002	Pulse fast	C0039231	Tachycardia	narrow
SNOMEDCT_US	111288001	Ventricular flutter	C0152173	Ventricular Flutter	narrow
SNOMEDCT_US	142055005	ECG: ventricular tachycardia	C0344428	ECG: ventricular tachycardia	narrow
SNOMEDCT_US	155354000	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
SNOMEDCT_US	155354000	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
SNOMEDCT_US	155354000	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
SNOMEDCT_US	155360000	Anomalous A-V excitation	C0392470	Anomalous atrioventricular excitation	narrow
SNOMEDCT_US	155360000	Wolff - Parkinson - White syndrome	C0043202	Wolff-Parkinson-White Syndrome	narrow
SNOMEDCT_US	155362008	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
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SNOMEDCT_US	155362008	Conduction disorders NOS	C0264886	Conduction disorder of the heart	narrow
SNOMEDCT_US	155363003	Paroxysmal sup. tachy.	C0030590	Paroxysmal supraventricular tachycardia	narrow
SNOMEDCT_US	155363003	Supraventricular tachycardia	C0039240	Supraventricular tachycardia	narrow
SNOMEDCT_US	155364009	Atrial fibrillation	C0004238	Atrial Fibrillation	narrow
SNOMEDCT_US	155364009	Atrial flutter	C0004239	Atrial Flutter	narrow
SNOMEDCT_US	155366006	Supraventricular ectopic beats	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	155367002	Ventricular ectopic beats	C0151636	Premature ventricular contractions	narrow
SNOMEDCT_US	155369004	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	155369004	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	155369004	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	155370003	Tachycardia - ventric.	C0042514	Tachycardia, Ventricular	narrow
SNOMEDCT_US	155371004	Ventricular fibrillation	C0042510	Ventricular Fibrillation	narrow
SNOMEDCT_US	155371004	Ventricular fibrillation	C0042510	Ventricular Fibrillation	narrow
SNOMEDCT_US	155373001	Cardiac dysrhythmias NOS	C0003811	Cardiac Arrhythmia	narrow



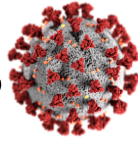
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SNOMEDCT_US	155373001	Cardiac dysrhythmias NOS	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	155373001	Sick sinus syndrome	C0037052	Sick Sinus Syndrome	narrow
SNOMEDCT_US	164895002	EKG: ventricular tachycardia	C0344428	ECG: ventricular tachycardia	narrow
SNOMEDCT_US	195038000	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
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SNOMEDCT_US	195050006	Other bilateral bundle branch block	C0155706	Other bilateral bundle branch block	narrow
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SNOMEDCT_US	195066008	Conduction disorders unspecified	C0264886	Conduction disorder of the heart	narrow
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SNOMEDCT_US	195074009	Paroxysmal supraventricular tachycardia NOS	C0030590	Paroxysmal supraventricular tachycardia	narrow
SNOMEDCT_US	195075005	Tachycardia - ventric.	C0042514	Tachycardia, Ventricular	narrow
SNOMEDCT_US	195076006	Paroxysmal tachycardia unspecified	C0039236	Tachycardia, Paroxysmal	narrow
SNOMEDCT_US	195077002	Essential paroxysmal tachycardia	C0039236	Tachycardia, Paroxysmal	narrow
SNOMEDCT_US	195078007	Bouveret-Hoffmann syndrome	C0039236	Tachycardia, Paroxysmal	narrow
SNOMEDCT_US	195079004	Paroxysmal tachycardia NOS	C0039236	Tachycardia, Paroxysmal	narrow
SNOMEDCT_US	195080001	Atrial fibrillation and flutter	C0155709	Atrial fibrillation and flutter	narrow
SNOMEDCT_US	195081002	Paroxysmal atrial fibrillation	C0235480	Paroxysmal atrial fibrillation	narrow
SNOMEDCT_US	195082009	Atrial fibrillation and flutter NOS	C0155709	Atrial fibrillation and flutter	narrow
SNOMEDCT_US	195083004	Ventricular fibrillation and flutter	C0155710	Ventricular fibrillation and flutter	narrow
SNOMEDCT_US	195084005	Ventricular fibrillation and flutter NOS	C0155710	Ventricular fibrillation and flutter	narrow
SNOMEDCT_US	195093006	Ventricular ectopic beats	C0151636	Premature ventricular contractions	narrow
SNOMEDCT_US	195094000	Atrial premature complex	C0033036	Atrial Premature Complexes	narrow
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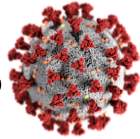
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SNOMEDCT_US	195104006	Supraventricular tachycardia NOS	C0039240	Supraventricular tachycardia	narrow
SNOMEDCT_US	195105007	Re-entry ventricular arrhythmia	C0349069	Re-entry ventricular arrhythmia	narrow
SNOMEDCT_US	195107004	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	195107004	Cardiac dysrhythmia NOS	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	207041006	[X]Bradycardia, unspecified	C0428977	Bradycardia	narrow
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SNOMEDCT_US	233901002	His bundle tachycardia	C0039235	Tachycardia, Ectopic Junctional	narrow
SNOMEDCT_US	251115003	Wolff-Parkinson-White pattern	C0043202	Wolff-Parkinson-White Syndrome	narrow
SNOMEDCT_US	251122006	Bundle branch block	C0006384	Bundle-Branch Block	narrow
SNOMEDCT_US	251151005	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	251151005	Arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	251155001	Junctional ectopic tachycardia	C0039235	Tachycardia, Ectopic Junctional	narrow
SNOMEDCT_US	251169001	Atrial premature complex	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	251175005	Ventricular premature complex	C0151636	Premature ventricular contractions	narrow
SNOMEDCT_US	266302004	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
SNOMEDCT_US	266302004	Conduction disorders	C0264886	Conduction disorder of the heart	narrow
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SNOMEDCT_US	266304003	Anomalous A-V excitation	C0392470	Anomalous atrioventricular excitation	narrow
SNOMEDCT_US	266304003	Wolff - Parkinson - White syndrome	C0043202	Wolff-Parkinson-White Syndrome	narrow



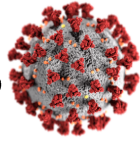
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SNOMEDCT_US	266307005	Cardiac dysrhythmias NOS	C0003811	Cardiac Arrhythmia	narrow
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SNOMEDCT_US	266307005	Cardiac dysrhythmias NOS	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	266307005	Sick sinus syndrome	C0037052	Sick Sinus Syndrome	narrow
SNOMEDCT_US	282825002	Paroxysmal atrial fibrillation	C0235480	Paroxysmal atrial fibrillation	narrow
SNOMEDCT_US	284470004	Premature atrial contraction	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	287057009	Atrial premature complex	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	367107008	Sinus tachycardia	C0039239	Sinus Tachycardia	narrow
SNOMEDCT_US	406461004	Ectopic atrial beats	C0033036	Atrial Premature Complexes	narrow
SNOMEDCT_US	419166005	Junctional ectopic tachycardia	C0039235	Tachycardia, Ectopic Junctional	narrow
SNOMEDCT_US	426749004	Chronic atrial fibrillation	C0694539	Chronic atrial fibrillation	narrow
SNOMEDCT_US	440059007	Persistent atrial fibrillation	C2585653	Persistent atrial fibrillation	narrow
SNOMEDCT_US	698247007	Cardiac arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	698247007	Cardiac arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	698247007	Cardiac arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	698247007	Cardiac arrhythmia	C0003811	Cardiac Arrhythmia	narrow
SNOMEDCT_US	720448006	Typical atrial flutter	C3264370	Typical atrial flutter	narrow
SNOMEDCT_US	1,59649E+16	Atypical atrial flutter	C3264372	Atypical atrial flutter	narrow
SNOMEDCT_US	4973001	Left bundle branch hemiblock			narrow
SNOMEDCT_US	9651007	Long Q-T syndrome			narrow
SNOMEDCT_US	9651007	Long QT syndrome			narrow
SNOMEDCT_US	9651007	Long Q-T syndrome			narrow
SNOMEDCT_US	16797001	Accelerated atrioventricular conduction			narrow
SNOMEDCT_US	16797001	Preexcitation syndrome			narrow
SNOMEDCT_US	16797001	Accessory atrioventricular conduction			narrow
SNOMEDCT_US	16797001	Accelerated atrioventricular conduction			narrow
SNOMEDCT_US	16797001	Accessory atrioventricular conduction			narrow



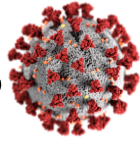
SNOMEDCT_US	16797001	Pre-excitation atrioventricular conduction			narrow
SNOMEDCT_US	20143001	Other bilateral bundle branch block			narrow
SNOMEDCT_US	20852007	Romano - Ward syndrome			narrow
SNOMEDCT_US	20852007	Romano - Ward syndrome			narrow
SNOMEDCT_US	27885002	Complete atrioventricular block			narrow
SNOMEDCT_US	27885002	High grade atrioventricular block			narrow
SNOMEDCT_US	27885002	CHB - Complete heart block			narrow
SNOMEDCT_US	27885002	Complete heart block			narrow
SNOMEDCT_US	27885002	Complete atrioventricular block			narrow
SNOMEDCT_US	27885002	Third degree atrioventricular block			narrow
SNOMEDCT_US	27885002	Complete atrioventric. block			narrow
SNOMEDCT_US	27885002	Atrioventricular dissociation			narrow
SNOMEDCT_US	27885002	Congenital heart block, unspecified			narrow
SNOMEDCT_US	27885002	Congenital heart block NOS			narrow
SNOMEDCT_US	28189009	Mobitz type II atrioventricular block			narrow
SNOMEDCT_US	28189009	Second degree Mobitz type II incomplete atrioventricular block			narrow
SNOMEDCT_US	28189009	Mobitz type 2 second degree atrioventricular block			narrow
SNOMEDCT_US	28189009	Mobitz type II atrioventricular block			narrow
SNOMEDCT_US	29717002	Extrasystoles			narrow
SNOMEDCT_US	29717002	Ectopics			narrow
SNOMEDCT_US	29717002	Extrasystoles			narrow
SNOMEDCT_US	29717002	Ectopic beats NOS			narrow
SNOMEDCT_US	30667004	Right BBB with left anterior fascicular block			narrow
SNOMEDCT_US	30667004	RBBB - Right bundle branch block with left anterior fascicular block			narrow
SNOMEDCT_US	30667004	Right BBB with left anterior fascicular block			narrow
SNOMEDCT_US	33413000	Ectopic beats			narrow
SNOMEDCT_US	33413000	Ectopic beats			narrow
SNOMEDCT_US	33413000	Premature beats			narrow
SNOMEDCT_US	33413000	Ectopic beats/extrasystoles			narrow
SNOMEDCT_US	33413000	Ectopic beats unspecified			narrow
SNOMEDCT_US	37760005	Left anterior fascicular block			narrow



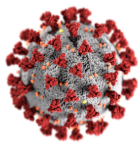
SNOMEDCT_US	37760005	Left anterior hemiblock			narrow
SNOMEDCT_US	37760005	Left anterior fascicular block			narrow
SNOMEDCT_US	42807005	Pulsus alternans			narrow
SNOMEDCT_US	42807005	Pulsus alternans			narrow
SNOMEDCT_US	44602002	Persistent sinus bradycardia			narrow
SNOMEDCT_US	46319007	Right BBB with left posterior fascicular block			narrow
SNOMEDCT_US	46319007		RBBB - Right bundle branch block with left posterior fascicular block		narrow
SNOMEDCT_US	46319007	Right BBB with left posterior fascicular block			narrow
SNOMEDCT_US	46935006	Stokes-Adams syndrome			narrow
SNOMEDCT_US	46935006	Stokes-Adams syndrome			narrow
SNOMEDCT_US	49044005	Severe sinus bradycardia			narrow
SNOMEDCT_US	54016002	Mobitz type I (Wenckebach) atrioventricular block			narrow
SNOMEDCT_US	54016002	Wenckebach's incomplete AV block			narrow
SNOMEDCT_US	54016002	Wenckebach's phenomenon			narrow
SNOMEDCT_US	54016002	Mobitz type I (Wenckebach) atrioventricular block			narrow
SNOMEDCT_US	54016002	Mobitz type 1 second degree atrioventricular block			narrow
SNOMEDCT_US	55475008	Lown-Ganong-Levine syndrome			narrow
SNOMEDCT_US	55475008		Syndrome of short P-R interval, normal QRS complexes AND supraventricular tachycardias		narrow
SNOMEDCT_US	55475008	Lown-Ganong-Levine syndrome			narrow
SNOMEDCT_US	59118001	Right bundle branch block			narrow
SNOMEDCT_US	59118001	Right bundle branch block			narrow
SNOMEDCT_US	59118001	Right fascicular block			narrow
SNOMEDCT_US	59118001	Right fascicular block			narrow
SNOMEDCT_US	59118001	[X]Other and unspecified right bundle-branch block			narrow
SNOMEDCT_US	62026008	Left posterior fascicular block			narrow
SNOMEDCT_US	63467002	Left bundle branch block			narrow
SNOMEDCT_US	63467002	Left bundle branch block			narrow
SNOMEDCT_US	63467002	Left bundle branch hemiblock NOS			narrow
SNOMEDCT_US	63593006	Supraventricular ectopic beats			narrow
SNOMEDCT_US	65778007	Sinoatrial block			narrow
SNOMEDCT_US	65778007	Sinoatrial exit block			narrow



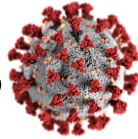
SNOMEDCT_US	65778007	Sinoatrial block			narrow
SNOMEDCT_US	66657009	Paroxysmal ventricular tachycardia			narrow
SNOMEDCT_US	66657009	Paroxysmal ventric. tachyc.			narrow
SNOMEDCT_US	74021003	Bifascicular block			narrow
SNOMEDCT_US	86014007	Trifascicular block			narrow
SNOMEDCT_US	86014007	Trifascicular block			narrow
SNOMEDCT_US	95281009	Sudden cardiac death, so described			narrow
SNOMEDCT_US	111288001	Ventricular flutter			narrow
SNOMEDCT_US	129575004	Pacemaker twiddler's syndrome			narrow
SNOMEDCT_US	129575004	Pacemaker twiddler's syndrome			narrow
SNOMEDCT_US	162988008	O/E - pulse rate - bradycardia			narrow
SNOMEDCT_US	162988008	O/E - pulse rate - bradycardia			narrow
SNOMEDCT_US	162988008	O/E - bradycardia			narrow
SNOMEDCT_US	162992001	O/E - pulse rate tachycardia			narrow
SNOMEDCT_US	162992001	O/E - pulse rate tachycardia			narrow
SNOMEDCT_US	162992001	O/E - tachycardia			narrow
SNOMEDCT_US	164895002	ECG: ventricular tachycardia			narrow
SNOMEDCT_US	164895002	Electrocardiographic ventricular tachycardia			narrow
SNOMEDCT_US	164895002	ECG: ventricular tachycardia			narrow
SNOMEDCT_US	164947007	Prolonged P-R interval			narrow
SNOMEDCT_US	164947007	ECG: P-R interval prolonged			narrow
SNOMEDCT_US	164947007	Prolonged P-R interval			narrow
SNOMEDCT_US	195039008	Partial atrioventricular block			narrow
SNOMEDCT_US	195039008	Incomplete atrioventricular block			narrow
SNOMEDCT_US	195039008	Incomplete heart block			narrow
SNOMEDCT_US	195039008	Partial atrioventricular block			narrow
SNOMEDCT_US	195042002	Second degree atrioventricular block			narrow
SNOMEDCT_US	195042002	Incomplete atrioventricular block, second degree			narrow
SNOMEDCT_US	195042002	Second degree atrioventricular block			narrow
SNOMEDCT_US	195046004	Left main stem bundle branch block			narrow
SNOMEDCT_US	195060002	Ventricular pre-excitation			narrow
SNOMEDCT_US	195069001	Paroxysmal atrial tachycardia			narrow



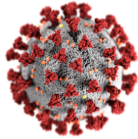
SNOMEDCT_US	195069001	PAT - Paroxysmal atrial tachycardia		narrow
SNOMEDCT_US	195069001	Atrial paroxysmal tachycardia		narrow
SNOMEDCT_US	195069001	Paroxysmal atrial tachycardia		narrow
SNOMEDCT_US	195070000	Paroxysmal atrioventricular tachycardia		narrow
SNOMEDCT_US	195070000	AV paroxysmal tachycardia		narrow
SNOMEDCT_US	195070000	Paroxysmal atrioventricular tachycardia		narrow
SNOMEDCT_US	195071001	Paroxysmal junctional tachycardia		narrow
SNOMEDCT_US	195071001	Paroxysmal junctional tachycardia		narrow
SNOMEDCT_US	195072008	Paroxysmal nodal tachycardia		narrow
SNOMEDCT_US	195072008	Paroxysmal nodal tachycardia		narrow
SNOMEDCT_US	195080001	Atrial fibrillation and flutter		narrow
SNOMEDCT_US	195080001	Atrial fibrillation and flutter NOS		narrow
SNOMEDCT_US	195083004	Ventricular fibrillation and flutter		narrow
SNOMEDCT_US	195083004	Ventricular fibrillation and flutter NOS		narrow
SNOMEDCT_US	195101003	Wandering atrial pacemaker		narrow
SNOMEDCT_US	195103000	Bigeminal pulse		narrow
SNOMEDCT_US	195103000	Bigeminal pulse		narrow
SNOMEDCT_US	195105007	Re-entry ventricular arrhythmia		narrow
SNOMEDCT_US	233911009	Non-rheumatic atrial fibrillation		narrow
SNOMEDCT_US	233911009	Non-rheumatic atrial fibrillation		narrow
SNOMEDCT_US	233916004	Heart block		narrow
SNOMEDCT_US	233916004	Heart block		narrow
SNOMEDCT_US	233916004	Other heart block		narrow
SNOMEDCT_US	233916004	Interventricular block NOS		narrow
SNOMEDCT_US	233916004	Other heart block NOS		narrow
SNOMEDCT_US	233916004	[X]Other specified heart block		narrow
SNOMEDCT_US	233917008	Atrioventricular block unspecified		narrow
SNOMEDCT_US	233917008	AVB - Atrioventricular block		narrow
SNOMEDCT_US	233917008	Atrioventricular block unspecified		narrow
SNOMEDCT_US	233917008	Atrioventricular block NOS		narrow
SNOMEDCT_US	233917008	[X]Other and unspecified atrioventricular block		narrow
SNOMEDCT_US	233927002	Cardiac arrest with successful resuscitation		narrow



SNOMEDCT_US	234172002	Electromechanical dissociation		narrow
SNOMEDCT_US	234172002	EMD		narrow
SNOMEDCT_US	234172002	PEA - Pulseless electrical activity		narrow
SNOMEDCT_US	234172002	Cardiac arrest with electromechanical dissociation		narrow
SNOMEDCT_US	234172002	Electromechanical dissociation		narrow
SNOMEDCT_US	248629002	Pulse missed beats		narrow
SNOMEDCT_US	248629002	Skipped beat		narrow
SNOMEDCT_US	251164006	Junctional premature depolarization		narrow
SNOMEDCT_US	251164006	Junctional premature depolarization		narrow
SNOMEDCT_US	251164006	Junctional premature depolarisation		narrow
SNOMEDCT_US	251164006	AV junctional (nodal) premature beats		narrow
SNOMEDCT_US	251164006	Junctional premature depolarization		narrow
SNOMEDCT_US	251175005	Ventricular premature depolarization		narrow
SNOMEDCT_US	251175005	Ventricular premature depolarization		narrow
SNOMEDCT_US	251175005	Ventricular premature complex		narrow
SNOMEDCT_US	251175005	Premature ventricular complex		narrow
SNOMEDCT_US	251175005	Ventricular premature depolarization		narrow
SNOMEDCT_US	270492004	First degree atrioventricular block		narrow
SNOMEDCT_US	270492004	Incomplete atrioventricular block, first degree		narrow
SNOMEDCT_US	270492004	First degree atrioventricular block		narrow
SNOMEDCT_US	282825002	Paroxysmal atrial fibrillation		narrow
SNOMEDCT_US	282825002	AF - Paroxysmal atrial fibrillation		narrow
SNOMEDCT_US	282825002	Intermittent atrial fibrillation		narrow
SNOMEDCT_US	282825002	Paroxysmal atrial fibrillation		narrow
SNOMEDCT_US	287057009	Atrial premature depolarization		narrow
SNOMEDCT_US	287057009	Atrial premature complex		narrow
SNOMEDCT_US	287057009	Atrial premature depolarization		narrow
SNOMEDCT_US	309809007	Electromechanical dissociation with successful resuscitation		narrow
SNOMEDCT_US	361137007	Heart beats irregular		narrow
SNOMEDCT_US	361137007	Heart beats irregular		narrow
SNOMEDCT_US	371073003	[D]Postural orthostatic tachycardia syndrome (POTS)		narrow
SNOMEDCT_US	373905003	Jervell and Lange-Nielsen syndrome		narrow



SNOMEDCT_US	373905003	Jervell and Lange-Nielsen syndrome			narrow
SNOMEDCT_US	397829000	Asystole			narrow
SNOMEDCT_US	397829000	Asystole			narrow
SNOMEDCT_US	410429000	Cardiac arrest			narrow
SNOMEDCT_US	410429000	Cardiac arrest, unspecified			narrow
SNOMEDCT_US	410430005	Cardio-respiratory arrest			narrow
SNOMEDCT_US	410430005	Cardio-respiratory arrest			narrow
SNOMEDCT_US	418818005	Brugada syndrome			narrow
SNOMEDCT_US	427665004	Paroxysmal atrial flutter			narrow
SNOMEDCT_US	440028005	Permanent atrial fibrillation			narrow
SNOMEDCT_US	440059007	Persistent atrial fibrillation			narrow
SNOMEDCT_US	450919004	Atrial standstill			narrow
SNOMEDCT_US	450919004	Atrial standstill			narrow
SNOMEDCT_US	698247007	Cardiac dysrhythmias			narrow
SNOMEDCT_US	698247007	Disorder of heart rhythm			narrow
SNOMEDCT_US	698247007	Cardiac dysrhythmias			narrow
SNOMEDCT_US	698247007	Cardiac arrhythmias			narrow
SNOMEDCT_US	698247007	Other cardiac dysrhythmias			narrow
SNOMEDCT_US	698247007	Other cardiac dysrhythmia NOS			narrow
SNOMEDCT_US	698247007	Cardiac dysrhythmia NOS			narrow
SNOMEDCT_US	698247007	[X]Other specified cardiac arrhythmias			narrow
SCTSPA	733534002		Electrocardiographic complete left bundle branch block (finding)		narrow
SCTSPA	251124007	Incomplete right bundle branch block (disorder)			narrow
SCTSPA	74615001	Tachycardia-bradycardia (disorder)			narrow
SCTSPA	49710005	Sinus bradycardia (disorder)			narrow
SCTSPA	427393009	Electrocardiogram: sinus arrhythmia (finding)			narrow
SCTSPA	314208002	Rapid atrial fibrillation (disorder)			narrow
SCTSPA	276796006	Atrial tachycardia (disorder)			narrow
SCTSPA	251123001	Complete right bundle branch block (disorder)			narrow
SCTSPA	251120003	Incomplete left bundle branch block (disorder)			narrow
SCTSPA	29320008	Ectopic rhythm (disorder)			narrow
SCTSPA	421869004	Bradyarrhythmia (disorder)			narrow
SCTSPA	425615007	Chronic atrial flutter (disorder)			narrow



10. Algorithm proposal

Broad algorithm:

- All concept sets = (Sinus_disorders, Rythms_disorders, Conduction_disorders, Pulse_rate) in any provenance, no prior codes
- Index date: first occurrence of any of these concept sets

Narrow algorithm:

- Concept set = (Sinus_disorders, Rythms_disorders, Conduction_disorders) in any location (no prior codes)
- Index date: first occurrence of any of these concept sets

11. Background rates

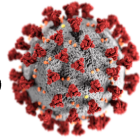
We used the following search string: “Arrhythmias, Cardiac” [Mesh] OR “atrial fibrillation” [tw] OR “atrial flutter” [tw] OR “paroxysmal supraventricular tachycardia” [tw] OR “Wolff-Parkinson-White syndrome” [tw] OR “ventricular tachycardia” [tw] OR “ventricular fibrillation” [tw] OR “torsades des pointes” [tw] OR “premature ventricular complexes” [tw] OR “sinus tachycardia” [tw] OR “sick sinus syndrome” [tw] OR “bradyarrhythmia” [tw] AND “incidence” [TI] NOT (Comment [ptyp] OR Editorial[ptyp] OR News[ptyp] OR Newspaper Article[ptyp]) NOT (“animals”[Mesh] NOT “humans” [Mesh]) AND English [lang]. Filters: abstract, English and from 2010 – 2020.

Recent overview

Khurshid S, Choi SH, Weng LC, Wang EY, Trinquart L, Benjamin EJ, Ellinor PT, Lubitz SA. Frequency of Cardiac Rhythm Abnormalities in a Half Million Adults. *Circ Arrhythm Electrophysiol.* 2018 Jul;11(7):e006273. doi: 10.1161/CIRCEP.118.006273. PMID: 29954742; PMCID: PMC6051725.

12. References

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2. Types of Heart Arrhythmia | Memorial Hermann Heart & Vascular Institute [Internet]. heart. 2012 [Accessed on 19th of june 2020]. Available from: <http://heart.memorialhermann.org/types-of-heart-arrhythmia/>
3. Arrhythmia | National Heart, Lung, and Blood Institute (NHLBI) [Internet]. [Accessed on 20th of june 2020]. Available from: <https://www.nhlbi.nih.gov/health-topics/arrhythmia>



4. Nederland Z. ritmestoornissen [Internet]. Zorginstituut Nederland; [Accessed on 20th of june 2020]. Available from: <https://www.farmacotherapeutischkompas.nl/bladeren/indicatieteksten/ritmestoornissen>
5. Heart arrhythmia - Diagnosis and treatment - Mayo Clinic [Internet]. [Accessed on 20th of june 2020]. Available from: <https://www.mayoclinic.org/diseases-conditions/heart-arrhythmia/diagnosis-treatment/drc-20350674>
6. Blood tests [Internet]. [Accessed on 20th of june 2020]. Available from: <https://www.bhf.org.uk/information-support/tests/blood-tests>