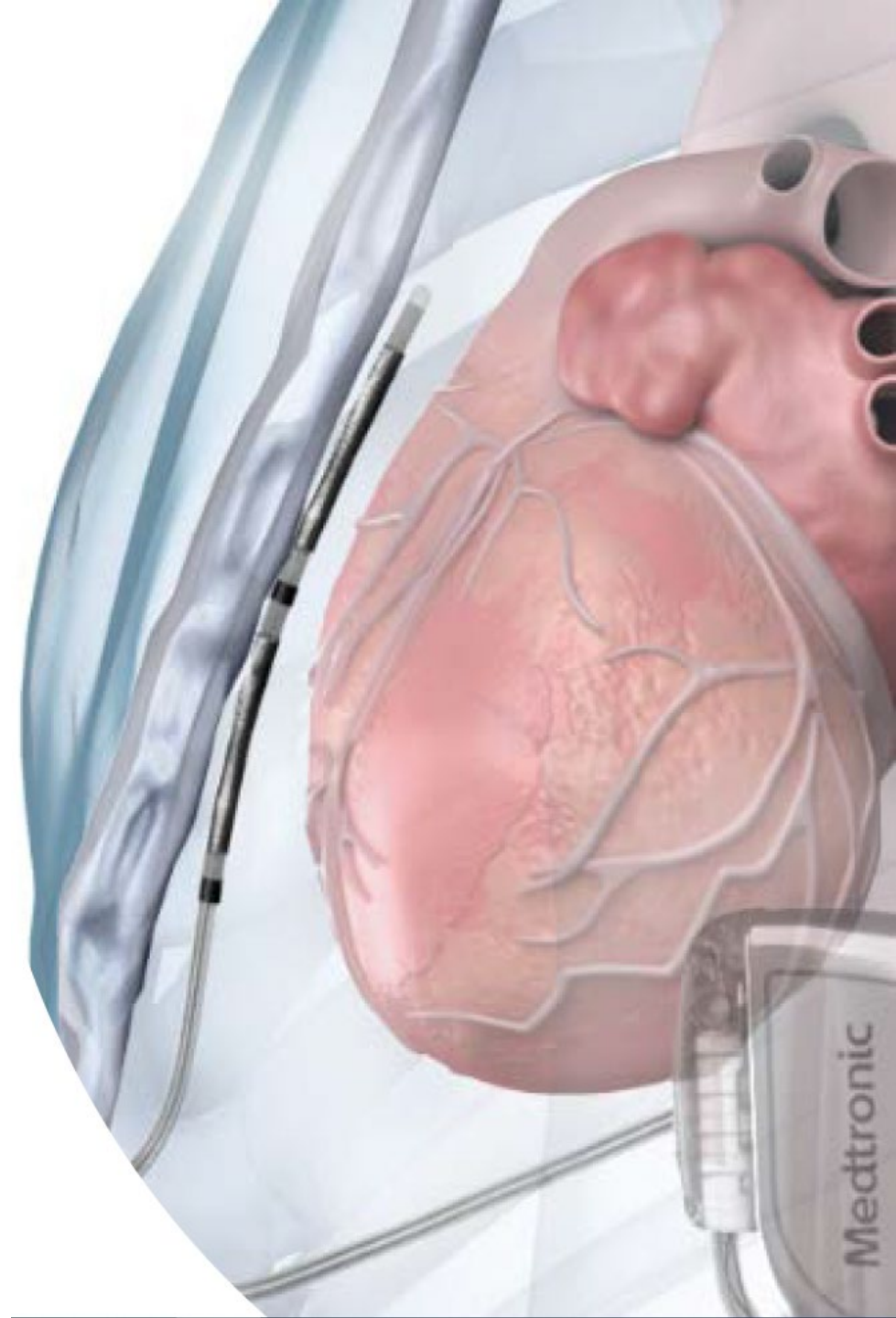


# Extravascular Implantable Defibrillator Leads

**ICD-10 Coordination and Maintenance Committee  
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Amy Thompson  
Director of Clinical Research, Defibrillation  
Medtronic

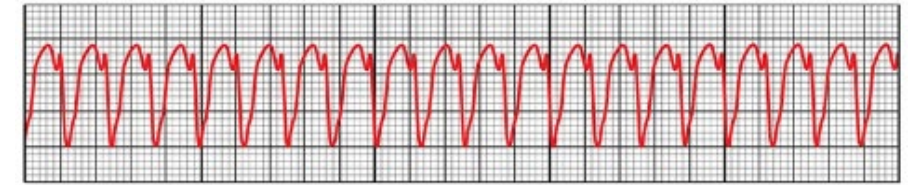


# Implantable Cardioverter Defibrillators (ICDs)

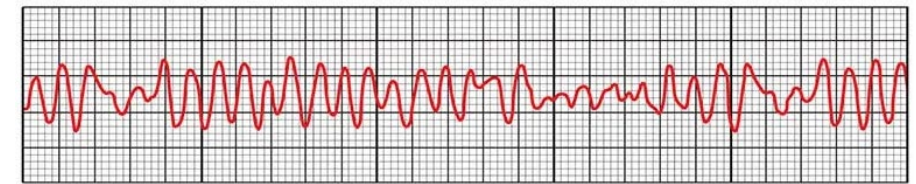
- ❖ Implantable cardioverter defibrillators (ICDs) have been an established therapy since the 1980's.
- ❖ ICDs are used to treat life-threatening ventricular tachyarrhythmias:
  - ventricular tachycardia
  - ventricular fibrillation
- ❖ The ICD delivers a shock to terminate the tachyarrhythmia.



normal EKG (sinus rhythm)



ventricular tachycardia



ventricular fibrillation

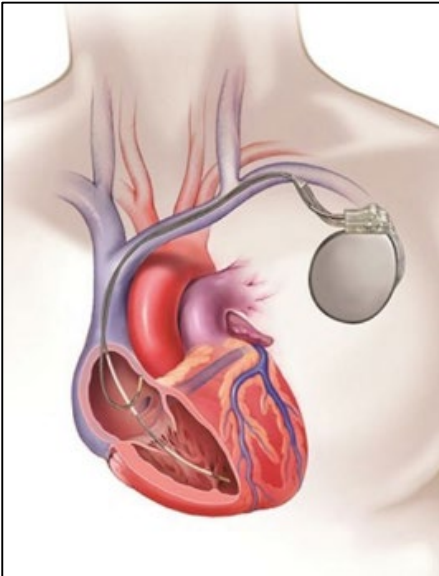


ventricular fibrillation      -shock-      sinus rhythm

# ICD System Placement

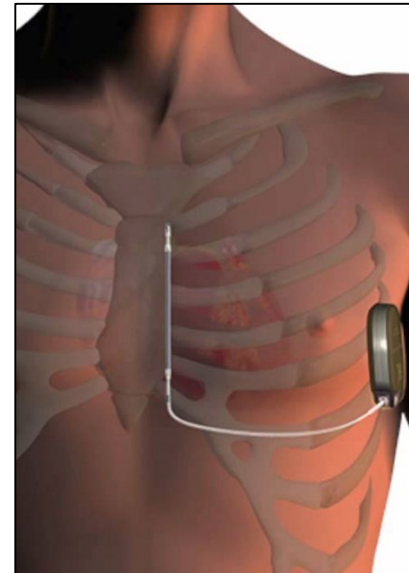
- ❖ An ICD system consists of a generator and one or more leads.
- ❖ The generator is placed in a subcutaneous pocket in the chest.

## ① Conventional Lead



- The ICD lead is advanced transvenously into the heart, eg, right ventricle.
- It is in direct contact with heart tissue to deliver the shock.

## ② Subcutaneous Lead

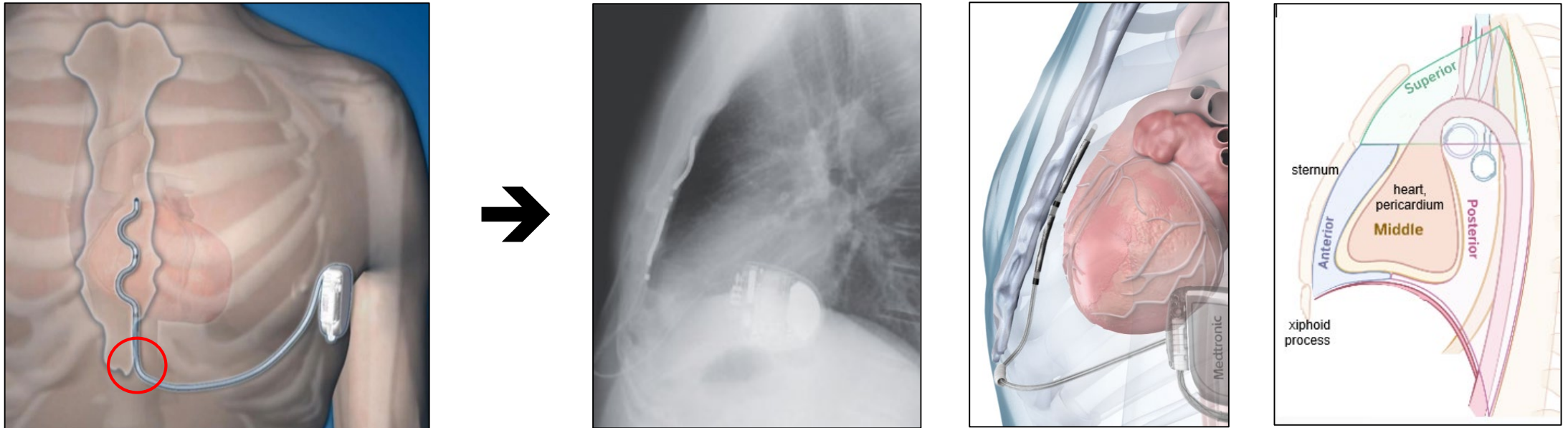


- The ICD lead is placed in subcutaneous tissue beside the sternum.
- While not in direct contact with heart tissue, the shock can travel through the intervening tissue.

# Extravascular ICD System (EV ICD)

- ❖ The lead is placed in the anterior mediastinum.
- ❖ It lies between the underside of the sternum and the outer layer of the pericardial sac.

## ③ EV ICD Lead

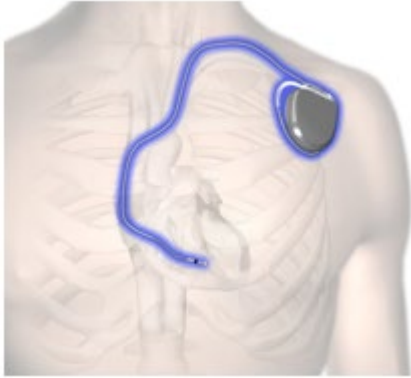


As of December 2022, the Medtronic Aurora EV ICD™ implantable cardioverter defibrillator is under clinical evaluation and is not commercially available or approved by any regulatory agency in the world.

The intended population to receive the EV ICD System includes patients who are indicated for implantation of a single chamber ICD according to current ACC/AHA/HRS or ESC guidelines, and who do not have a bradycardia pacing or cardiac resynchronization therapy indication.

# Types of ICD Systems

## Transvenous



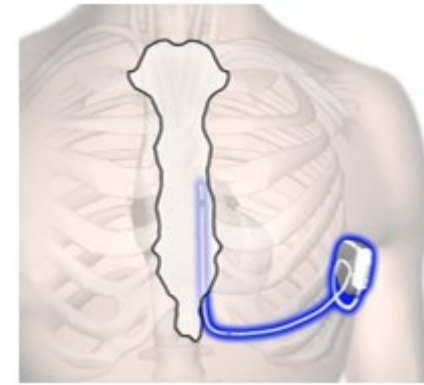
- Proven therapy, but not available when veins are unsuitable eg, occluded.
- Vascular access is susceptible to complications, eg, with chronic lead and infection management
- Provides pacing and shock therapies

## Subcutaneous



- Available when veins are unsuitable.
- Avoids complications with transvenous leads.
- Shocks but does not have the same therapy and diagnostic capabilities currently available in transvenous ICDs, eg, antitachycardia pacing

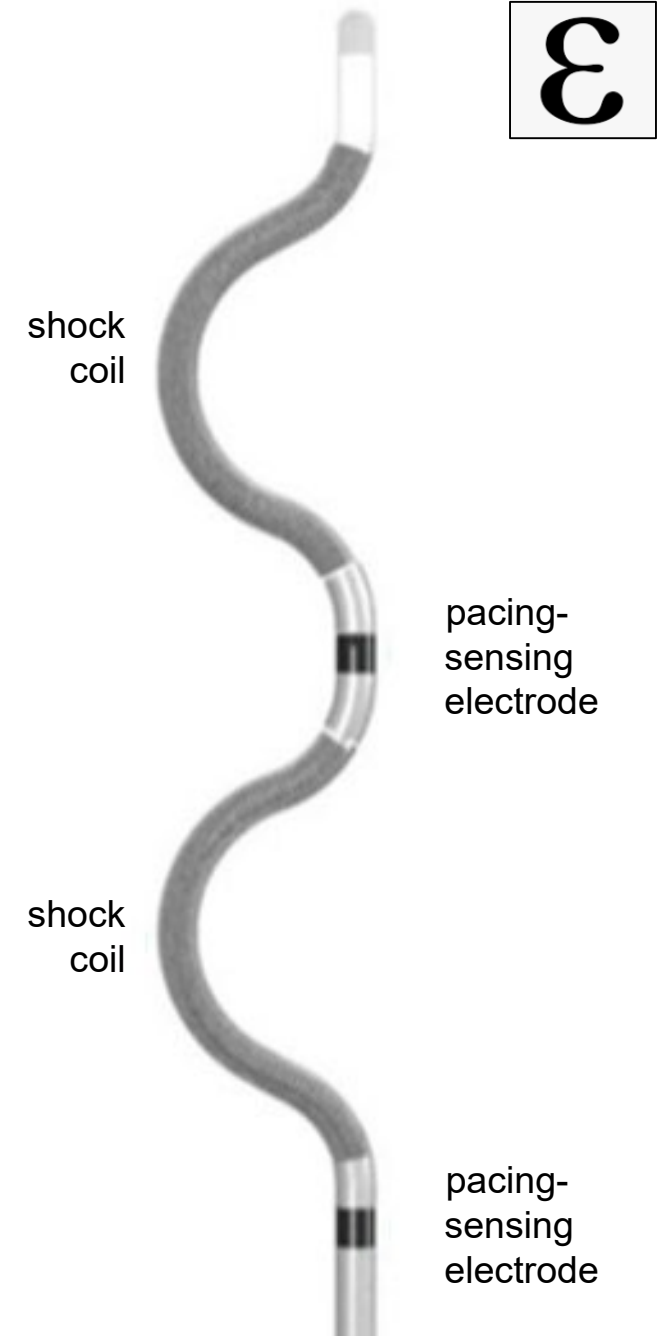
## Extravascular



- Available when veins are unsuitable.
- Avoids complications with transvenous leads.
- Shocks and performs antitachycardia pacing, and also has diagnostic capabilities available in transvenous ICDs

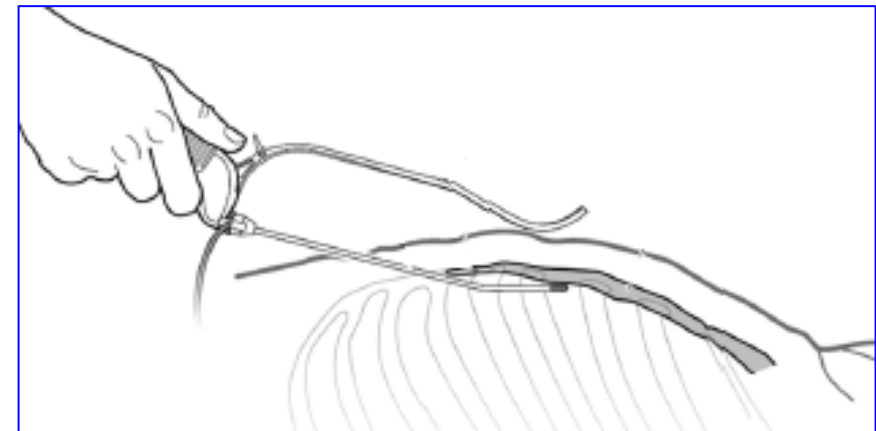
# EV Defibrillation Lead Technology

- ❖ The single lead is configured with two shocking (defibrillation) coils plus two pacing-sensing ring electrodes.
- ❖ The sensing electrodes monitor the heart rhythm to detect ventricular arrhythmias and to differentiate between them.
- ❖ The electrodes also provide pacing to terminate certain types of ventricular tachycardia without the need for a shock.



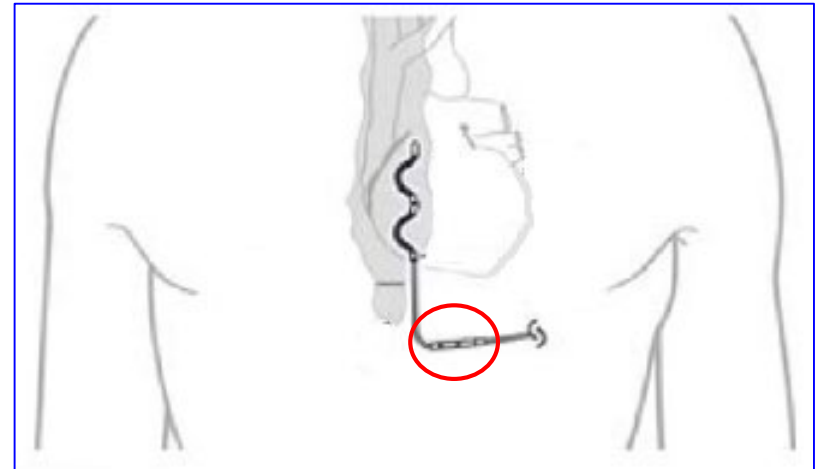
# Placement of EV Defibrillation Lead

- ❖ Insertion is minimally invasive and performed under imaging guidance (lateral fluoroscopy).
  - The procedure begins with a small incision proximate to the xiphoid process.
  - A fingertip/curved Kelly hemostat is used to dissect through diaphragmatic attachments.
  - A sternal tunneling tool is inserted into the anterior mediastinum and advanced no further than the top of the cardiac silhouette.
  - The tunneling tool is removed, leaving a sheath in place.
  - The EV defibrillation lead is advanced into the sheath.



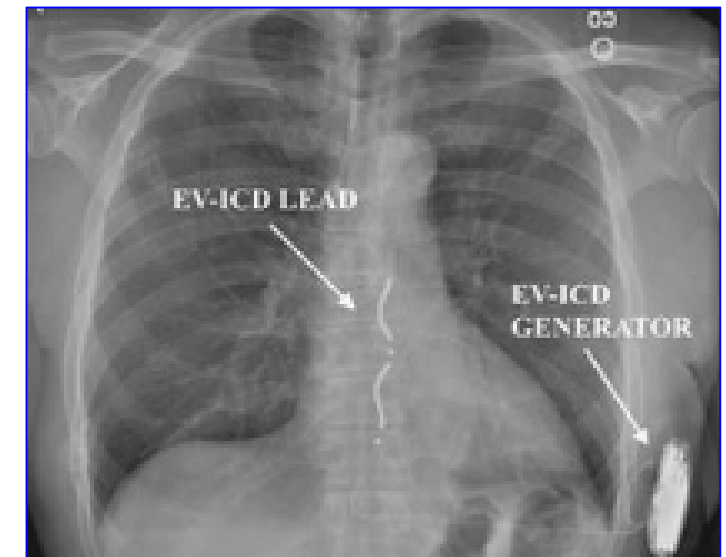
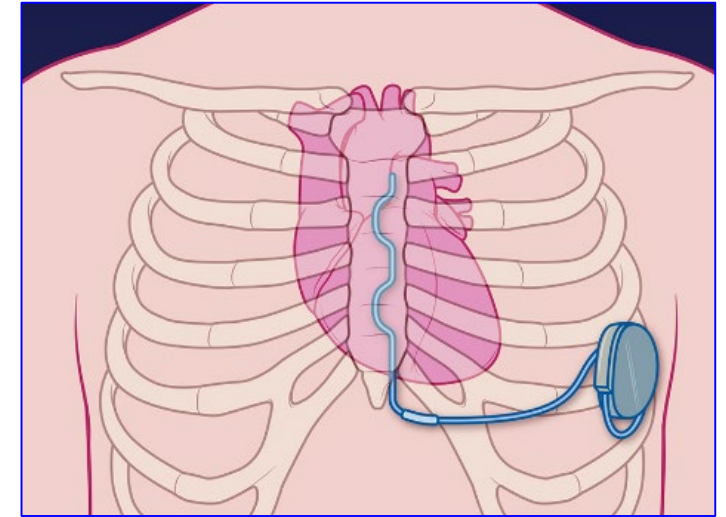
# Placement of EV Defibrillation Lead

- The EV defibrillation lead is deployed by removing the sheath to expose the shock coils and sensing-pacing electrodes.
- Appropriate lead position and function are confirmed using fluoroscopy and measurement of signal amplitude.
- The lead end is secured to an anchoring sleeve which is sutured to the fascia of the rectus muscle.
- The proximal portion of the lead is tunneled through the subcutaneous tissue to the chest pocket and connected to the generator.
- The incision proximate to the xiphoid is closed.



# Procedure Documentation

- ❖ The procedure is typically performed by teams including electrophysiologists/ cardiologists who also implant transvenous and subcutaneous ICDs.
- ❖ An EV defibrillation lead may also be documented as:
  - substernal lead or electrode
  - extracardiac lead or electrode
- ❖ The EV lead model used in the US is the Epsila EV™ defibrillation lead.
- ❖ The EV ICD generator model used in the US is the Aurora EV ICD™ implantable cardioverter defibrillator.



# Extravascular Implantable Defibrillator Leads

*Clinical Questions?*

