

# **Electrophysiology (EP) Pacemaker/ Implantable Cardioverter-defibrillator (ICD) Generator Change Order Set**

## **Order Set: Conceptual Structure**

**Contract: VA118-16-D-1008, Task Order (TO): VA-118-16-F-1008-0007, CLIN0004AE**

**Department of Veterans Affairs (VA)**



**Knowledge Based Systems (KBS)  
Office of Informatics and Information Governance (OIIG)  
Clinical Decision Support (CDS)**

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# **Electrophysiology (EP) Pacemaker/Implantable Cardioverter-defibrillator (ICD) Generator Change Order Set: Order Set: Conceptual Structure**

by Knowledge Based Systems (KBS), Office of Informatics and Information Governance (OIIG), and Clinical Decision Support (CDS)

Publication date 03/28/2018

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# Preface

**Table 1. Revision History**

Date	Life Cycle Event
March 28, 2018	Published
March 28, 2018	Reviewed
February 8, 2018	Created

**Table 2. Clinical White Paper Contributors**

Name	Role	Affiliation
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**Table 3. Artifact Identifier**

Domain	Artifact ID	Name
urn:va.gov:kbs:knart:artifact:rl	777b989f-24a2-522b-a22e-84c137e6b2a9	B11

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# Artifact Applicability

**Table 4. Applicability Foci, Description and Codes**

Focus	Description	Code System Name	Code System	Code	Code System Version	Value Set	Value Set Version
PatientAgeGroup	Adult patients						
ClinicalVenue	Outpatient						
ClinicalFocus	Previously received an ICD, CRT, or a similar device						
ClinicalFocus	Is candidate for generator change						

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# Models

**Table 5. Model References**

Referenced Model	Description
urn:solor.io:anf-model:1.0	VA Analysis Normal Form Model

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# Chapter 1. Consults and Referrals

Electrophysiology generator change consult order.

☐ Referral to electrophysiology for generator change

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 1291000205108 |Referral to electrophysiology service (procedure) [277132007 |Therapeutic procedure (procedure)] ->(363702006 |Has focus (attribute))->[1331000205100 |Replacement of pulse generator of implantable cardioverter defibrillator (procedure)])

☐ prompt: Operative report for device placement

response: String (Single)

☐ prompt: Currently implanted device interrogation report

response: String (Single)

Goal of Consult

◆ prompt: Consult Goal:

response: Code (Single)

response range: EnumerationConstraint (List)

item: Provide recommendation and return to Primary Care Provider (PCP) for therapy.

item: Start treatment and return to PCP for follow up and maintenance.

item: Start treatment, monitor for effect and when on stable therapy return to PCP.

item: Provide recommendations and treat as long as necessary (or indefinitely).

Consult Specialty: Electrophysiology

Priority: Routine

prompt: Ordering Physician/Provider Name

response: String (Single)

prompt: Ordering Physician/Provider Service/Section

response: String (Single)

prompt: Ordering Physician/Provider Telephone Number

response: String (Single)

prompt: Ordering Physician/Provider Pager

response: String (Single)

prompt: Information required by receiving facility

response: String (Single)



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## Chapter 2. Imaging and Electrocardiogram

Consider ordering prior to the electrophysiology consultation. Resting 12-lead electrocardiogram is required if it has not been obtained within the past two months. Resting echocardiogram and chest x-ray are required if they have not been obtained within the past six months.

- Resting 12-lead electrocardiogram to evaluate for antiarrhythmic benefit of previously implanted ICD device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression , purpose[1]:Postcoordinated Expression"  
(Codes: 385644000 |Requested (qualifier value)| 447113005 |12 lead electrocardiogram at rest (procedure)| [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[698247007 |Cardiac arrhythmia (disorder)] [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[395218007 |Implantation of internal cardiac defibrillator (procedure)])

- Resting 12-lead electrocardiogram to evaluate for antiarrhythmic benefit of previously implanted pacemaker device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression , purpose[1]:Postcoordinated Expression"  
(Codes: 385644000 |Requested (qualifier value)| 447113005 |12 lead electrocardiogram at rest (procedure)| [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[307280005 |Implantation of cardiac pacemaker (procedure)] [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[698247007 |Cardiac arrhythmia (disorder)])

- Resting 12-lead electrocardiogram to evaluate for antiarrhythmic benefit of previously implanted CRT device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression , purpose[1]:Postcoordinated Expression"  
(Codes: 385644000 |Requested (qualifier value)| 447113005 |12 lead electrocardiogram at rest (procedure)| [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[41eae47f-3038-4b7b-b36f-d26521aaec56 |Implantation of cardiac resynchronization therapy implantable pacemaker (procedure)] [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[698247007 |Cardiac arrhythmia (disorder)])

- Echocardiogram to evaluate for antiarrhythmic benefit of previously implanted ICD device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression , purpose[1]:Postcoordinated Expression"  
(Codes: 385644000 |Requested (qualifier value)| 40701008 |Echocardiography (procedure)| [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[395218007 |Implantation of internal cardiac defibrillator (proce-

dure)] [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[698247007 |Cardiac arrhythmia (disorder))

---

- Echocardiogram to evaluate for antiarrhythmic benefit of previously implanted pacer device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression , purpose[1]:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 40701008 |Echocardiography (procedure)| [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[307280005 |Implantation of cardiac pacemaker (procedure)] [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[698247007 |Cardiac arrhythmia (disorder))

---

- X-ray chest to evaluate for antiarrhythmic benefit of previously implanted ICD device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 399208008 |Plain chest X-ray (procedure)| [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[395218007 |Implantation of internal cardiac defibrillator (procedure))

---

- X-ray chest to evaluate for antiarrhythmic benefit of previously implanted CRT device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 399208008 |Plain chest X-ray (procedure)| [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[1301000205107 |Implantation of cardiac resynchronization therapy implantable pacemaker (procedure))

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- X-ray chest to evaluate for antiarrhythmic benefit of previously implanted pacer device.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression , purpose[0]:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 399208008 |Plain chest X-ray (procedure)| [386053000 |Evaluation procedure (procedure)] -(363702006 |Has focus (attribute))-[307280005 |Implantation of cardiac pacemaker (procedure))

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# Chapter 3. Laboratory Tests

Consider the following tests to be completed prior to the electrophysiology consultation.

- ☐ Comprehensive metabolic panel

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 1411000205104 |Comprehensive metabolic panel (procedure))

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- ☐ Complete blood count

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 26604007 |Complete blood count (procedure))

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- ☐ Brain natriuretic peptide

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 390917008 |Brain natriuretic peptide measurement (procedure))

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- ☐ Digoxin level

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

"statementType:Postcoordinated Expression topic:Postcoordinated Expression"

(Codes: 385644000 |Requested (qualifier value)| 25514001 |Digoxin measurement (procedure))

---

# Chapter 4. Tabular List

## *Terminology Service Request (TSR) Mappings*

**Table 4.1. Terminology References**

System	Code	Display Text	References
SNOMED CT	1291000205108  Referral to electrophysiology service (procedure)	Postcoordinated Expression	1
SNOMED CT	1411000205104  Comprehensive metabolic panel (procedure)	Postcoordinated Expression	1
SNOMED CT	25514001  Digoxin measurement (procedure)	Postcoordinated Expression	1
SNOMED CT	26604007  Complete blood count (procedure)	Postcoordinated Expression	1
SNOMED CT	385644000  Requested (qualifier value)	Postcoordinated Expression	13
SNOMED CT	390917008  Brain natriuretic peptide measurement (procedure)	Postcoordinated Expression	1
SNOMED CT	399208008  Plain chest X-ray (procedure)	Postcoordinated Expression	3
SNOMED CT	40701008  Echocardiography (procedure)	Postcoordinated Expression	2
SNOMED CT	447113005  12 lead electrocardiogram at rest (procedure)	Postcoordinated Expression	3
SNOMED CT	[277132007  Therapeutic procedure (procedure)] -(363702006  Has focus (attribute))>[1331000205100  Replacement of pulse generator of implantable cardioverter defibrillator (procedure)]	Postcoordinated Expression	1
SNOMED CT	[386053000  Evaluation procedure (procedure)] -(363702006  Has focus (attribute))>[1301000205107  Implantation of cardiac resynchronization therapy implantable pacemaker (procedure)]	Postcoordinated Expression	1

System	Code	Display Text	References
SNOMED CT	[386053000  Evaluation procedure (procedure)] ->(363702006  Has focus (attribute))->[307280005  Implantation of cardiac pacemaker (procedure)]	Postcoordinated Expression	3
SNOMED CT	[386053000  Evaluation procedure (procedure)] ->(363702006  Has focus (attribute))->[395218007  Implantation of internal cardiac defibrillator (procedure)]	Postcoordinated Expression	3
SNOMED CT	[386053000  Evaluation procedure (procedure)] ->(363702006  Has focus (attribute))->[41eae47f-3038-4b7b-b36f-d26521aaec56  Implantation of cardiac resynchronization therapy implantable pacemaker (procedure)]	Postcoordinated Expression	1
SNOMED CT	[386053000  Evaluation procedure (procedure)] ->(363702006  Has focus (attribute))->[698247007  Cardiac arrhythmia (disorder)]	Postcoordinated Expression	5

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# Chapter 5. Behavior Symbols

**Table 5.1. Group Organizational Behavior**

Sym- bol	Name	Definition
▶	Sentence Group	A group of related alternative actions is a sentence group if the item referenced by the action is the same in all the actions, and each action simply constitutes a different variation on how to specify the details for that item. For example, two actions that could be in a SentenceGroup are "aspirin, 500 mg, 2 times per day" and "aspirin, 300 mg, 3 times per day". In both cases, aspirin is the item referenced by the action, and the two actions represent two different options for how aspirin might be ordered for the patient. Note that a SentenceGroup would almost always have an associated selection behavior of "AtMostOne", unless it's a required action, in which case, it would be "ExactlyOne".
▷	Logical Group	A group with this behavior logically groups its sub-elements, and may be shown as a visual group to the end user, but it is not required to do so.
➤	Visual Group	Any group marked with this behavior should be displayed as a visual group to the end user.

**Table 5.2. Group Selection Behavior**

Sym- bol	Name	Definition
□	Any	Any number of the items in the group may be chosen, from zero to all.
⊙	All	All the items in the group must be selected as a single unit.
⊙	AllOrNone	All the items in the group are meant to be chosen as a single unit: either all must be selected by the end user, or none may be selected.
○	ExactlyOne	The end user must choose one and only one of the selectable items in the group. The user may not choose none of the items in the group.
⊛	AtMostOne	The end user may choose zero or at most one of the items in the group.
⊛	OneOrMore	The end user must choose a minimum of one, and as many additional as desired.

**Table 5.3. Required Behavior**

Sym- bol	Name	Definition
◆	Must	An action with this behavior must be included in the actions processed by the end user; the end user may not choose not to include this action.

Sym- bol	Name	Definition
◇	Could	An action with this behavior may be included in the set of actions processed by the end user.
➤	MustUnlessDocumented	An action with this behavior must be included in the set of actions processed by the end user, unless the end user provides documentation as to why the action was not included.

**Table 5.4. Precheck Behavior**

Sym- bol	Name	Definition
▲	Yes	An action with this behavior is one of the most frequent actions that is, or should be, included by an end user, for the particular context in which the action occurs. The system displaying the action to the end user should consider "pre-checking" such an action as a convenience for the user.
▽	No	An action with this behavior is one of the less frequent actions included by the end user, for the particular context in which the action occurs. The system displaying the actions to the end user would typically not "pre-check" such an action.

**Table 5.5. Cardinality Behavior**

Sym- bol	Name	Definition
◆	Single	An action with this behavior may only be completed once.
❖	Multiple	An action with this behavior may be repeated multiple times.

**Table 5.6. Item Flags**

Sym- bol	Name	Definition
☞	fillIn	This item, in a list entry, allows the user to enter a fill in value that is not present in the set of presented choices.

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# Appendix A. References

This appendix contains the list of related resources and supporting documents used in creating this KNART.

## List of References

## Related Resources

[CCWP] *Cardiology: Electrophysiology ( EP ) Implanted Cardiac Devices Clinical Content White Paper* (link [20180112CDSK\_CCWP\_B9B10B11EPICD\_final.xml])

[CSD] *Cardiology: Electrophysiology ( EP ) Implanted Cardiac Devices Clinical Content White Paper*

[KVRpt] *Cardiology: Electrophysiology ( EP ) Implanted Cardiac Devices Clinical Content White Paper*

## Supporting Evidence

[Al-Khatib 2011] *Al-Khatib SM, Hellkamp A, Curtis J, et al. Non-Evidence-Based ICD Implantations in the United States. JAMA. 2011;305(1):43-49* (link [<https://doi.org/10.1001/jama.2010.1915>])

[Epstein 2008] *Epstein AE, DiMarco JP, Ellenbogen KA, et al. ACC / AHA / HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines [Writing Committee to Revise the ACC / AHA /National Association for Sport and Physical Education ( NASPE ) 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices]: developed in collaboration with the American Association for Thoracic Surgery and Society of Thoracic Surgeons. Circulation. 2008;117(21):e350-e408* (link [<https://doi.org/10.1016/j.hrthm.2008.04.014>])

[Hess 2013] *Hess PL, Grau-Sepulveda MV, Hernandez AF, et al. Get with The Guidelines Steering Committee and Hospitals. Age differences in the use of implantable cardioverter-defibrillators among older patients hospitalized with heart failure. J Cardiovasc Electrophysiol. 2013;24(6):664-671* (link [<https://doi.org/10.1111/jce.12100>])

[Hess 2016] *Hess PL, Hernandez AF, Bhatt DL, et al. Sex and Race/Ethnicity Differences in Implantable Cardioverter-Defibrillator Counseling and Use Among Patients Hospitalized with Heart Failure: Findings from the Get with The Guidelines-Heart Failure Program. Circulation. 2016;134(7):517-526* (link [<https://doi.org/10.1161/CIRCULATIONAHA.115.021048>])

[Owens 2011] *Owens DK, Qaseem A, Chou R, Shekelle P, Clinical Guidelines Committee of the American College of Physicians. A High-value, cost-conscious health care: concepts for clinicians to evaluate the benefits, harms, and costs of medical interventions. Ann Intern Med. 2011;154(3):174-180* (link [<https://doi.org/10.7326/0003-4819-154-3-20110210-00007>])

[Russo 2013] *Russo AM, Stainback RF, Bailey SR, et al. American College of Cardiology Foundation ( ACCF )/ HRS / AHA / ASE / HFSA / SCAI / SCCT / SCMR 2013 appropriate use criteria for implantable cardioverter-defibrillators and cardiac resynchronization therapy: a report of the American College of Cardiology Foundation appropriate use criteria task force, Heart Rhythm Society, American Heart Association, American Society of Echocardiography, Heart Failure Society of America, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance. J Am Coll Cardiol. 2013;61(12):1318-1368* (link [<https://doi.org/10.1016/j.hrthm.2013.01.008>])