

Special Value Codes:**-9 = missing****-8 = don't know/indeterminate****-2 = programmed skipped field based on results of or response to a previous question****-1 = not applicable/structure not present****Section A: KEY IDENTIFYING INFORMATION**

A1. Echocardiogram Identification Number ____ - ____ - ____ - ____ - ____

Replaced by blinded subject ID

subj_id	Blinded subject ID
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Blinded site ID <created var>

site_id	Blinded site ID
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A2. Date of echocardiogram

____	____	/	____	____	/	____	____	____	____
M	M		D	D		Y	Y	Y	Y

Replaced by age

echo_age	<created var> Age (yrs) of the subject at A2. Date of Echocardiogram
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A3. Reader Identification Number ____

READERID	A3. Reader Identification Number
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A4. Core Lab echo Accession Identifier ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____

ECL_ID	A4. Core lab echo accession identifier
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A5. Date of central reading

____	____	/	____	____	/	____	____	____	____
M	M		D	D		Y	Y	Y	Y

Replaced by age

READ_AGE	<created var> Age (yrs) of the subject at A5. Date of Central Reading
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A6. Acceptable YES.....1 NO.....2

STOP – FORM COMPLETE

ACPTECHO	A6. Acceptable
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a. Image quality EXCELLENT1 GOOD2 FAIR3

ECHOQLTY	A6a. Image Quality
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CREATED VARIABLES: ANATOMYSee **Appendix A** at the end of this codebook for details on how these variables were coded.

f001_dx	<created var> Final (corrected) Pre-Fontan dx, per Screener (code list A)
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<Created var> Final core lab adjudicated ventricular morphology

vent_type	<created var> Final Core Lab adjudicated ventricular type
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<Created var> L-loop configuration

lloop	<created var> L-loop configuration
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**<Created var> Restrictive physiology: 1=present 2=absent
(Restrictive pattern present if E/A > 2 or 1<E/A<2 and DT<140)**

restrict	<created var> Restrictive diastolic filling pattern: 1=present 2=absent
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<Created var> SV diagnosis with 2 ventricles (A1.06, A3.05-A3.07)

twovent	<created var> Functionally SV hearts with 2 ventricles (A1.06,A3.05-A3.07)
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CREATED VARIABLES: REGURGITATIONSee **Appendix B** at the end of this codebook for details on how these variables were coded.

*<Created var> Overall AV valve regurgitation
(Based on a hierarchy of B8, B10, and B12)*

oavvregurg	<created var> Overall AV valve regurgitation
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*<Created var> Semilunar valve regurgitation
(Based on a hierarchy of B16 and B17)*

slvregurg	<created var> Semilunar valve regurgitation
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CREATED VARIABLES: OVERALL DYSFUNCTION & DIASTOLIC DYSFUNCTIONSee **Appendix C** at the end of this codebook for details on how these variables were coded.

<Created var> Diastolic dysfunction grade

grade	<created var> Diastolic dysfunction grade 0=normal, 1=impaired relaxation, 2=pseudonormalization, 3=restrictive
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CREATED VARIABLES: TISSUE DOPPLER AND VELOCITIESSee **Appendix D** at the end of this codebook for details on how these variables were coded.

tde	<created var> Tissue Doppler peak early diastolic velocity (cm/sec)
tda	<created var> Tissue Doppler peak late diastolic velocity (cm/sec)
e	<created var> Atrioventricular valve peak early diastolic velocity (m/sec)
a	<created var> Atrioventricular valve peak late diastolic velocity (m/sec)
dt	<created var> Atrioventricular valve deceleration time (msec)
at	<created var> Duration of atrioventricular valve late diastolic inflow (msec)
fp	<created var> Systemic ventricular flow propagation rate (cm/sec)
abs_fp	<created var> Absolute Systemic ventricular flow propagation rate (cm/sec)
e_a	<created var> Ratio of early to late atrioventricular valve diastolic velocities
e_tde	<created var> Ratio of AV to tissue Doppler peak early diastolic velocity ($E*100/TDE$)

CREATED VARIABLES: TEI INDEXSee **Appendix E** at the end of this codebook for details on how these variables were coded.

tei_index	<created var> Tei Index
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CREATED VARIABLES: MASS AND VOLUMESSee **Appendix F** at the end of this codebook for details on how these variables were coded.

echohr	<created var>Echo heart rate
echohr_z	<created var>Echo heart rate z-score
echoedv	<created var> Total EDV, ml (lvedv2d+rvedv2d)
echoesv	<created var> Total ESV, ml (lvesv2d+rvesv2d)
echoedv_z	<created var> Total Echo EDV z-score
echoesv_z	<created var> Total Echo ESV z-score
echosv	<created var> Total Stroke Volume, ml (echoedv-echoesv)
echosv_z	<created var> Total Echo SV z-score
echomass	<created var> Total Ventricular Mass, gm (lvmass2d+rvmass2d)
echomass_z	<created var> Total Echo ventricular mass z-score
echomv	<created var> Total mass:volume ratio (echomass / echoedv)
echomv_z	<created var>Echo mass:volume ratio z-score
echobsa	<created var> Echo BSA(m^2)= $0.024265 \times \text{Echo ht(cm)}^2 \times 0.3964 \times \text{Echo wt(kg)}^{0.5378}$
echoedvi	<created var> Total Echo End Diastolic Volume / echobsa $^{1.3}$
echoesvi	<created var> Total Echo End Systolic Volume / echobsa $^{1.3}$
echosvi	<created var> Total Echo Stroke Volume / Echo BSA
echomassi	<created var> Total Echo Ventricular Mass / Echo BSA $^{1.3}$
echoef	<created var> Total Ejection Fraction, % $((\text{echoedv} - \text{echoesv}) / \text{echoedv}) \times 100$
echoef_z	<created var> Total Echo EF z-score
echoefcat	<created var> Total Ejection Fraction, categorical

Section B: ECHOCARDIOGRAM RESULTS

B1. Inferior vena cava pathway obstruction

YES..... 1

NO 2 (**B2**)STRUCTURE NOT PRESENT ... -1 (**B2**)INDETERMINATE -8 (**B2**)

IVCOBSTR	B1. Inferior vena cava pathway obstruction	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

IVCSVRTY	B1a. Inferior vena cava: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec

IVCPKJET	B1b. Inferior vena cava: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec

IVCMNJET	B1c. Inferior vena cava: Mean jet velocity (m/sec)	
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B2. Superior vena cava pathway obstruction

YES..... 1
 NO 2 **(B3)**
 STRUCTURE NOT PRESENT ... -1 **(B3)**
 INDETERMINATE -8 **(B3)**

SVCBSTR	B2. Superior vena cava pathway obstruction	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

SVCSVR	B2a. Superior vena cava: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec

SVCPJET	B2b. Superior vena cava: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec

SVCPJET	B2b. Superior vena cava: Peak jet velocity (m/sec)	
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B3. Pulmonary venous obstruction

YES..... 1
 NO 2 (**B4**)
 INDETERMINATE -8 (**B4**)

PVOBSTR	B3. Pulmonary venous obstruction	
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a. Severity MILD1 MODERATE..... 2 SEVERE3

PVOBSTR	B3. Pulmonary venous obstruction	
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b. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 3.00]

PVPKJET	B3b. Pulmonary venous obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 2.00]

PVMNJET	B3c. Pulmonary venous obstruction: Mean jet velocity (m/sec)	
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B4. Right pulmonary artery obstruction

YES..... 1
 NO 2 (**B5**)
 STRUCTURE NOT PRESENT ... -1 (**B5**)
 INDETERMINATE -8 (**B5**)

RPAOBSTR	B4. Right PA obstruction	
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a. Severity MILD1 MODERATE 2 SEVERE3

RPASEVER	B4a. Right PA obstruction: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec

RPAPKJET	B4b. Right PA obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec

RPAMNJET	B4c. Right PA obstruction: Mean jet velocity (m/sec)	
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B5. Left pulmonary artery obstruction

YES..... 1
 NO 2 (B6)
 STRUCTURE NOT PRESENT ... -1 (B6)
 INDETERMINATE -8 (B6)

LPAOBSTR	B5. Left PA obstruction	
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a. Severity MILD1 MODERATE 2 SEVERE3

LPASEVER	B5a. Left PA obstruction: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec

LPAPKJET	B5b. Left PA obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec

LPAMNJET	B5c. Left PA obstruction: Mean jet velocity (m/sec)	
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B6. Systemic venous pathway fenestration patent

YES..... 1
 NO2 **(B7)**
 STRUCTURE NOT PRESENT... -1 **(B7)**
 INDETERMINATE..... -8 **(B7)**

SVPFNSTR	B6. Systemic venous pathway fenestration patent	
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a. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 3.00] *

SVPPKJET	B6a. Systemic venous pathway fenestration patent: Peak jet velocity (m/sec)
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* ADEPT override : SVPPKJET=-1.59 Flow away from transducer (Echo_ID=90010312)

b. Mean jet velocity ____ . ____ ____ m/sec **Exp. range: [0.00, 2.00] ***

SVPMNJET	B6b. Systemic venous pathway fenestration patent: Mean jet velocity (m/sec)
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*ADEPT override : SVPMNJET=-1.06 Flow away from transducer (Echo_ID=90010312)

c. Proximal jet width ____ . ____ ____ cm **Exp. range: [0.00, 1.50]**

SVPPJTW	B6c. Systemic venous pathway fenestration patent: Proximal jet width (m/sec)
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B7. Systemic venous pathway baffle leak

YES..... 1
 NO 2 (**B8**)
 STRUCTURE NOT PRESENT ... -1 (**B8**)
 INDETERMINATE -8 (**B8**)

VPBAFFLK	B7. Systemic venous pathway baffle leak	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

VPBSEVER	B7a. Systemic venous pathway baffle leak: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 3.00]

VPBPKJET	B7b. Systemic venous pathway baffle leak: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 2.00]

VPBMNJET	B7c. Systemic venous pathway baffle leak: Mean jet velocity (m/sec)	
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B8. Left atrioventricular valve regurgitation

YES..... 1
 NO 2 (**B9**)
 STRUCTURE NOT PRESENT ... -1 (**B9**)
 INDETERMINATE -8 (**B9**)

LAVREGRG	B8. Left AV valve regurg.	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

LAVRSVR	B8a. Left AV valve regurg.: Severity	
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lavvreg	<created var> Left AV valve regurgitation (none/mild/moderate/severe)	
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b. Proximal jet lateral width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

LAVRPJLW	B8b. Left AV valve regurg.: Proximal jet lateral width (cm)	
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c. Proximal jet anteroposterior width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

LAVRPJAW	B8c. Left AV valve regurg: Prox. jet anteroposterior width (cm)	
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B9. Left atrioventricular valve stenosis

YES..... 1
 NO 2 (**B10**)
 STRUCTURE NOT PRESENT ... -1 (**B10**)
 INDETERMINATE -8 (**B10**)

LAVSTEN	B9. Left AV valve stenosis	
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a. Severity MILD1 MODERATE.....2 SEVERE3

LAVSSVR	B9a. Left AV valve stenosis: Severity	
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lavvsten	<created var> Left AV valve stenosis (none/mild/moderate/severe)	
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b. Heart rate ____ ____ ____ beats/min

LAVSHRTR	B9b. Left AV valve stenosis: Heart rate (beats/min)	
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c. Peak jet velocity ____ . ____ ____ m/sec

LAVSPKJT	B9c. Left AV valve stenosis: Peak jet velocity (m/sec)	
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d. Mean jet velocity ____ . ____ ____ m/sec

LAVSMNJT	B9d. Left AV valve stenosis: Mean jet velocity (m/sec)	
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B10. Right atrioventricular valve regurgitation

YES.....1
 NO2 (**B11**)
 STRUCTURE NOT PRESENT ... -1 (**B11**)
 INDETERMINATE..... -8 (**B11**)

RAVREGRG	B10. Right AV valve regurg.	
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a. Severity MILD1 MODERATE..... 2 SEVERE3

RAVRSVR	B10a. Right AV valve regurg.: Severity	
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ravvreg	<created var> Right AV valve regurgitation (none/mild/moderate/severe)	
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b. Proximal jet lateral width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

RAVRPJLW	B10b. Right AV valve regurg.: Proximal jet lateral width (cm)	
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c. Proximal jet anteroposterior width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

RAVRPJAW	B10c. Right AV valve regurg.: Prox. jet anteroposterior width (cm)	
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B11. Right atrioventricular valve stenosis

YES..... 1
 NO 2 (**B12**)
 STRUCTURE NOT PRESENT ... -1 (**B12**)
 INDETERMINATE -8 (**B12**)

RAVSTEN	B11. Right AV valve stenosis	
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a. Severity MILD1 MODERATE.....2 SEVERE3

RAVSSVR	B11a. Right AV valve stenosis: Severity	
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ravvsten	<created var> Right AV valve stenosis (none/mild/moderate/severe)	
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b. Heart rate ____ ____ ____ beats/min Exp. range: [40, 200]

RAVSHRTR	B11b. Right AV valve stenosis: Heart rate (beats/min)	
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c. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 3.00]

RAVSPKJT	B11c. Right AV valve stenosis: Peak jet velocity (m/sec)	
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d. Mean jet velocity ____ . ____ ____ m/sec Exp. range: [0.00, 3.00]

RAVSMNJT	B11d. Right AV valve stenosis: Mean jet velocity (m/sec)	
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B12. Common atrioventricular valve regurgitation

YES..... 1
 NO 2 (**B13**)
 STRUCTURE NOT PRESENT ... -1 (**B13**)
 INDETERMINATE -8 (**B13**)

CAVREGRG	B12. Common AV valve regurg.	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

CAVRSVR	B12a. Common AV valve regurg.: Severity
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cavvreg	<created var> Common AV valve regurgitation (none/mild/moderate/severe)
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b. Proximal jet lateral width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

CAVRPJLW	B12b. Common AV valve regurg.: Proximal jet lateral width (cm)	
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c. Proximal jet anteroposterior width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

CAVRPJAW	B12c. Common AV valve regurg.: Prox. jet anteroposterior width (cm)
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B13. Common atrioventricular valve stenosis

YES..... 1
 NO 2 (**B14**)
 STRUCTURE NOT PRESENT ... -1 (**B14**)
 INDETERMINATE -8 (**B14**)

CAVSTEN	B13. Common AV valve stenosis	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

CAVSSVR	B13a. Common AV valve stenosis: Severity	
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cavvsten	<created var> Common AV valve stenosis (none/mild/moderate/severe)	
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b. Heart rate ____ ____ ____ beats/min

CAVSHRTR	B13b. Common AV valve stenosis: Heart rate (beats/min)	
----------	--	--

c. Peak jet velocity ____ . ____ ____ m/sec

CAVSPKJT	B13c. Common AV valve stenosis: Peak jet velocity (m/sec)	
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d. Mean jet velocity ____ . ____ ____ m/sec

CAVSMNJT	B13d. Common AV valve stenosis: Mean jet velocity (m/sec)	
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B14. Systemic ventricular outflow tract obstruction

YES.....1

NO2 (**B15a**)INDETERMINATE..... -8 (**B15a**)

SVOTRCOB	B14. Systemic ventricular outflow tract obstruction	
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a. Severity MILD 1 MODERATE..... 2 SEVERE3

SVOSEVER	B14a. Systemic ventricular outflow tract obstruction: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [-6.00, 6.00]

SVOPKJT	B14b. Systemic ventricular outflow tract obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec Exp. range: [-4.00, 4.00]

SVOMNJT	B14c. Systemic ventricular outflow tract obstruction: Mean jet velocity (m/sec)	
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B15.a Left-sided ventricular dysfunction

NONE1
 MILD2
 MODERATE.....3
 SEVERE4
 STRUCTURE NOT PRESENT ... -1 (**B15b**)
 INDETERMINATE..... -8 (**B15b**)

LVDYSFUN	B15a. Left-sided ventricular dysfunction	
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1. Heart rate ___ ___ ___ beats/min Exp. range: [40, 200]

LVHRTRT	B15a1. Left-sided ventricular dysfunction: Heart Rate (beats/min)	
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2. 2D end-diastolic volume ___ ___ ___ . ___ ml

LVEDV2D	B15a2. Left-sided ventricular dysfunction: 2D EDV (ml)	
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3. 2D end-systolic volume ___ ___ ___ . ___ ml Exp. range: <= B15.a.2

LVESV2D	B15a3. Left-sided ventricular dysfunction: 2D ESV (ml)	
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4. 2D ejection fraction ___ ___ . ___ % Exp. range: [2.0, 99.9]

LVEF2D	B15a4. Left-sided ventricular dysfunction: 2D EF (%)	
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5. 2D mass ___ ___ ___ . ___ gm

LVMAS2D	B15a5. Left-sided ventricular dysfunction: 2D mass (gm)	
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B15.b Right-sided ventricular dysfunction

NONE..... 1
 MILD 2
 MODERATE 3
 SEVERE 4
 STRUCTURE NOT PRESENT ...-1 (**B16**)
 INDETERMINATE -8 (**B16**)

RVDYSFUN	B15b. Right-sided ventricular dysfunction	
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1. Heart rate ___ ___ ___ beats/min Exp. range: [40, 200]

RVHRTT	B15b1. Right-sided ventricular dysfunction: Heart Rate (beats/min)	
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2. 2D end-diastolic volume ___ ___ ___ . ___ ml

RVEDV2D	B15b2. Right-sided ventricular dysfunction: 2D EDV (ml)	
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3. 2D end-systolic volume ___ ___ ___ . ___ ml Exp. range: <= B15.b.2

RVESV2D	B15b3. Right-sided ventricular dysfunction: 2D ESV (ml)	
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4. 2D ejection fraction ___ ___ . ___ % Exp. range: [2.0, 99.9]

RVEF2D	B15b4. Right-sided ventricular dysfunction: 2D EF (%)	
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5. 2D mass ___ ___ ___ . ___ gm

RVMAS2D	B15b5. Right-sided ventricular dysfunction: 2D Mass (gm)	
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B16. Native aortic valve regurgitation

YES 1
 NO 2 (**B17**)
 STRUCTURE NOT PRESENT ... -1 (**B17**)
 INDETERMINATE -8 (**B17**)

NAVREGRG	B16. Native aortic valve regurg.	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

NAVSEVER	B16a. Native aortic valve regurg.: Severity	
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navreg	<created var> Native aortic valve regurgitation (none/mild/moderate/severe)	
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b. Proximal jet anteroposterior width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

NAVPTW	B16b. Native aortic valve regurg.: Proximal jet anteroposterior width (cm)	
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B17. Native pulmonary valve regurgitation

YES..... 1
 NO 2 (**B18**)
 STRUCTURE NOT PRESENT ... -1 (**B18**)
 INDETERMINATE -8 (**B18**)

NPVREGRG	B17. Native pulmonary valve regurg.	
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a. Severity MILD1 MODERATE..... 2 SEVERE3

NPVSEVER	B17a. Native pulmonary valve regurg.: Severity	
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npvreg	<created var> Native PV regurgitation (none/mild/moderate/severe)	
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b. Proximal jet anteroposterior width ____ . ____ ____ cm Exp. range: [0.00, 1.50]

NPVPJTW	B17b. Native pulmonary valve regurg.: Proximal jet anteroposterior width (cm)	
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B18. Aortopulmonary anastomosis obstruction

YES..... 1
 NO 2 (**B19**)
 STRUCTURE NOT PRESENT ... -1 (**B19**)
 INDETERMINATE -8 (**B19**)

AAOBSTR	B18. Aortopulmonary anastomosis obstruction	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

AASEVER	B18a. Aortopulmonary anastomosis obstruction: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec

AAPKJET	B18b. Aortopulmonary anastomosis obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec

AAMNJET	B18c. Aortopulmonary anastomosis obstruction: Mean jet velocity (m/sec)	
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B19. Aortic arch obstruction

YES 1

NO 2 (**B20**)INDETERMINATE -8 (**B20**)

AARCHOB	B19. Aortic arch obstruction	
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a. Severity MILD1 MODERATE 2 SEVERE3

AARCHSV	B19a. Aortic arch obstruction: Severity	
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b. Peak jet velocity ____ . ____ ____ m/sec Exp. range: [-6.00, 6.00]

AARCHPKJ	B19b. Aortic arch obstruction: Peak jet velocity (m/sec)	
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c. Mean jet velocity ____ . ____ ____ m/sec Exp. range: [-4.00, 4.00]

AARCHMNJ	B19c. Aortic arch obstruction: Mean jet velocity (m/sec)	
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B20. Pericardial effusion

YES 1
 NO 2 (**B21**)
 INDETERMINATE -8 (**B21**)

PERIEFF	B20. Pericardial effusion	
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a. Severity MILD 1 MODERATE 2 SEVERE 3

PERIEFSV	B20a. Pericardial effusion: Severity
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B21. Systemic venous pathway thrombus

YES..... 1 NO 2 INDETERMINATE..... -8

SVPTHROM	B21. Systemic venous pathway thrombus
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B22. Pulmonary atrial thrombus

YES..... 1 NO 2 INDETERMINATE..... -8

PATHROM	B22. Pulmonary atrial thrombus
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B23. Ventricular thrombus

YES..... 1 NO 2 INDETERMINATE..... -8

VENTTHRM	B23. Ventricular thrombus
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- B24. Left atrioventricular valve inflow velocity
 RECORDED 1
 NOT RECORDED 2 (**B25**)
 INADEQUATE..... 3 (**B25**)
 STRUCTURE NOT PRESENT .. -1 (**B25**)

MITINFV	B24. Left AV valve inflow velocity	
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- a. Rhythm SINUS..... 1 PACED2 OTHER..... 9
 a1. If OTHER, specify: _____

MITINFRH	B24a. Left AV valve inflow velocity: Rhythm	
MITINFRO	B24a1. Left AV valve inflow velocity: Specify other rhythm	

- b. Heart rate ____ . ____ . ____ beats/min Exp. range: [40, 200]

MITINFHR	B24b. Left AV valve inflow velocity: Heart rate (beats/min)	
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- c. Summation wave YES 1 (**B25**) NO..... 2

MITINFSW	B24c. Left AV valve inflow velocity: Summation wave	
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- d. Peak early velocity ____ . ____ . ____ m/sec Exp. range: [0.00, 3.00]

MITINPEV	B24d. Left AV valve inflow velocity: Peak early velocity (m/sec)	
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- e. Peak atrial velocity ____ . ____ . ____ m/sec Exp. range: [0.00, 3.00]

MITINPAV	B24e. Left AV valve inflow velocity: Peak atrial velocity (m/sec)	
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- f. Early deceleration time ____ . ____ . ____ . ____ msec Exp. range: [0, 9999]

MITINEDT	B24f. Left AV valve inflow velocity: Early deceleration time (msec)	
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- g. A-wave duration ____ . ____ . ____ msec Exp. range: [0, 200]

MITINAWV	B24g. Left AV valve inflow velocity: A-wave duration (msec)	
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B25. Right atrioventricular valve inflow velocity

RECORDED 1
 NOT RECORDED 2 (**B26**)
 INADEQUATE 3 (**B26**)
 STRUCTURE NOT PRESENT ..-1 (**B26**)

TRICINV	B25. Right AV valve inflow velocity	
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a. Rhythm SINUS 1 PACED 2 OTHER 9
 a1. If OTHER, specify: _____

TRICINRH	B25a. Right AV valve inflow velocity: Rhythm	
TRICINRO	B25a1. Right AV valve inflow velocity: Specify other rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

TRICINHR	B25b. Right AV valve inflow velocity: Heart rate (beats/min)	
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c. Summation wave YES 1 (**B26**) NO 2

TRICINSW	B25c. Right AV valve inflow velocity: Summation wave	
----------	--	--

d. Peak early velocity _____ m/sec Exp. range: [0.00, 3.00]

TRICIEV	B25d. Right AV valve inflow velocity: Peak early velocity (m/sec)	
---------	---	--

e. Peak atrial velocity _____ m/sec Exp. range: [0.00, 3.00]

TRICIPAV	B25e. Right AV valve inflow velocity: Peak atrial velocity (m/sec)	
----------	--	--

f. Early deceleration time _____ msec Exp. range: [0, 9999]

TRICIEDT	B25f. Right AV valve inflow velocity: Early deceleration time (msec)	
----------	--	--

g. A-wave duration _____ msec Exp. range: [0, 200]

TRICIAWV	B25g. Right AV valve inflow velocity: A-wave duration (msec)	
----------	--	--

B26. Common atrioventricular valve inflow velocity

RECORDED 1
 NOT RECORDED..... 2 (**B27**)
 INADEQUATE 3 (**B27**)
 STRUCTURE NOT PRESENT ..-1 (**B27**)

CAVINFV	B26. Common AV valve inflow velocity	
---------	--------------------------------------	--

a. Rhythm SINUS 1 PACED2 OTHER..... 9

a1. If OTHER, specify: _____

CAVIVRH	B26a. Common AV valve inflow velocity: Rhythm	
CAVIVRO	B26a1. Common AV valve inflow velocity: Specify other rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

CAVIVHR	B26b. Common AV valve inflow velocity: Heart rate (beats/min)	
---------	---	--

c. Summation wave YES..... 1 (**B27**) NO..... 2

CAVIVSW	B26c. Common AV valve inflow velocity: Summation wave	
---------	---	--

d. Peak early velocity _____ m/sec Exp. range: [0.00, 3.00]

CAVIVPEV	B26d. Common AV valve inflow velocity: Peak early velocity (m/sec)	
----------	--	--

e. Peak atrial velocity _____ m/sec Exp. range: [0.00, 3.00]

CAVIVPAV	B26e. Common AV valve inflow velocity: Peak atrial velocity (m/sec)	
----------	---	--

f. Early deceleration time _____ msec Exp. range: [0, 9999]

CAVIVEDT	B26f. Common AV valve inflow velocity: Early deceleration time (msec)	
----------	---	--

g. A-wave duration _____ msec Exp. range: [0, 200]

CAVIVAWV	B26g. Common AV valve inflow velocity: A-wave duration (msec)	
----------	---	--

B27. Pulmonary vein Doppler

RECORDED..... 1
 NOT RECORDED 2 (**B28**)
 INADEQUATE..... 3 (**B28**)

PULVDPLR	B27. Pulmonary vein Doppler	
----------	-----------------------------	--

a. Duration of flow reversal during atrial systole ___ ___ msec Exp. range: [0, 200]

PVDFLRVS	B27a. Pulmonary vein Doppler: Duration of flow reversal (msec)
----------	--

B28. Left lateral atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
 NOT RECORDED 2 (B29)
 INADEQUATE 3 (B29)
 STRUCTURE NOT PRESENT ... -1 (B29)

LLAVAV	B28. Left lateral AV valve annulus velocity	
--------	---	--

a. Rhythm SINUS.....1 PACED..... 2 OTHER.....9

a1. If OTHER, specify: _____

LLAVAVRH	B28a. Left lateral AV valve annulus velocity: Rhythm	
LLAVAVRO	B28a1. Left lateral AV valve annulus velocity: Specify other rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

LLAVAVHR	B28b. Left lateral AV valve annulus velocity: Heart rate (beats/min)	
----------	--	--

c. Peak early diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

LLAVAEDV	B28c. Left lateral AV valve annulus velocity: Peak early dia. Velocity (cm/sec)	
----------	---	--

d. Peak atrial diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

LLAVAADV	B28d. Left lateral AV valve annulus velocity: Peak atrial dia. Velocity (cm/sec)	
----------	--	--

e. Peak systolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

LLAVAPSV	B28e. Left lateral AV valve annulus velocity: Peak systolic velocity (cm/sec)	
----------	---	--

f. Isovolumic contraction time _____ msec Exp. range: [0, 200]

LLAVAICT	B28f. Left lateral AV valve annulus velocity: Isovolumic contraction time (msec)	
----------	--	--

g. Isovolumic relaxation time _____ msec Exp. range: [0, 200]

LLAVAIRT	B28g. Left lateral AV valve annulus velocity: Isovolumic relaxation time (msec)	
----------	---	--

h. Systolic time _____ msec Exp. range: [100, 500]

LLAVAVST	B28h. Left lateral AV valve annulus velocity: Systolic time (msec)	
----------	--	--

i. Diastolic time _____ msec Exp. range: [1, 1300]

LLAVAVDT	B28i. Left lateral AV valve annulus velocity: Diastolic time (msec)	
----------	---	--

B29. Septal atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
 NOT RECORDED 2 (B30)
 INADEQUATE 3 (B30)
 STRUCTURE NOT PRESENT ... -1 (B30)

SAVAV	B29. Septal AV valve annulus velocity	
-------	---------------------------------------	--

a. Rhythm SINUS.....1 PACED.....2 OTHER.....9

a1. If OTHER, specify: _____

SAVAVRHY	B29a. Septal AV valve annulus velocity: Rhythm	
SAVAVROT	B29a1. Septal AV valve annulus velocity: specify other rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

SAVAVHR	B29b. Septal AV valve annulus velocity: Heart rate (beats/min)	
---------	--	--

c. Peak early diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

SAVAVPEV	B29c. Septal AV valve annulus velocity: Peak early diastolic velocity (cm/sec)	
----------	--	--

d. Peak atrial diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

SAVAVPAV	B29d. Septal AV valve annulus velocity: Peak atrial diastolic velocity (cm/sec)	
----------	---	--

e. Peak systolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

SAVAVPSV	B29e. Septal AV valve annulus velocity: Peak systolic velocity (cm/sec)	
----------	---	--

f. Isovolumic contraction time _____ msec Exp. range: [0, 200]

SAVAVICT	B29f. Septal AV valve annulus velocity: Isovolumic contraction time (msec)	
----------	--	--

g. Isovolumic relaxation time _____ msec Exp. range: [0, 200]

SAVAVIRT	B29g. Septal AV valve annulus velocity: Isovolumic relaxation time (msec)	
----------	---	--

h. Systolic time _____ msec Exp. range: [100, 500]

SAVAVST	B29h. Septal AV valve annulus velocity: Systolic time (msec)	
---------	--	--

i. Diastolic time _____ msec Exp. range: [1, 1300]

SAVAVDT	B29i. Septal AV valve annulus velocity: Diastolic time (msec)	
---------	---	--

B30. Right lateral atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
 NOT RECORDED 2 (B31)
 INADEQUATE 3 (B31)
 STRUCTURE NOT PRESENT -1 (B31)

RLAVAV	B30. Right lateral AV valve annulus velocity	
--------	--	--

a. Rhythm SINUS 1 PACED 2 OTHER 9

a1. If OTHER, specify: _____

RLAVAVRH	B30a. Right lateral AV valve annulus velocity: Rhythm	
RLAVAVRO	B30a1. Right lateral AV valve annulus velocity: Specify other rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

RLAVAVHR	B30b. Right lateral AV valve annulus velocity: Heart rate (beats/min)	
----------	---	--

c. Peak early diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

RLAVAVPE	B30c. Right lateral AV valve annulus velocity: Peak early diastolic velocity (cm/sec)	
----------	---	--

d. Peak atrial diastolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

RLAVAVPA	B30d. Right lateral AV valve annulus velocity: Peak atrial diastolic velocity (cm/sec)	
----------	--	--

e. Peak systolic velocity _____ cm/sec Exp. range: [1.0, 99.9]

RLAVAVPS	B30e. Right lateral AV valve annulus velocity: Peak systolic velocity (cm/sec)	
----------	--	--

f. Isovolumic contraction time _____ msec Exp. range: [0, 200]

RLAVAVIC	B30f. Right lateral AV valve annulus velocity: Isovolumic contraction time (msec)	
----------	---	--

g. Isovolumic relaxation time _____ msec Exp. range: [0, 200]

RLAVAVIR	B30g. Right lateral AV valve annulus velocity: Isovolumic relaxation time (msec)	
----------	--	--

h. Systolic time _____ msec Exp. range: [100, 500]

RLAVAVST	B30h. Right lateral AV valve annulus velocity: Systolic time (msec)	
----------	---	--

i. Diastolic time _____ msec Exp. range: [1, 1300]

RLAVAVDT	B30i. Right lateral AV valve annulus velocity: Diastolic time (msec)	
----------	--	--

B31. Left-sided ventricular flow propagation rate (M-mode color Doppler)

RECORDED 1
 NOT RECORDED 2 (**B32**)
 INADEQUATE 3 (**B32**)
 STRUCTURE NOT PRESENT -1 (**B32**)

LVFPR	B31. Left-sided ventricular flow propagation rate	
-------	---	--

a. Rhythm SINUS 1 PACED 2 OTHER 9

a1. If OTHER, specify: _____

LVFPRRH	B31a. Left-sided ventricular flow propagation rate: Rhythm	
LVFPRROT	B31a1. Left-sided ventricular flow propagation rate: Specify other Rhythm	

b. Heart rate _____ beats/min Exp. range: [40, 200]

LVFPRHR	B31b. Left-sided ventricular flow propagation rate: Heart rate (beats/min)	
---------	--	--

c. Flow propagation rate _____ cm/sec Exp. range: [40, 400] or
 [-400, -40]

LVFPRFPR	B31c. Left-sided ventricular flow propagation rate: Flow propagation rate (cm/sec)	
----------	--	--

B32. Right-sided ventricular flow propagation rate (M-mode color Doppler)

RECORDED 1
 NOT RECORDED 2 (**B33**)
 INADEQUATE 3 (**B33**)
 STRUCTURE NOT PRESENT-1 (**B33**)

RVFPR	B32. Right-sided ventricular flow propagation rate	
-------	--	--

a. Rhythm SINUS 1 PACED 2 OTHER 9

a1. If OTHER, specify: _____

RVFPRRH	B32a. Right-sided ventricular flow propagation rate: Rhythm	
RVFPRRO	B32a1. Right-sided ventricular flow propagation rate: Specify other rhythm	

b. Heart rate _____ beats/min Exp. Range: [40, 200]

RVFPRHR	B32b. Right-sided ventricular flow propagation rate: Heart rate (beats/min)	
---------	---	--

c. Flow propagation rate _____ cm/sec Exp. Range: [40, 400] or [-400, -40]

RVFPRFPR	B32c. Right-sided ventricular flow propagation rate: Flow propagation rate (cm/sec)	
----------	---	--

B33. Common ventricular flow propagation rate (M-mode color Doppler)

RECORDED 1
 NOT RECORDED 2 (**B34**)
 INADEQUATE 3 (**B34**)
 STRUCTURE NOT PRESENT-1 (**B34**)

CVFPR	B33. Common ventricular flow propagation rate	
-------	---	--

a. Rhythm SINUS 1 PACED 2 OTHER 9

a1. If OTHER, specify: _____

CVFPRRH	B33a. Common ventricular flow propagation rate: Rhythm	
CVFPRRO	B33a1. Common ventricular flow propagation rate: Specify other rhythm	

b. Heart rate _____ beats/min Exp. Range: [40, 200]

CVFPRHR	B33b. Common ventricular flow propagation rate: Heart rate (beats/min)	
---------	--	--

c. Flow propagation rate _____ cm/sec Exp. Range: [40, 400] or [-400, -40]

CVFPRFPR	B33c. Common ventricular flow propagation rate: Flow propagation rate (cm/sec)	
----------	--	--

B34. Ventricular dominance (See created variable VENT_TYPE)

RIGHT 1
 LEFT 2
 BOTH RIGHT AND LEFT 3
 N/A - ONLY 1 VENTRICLE -1

VENDOM	B34. Ventricular dominance (see _F12B VENT_TYPE)
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B35. DP/DT time intervals (Rhodes ancillary study)

- a. Q-wave to aortic valve opening ___ ___ msec Exp. Range: [0, 300]
 b. Q-wave to mitral valve closure ___ ___ msec Exp. Range: [0, 300]

QWTOAVO	B35a. DP/DT time intervals: Q-wave to aortic valve opening
QWTOMVC	B35b. DP/DT time intervals: Q-wave to mitral valve closure
dpdt	<created var> dP/dt (mmHg/sec): Calculated as (diastbp - 5)/(qwtoavo*0.001 - qwtomvc*0.001)

FORMSTAT_ID	Unique form/subject ID
FORM_ID	4 letter code for the form
VER_ID	1 letter code added to form code to make unique form/version
DESTATUS	Form completion

APPENDIX A**CREATED VARIABLES: ANATOMY****VENT_TYPE (1=left, 2=right, 3=mixed)**

This variable is used to identify subjects with left (=1), right (=2), or mixed (=3) ventricular morphology. Subjects were classified according to their diagnosis from F01A as follows:

Morphology	Diagnosis Code	Description
1=LEFT	A1.01	Double inlet left ventricle
	A1.04	Tricuspid atresia
	A1.05.02	Unbalanced AV canal defect, left dominant
	A1.06.02 ^a	Heterotaxia syndrome, single left ventricle
	A1.06.03 ^a	Heterotaxia syndrome, other
	A1.07.01	Other single ventricle, mostly left ventricle
	A3.01	Pulmonary atresia with intact ventricular septum
	A3.02*	Other functional single ventricle not fitting any other categories – Ventricular septal defect(s)
	A3.03	Tricuspid valve anomaly
	A3.10	Hypoplastic right ventricle with ventricular septal defect(s)
2=RIGHT	A1.02	Double inlet right ventricle
	A1.03	Mitral atresia
	A1.05.01	Unbalanced AV canal defect, right dominant
	A1.06.01 ^a	Heterotaxia syndrome, double outlet right ventricle with AV canal defect
	A1.06.03 ^a	Heterotaxia syndrome, other
	A1.07.02	Other single ventricle, mostly right ventricle
	A2 (not A2.03)	HLHS (not aortic atresia and ventricular septal defect, with well-developed MV and left ventricle)
	A3.09	Hypoplastic left ventricle with ventricular septal defect(s)
3=MIXED	A1.06.01	Heterotaxia syndrome, DORV with AV canal defect
	A1.06.02	Heterotaxia syndrome, single left ventricle
	A1.06.03	Heterotaxia syndrome, other
	A1.07.03	Other single ventricle, indeterminate
	A2.03	HLHS: Aortic atresia and ventricular septal defect (well-developed MV and LV)
	A3.02	Ventricular septal defect(s)
	A3.04	D-loop DORV with two ventricles
	A3.05	DOLV with two ventricles
	A3.06	D-loop transposition of the great arteries with two ventricles
	A3.07	L-loop transposition of the great arteries or L-loop DORV with two ventricles
	A3.08	Mitral valve anomaly
	A4	Unclassified

^aIf reclassified from MIXED based on echo and/or MRI Core Lab assessment.

LLOOP (1=yes, 2=no)

This variable is used to identify subjects with an L-loop configuration (=1) or not (=2). Subjects with the following diagnoses were classified as having an L-loop configuration:

Diagnosis Code	Description
A1.01.01	DILV: {S,L,L} or {S,L,D} or {S,L,I} Outlet chamber (bulboventricular foramen)
A1.01.07	DILV: {I,L,L} or {I,L,D} or {I,L,I} Outlet chamber (bulboventricular foramen)
A1.03.03	Mitral Atresia: {S,L,L} or {S,L,D} or {S,L,I} (corrected transposition)
A1.03.06	Mitral Atresia: {I,L,L} or {I,L,D} or {I,L,I} (corrected transposition)
A1.04.02	Tricuspid Atresia: L-loop, no transposition of the great arteries
A1.04.04	Tricuspid Atresia: L-loop transposition of the great arteries (Type 3)
A3.07	L-loop transposition of the great arteries or L-loop DORV with two ventricles

RESTRICT (1=present, 2=absent)

This variable is used to identify subjects with restrictive physiology, which is present if $E/A > 2$ or $(1 < E/A < 2 \text{ and } DT < 140)$, where

E/A = ratio of early to late AV valve diastolic velocities

DT = AV valve deceleration time.

TWOVENT (1=yes, 2=no)

This variable is used to identify subjects with two ventricle anatomies with a single functioning ventricle. The following diagnoses were coded as having two ventricles:

Diagnosis Code	Description
A1.06	Heterotaxia syndrome, single left ventricle
A3.04	D-loop DORV with two ventricles
A3.05	DOLV with two ventricles
A3.06	D-loop transposition of the great arteries with two ventricles
A3.07	L-loop transposition of the great arteries or L-loop DORV with two ventricles

APPENDIX B**CREATED VARIABLES: REGURGITATION****OAVVREGURG (0=None, 1=Mild, 2=Moderate, 3=Severe)**

This variable contains the overall AV valve regurgitation grade as none, mild, moderate, or severe. The coding is based on a hierarchy defined using items B8a (left AV valve regurgitation) and B10a (right AV valve regurgitation) from F12B (Core Lab Echo Form) as follows:

Left regurg. (B8a)	Operator	Right regurg. (B10a)	Overall regurg. (OAVVREGURG)
Severe	OR	Severe	Severe
Moderate	AND	Moderate	Severe
Moderate	OR	Moderate	Moderate
Mild	AND	Mild	Moderate
Mild	OR	Mild	Mild
None	AND	None	None
Unavailable	AND	Available	Right regurg. (B10a)
Available	AND	Unavailable	Left regurg. (B8a)
Unavailable	AND	Unavailable	Common AV valve regurg. (B12a)

SLVREGURG (0=None, 1=Mild, 2=Moderate, 3=Severe)

This variable contains the overall semi-lunar valve regurgitation grade as none, mild, moderate, or severe. The coding is based on a hierarchy defined using items B16a (native aortic valve regurgitation) and B17a (native pulmonary valve regurgitation) from F12B (Core Lab Echo Form) as follows:

NAoV regurg. (B16a)	Operator	NPV regurg. (B17a)	Semilunar regurg. (SLVREGURG)
Indeterminate	OR	Indeterminate	Indeterminate
None	--	--	None
Structure not present	--	--	NPV regurg. (B17a)
--	--	None	None
--	--	Structure not present	NAoV regurg. (B16a)
Severe	OR	Severe	Severe
Moderate	AND	Moderate	Severe
Moderate	OR	Moderate	Moderate
Mild	AND	Mild	Moderate
Mild	OR	Mild	Mild

APPENDIX C**CREATED VARIABLES: OVERALL DYSFUNCTION & DIASTOLIC DYSFUNCTION****OVDYSFUN (%)**

This variable is an exact copy of the created variable, ECHOEF (total ejection fraction). ECHOEF is defined as: $(\text{total EDV} - \text{total ESV}) / (\text{total EDV}) * 100$. Both total EDV and total ESV are also created variables, which take into account each subject's ventricular morphology, as follows:

Morphology	Looping	Left-sided ventricular dysfunction	Right-sided ventricular dysfunction	Then	Otherwise
Left	L-loop	Structure not present	> 0	Use right-sided	Use left-sided
Right	L-loop	> 0	Structure not present	Use left-sided	Use right-sided
Mixed	--	--	--	Use Left + Right	--

GRADE (0=Normal, 1=Impaired relation, 2=Pseudo-normalization, 3=Restrictive)

This variable contains a diastolic dysfunction grade for each subject, which is coded as follows:

CODED AS...	IF...
Normal	$(1 < E/A \leq 2)$ and $(DT \geq 140 \text{ msec})$ and $(E/TDE \leq 10)$
Impaired relaxation	$E/A \leq 1$
Pseudo-normalization	$(1 < E/A \leq 2)$ and $[(DT < 140 \text{ msec}) \text{ or } (E/TDE > 10) \text{ or } (FP < 55 \text{ cm/sec})]$
Restrictive	$E/A > 2$

Where

- E = Atrioventricular valve peak early diastolic velocity
- A = Atrioventricular valve peak late diastolic velocity
- E/A = Ratio of early to late AV valve diastolic velocities
- DT = AV valve deceleration time.
- TDE = Tissue Doppler peak early diastolic velocity
- FP = Systemic ventricular flow propagation rate

APPENDIX D**CREATED VARIABLES: TISSUE DOPPLER AND VELOCITIES**

Tissue Doppler and velocity variables are created from existing variables on the Echo Core Lab form according to the instructions below.

If B26 (common AV valve inflow velocity) is recorded:

TDE1 = B28c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
 TDE2 = B30c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
 TDA1 = B28d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)
 TDA2 = B30d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If B13 (common AV valve stenosis) = no and
 B26a (common AV valve inflow velocity) = sinus rhythm then:

E1 = B26d (common AV valve inflow velocity, peak early velocity, m/sec)

If B13 (common AV valve stenosis) = no and
 B33a (common ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = B33c (common ventricular flow propagation rate, cm/sec)

If B13 (common AV valve stenosis) = no and
 B26a (common AV valve inflow velocity) = sinus rhythm and
 B26c (common AV valve inflow velocity, summation wave) = no then:

A1 = B26e (common AV valve inflow velocity, peak atrial velocity, m/sec)
 DT1 = B26f (common AV valve inflow velocity, early deceleration time, msec)
 AT1 = B26g (common AV valve inflow velocity, A-wave duration, msec)

Otherwise if right ventricular morphology:

TDE1 = B29c (septal AV annulus velocity, peak early diastolic velocity, cm/sec)
 TDE2 = B30c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
 TDA1 = B29d (septal AV annulus velocity, peak atrial diastolic velocity, cm/sec)
 TDA2 = B30d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If B11 (right AV valve stenosis) = no and
 B25a (right AV valve inflow velocity) = sinus rhythm then:

E1 = B25d (right AV valve inflow velocity, peak early velocity, m/sec)

If B11 (right AV valve stenosis) = no and
 B32a (right-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = B32c (right-sided ventricular flow propagation rate, cm/sec)

If B11 (right AV valve stenosis) = no and

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B25a (right AV valve inflow velocity) = sinus rhythm and

B25c (right AV valve inflow velocity, summation wave) = no then:

A1 = B25e (right AV valve inflow velocity, peak atrial velocity, m/sec)

DT1 = B25f (right AV valve inflow velocity, early deceleration time, msec)

AT1 = B25g (right AV valve inflow velocity, A-wave duration, msec)

Otherwise if left ventricular morphology:

TDE1 = B28c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)

TDE2 = B29c (septal AV annulus velocity, peak early diastolic velocity, cm/sec)

TDA1 = B28d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

TDA2 = B29d (septal AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If B9 (left AV valve stenosis) = no and

B24a (left AV valve inflow velocity) = sinus rhythm then:

E1 = B24d (left AV valve inflow velocity, peak early velocity, m/sec)

If B9 (left AV valve stenosis) = no and

B31a (left-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = B31c (left-sided ventricular flow propagation rate, cm/sec)

If B9 (left AV valve stenosis) = no and

B24a (left AV valve inflow velocity) = sinus rhythm and

B24c (left AV valve inflow velocity, summation wave) = no then:

A1 = B24e (left AV valve inflow velocity, peak atrial velocity, m/sec)

DT1 = B24f (left AV valve inflow velocity, early deceleration time, msec)

AT1 = B24g (left AV valve inflow velocity, A-wave duration, msec)

Otherwise if mixed ventricular morphology:

TDE1 = B28c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)

TDE2 = B30c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)

TDA1 = B28d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

TDA2 = B30d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If B9 (left AV valve stenosis) = no and

B24a (left AV valve inflow velocity) = sinus rhythm then:

E1 = B24d (left AV valve inflow velocity, peak early velocity, m/sec)

If B9 (left AV valve stenosis) = no and

B31a (left-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = B31c (left-sided ventricular flow propagation rate, cm/sec)

If B9 (left AV valve stenosis) = no and

B24a (left AV valve inflow velocity) = sinus rhythm and

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B24c (left AV valve inflow velocity, summation wave) = no then:

A1 = B24e (left AV valve inflow velocity, peak atrial velocity, m/sec)
DT1 = B24f (left AV valve inflow velocity, early deceleration time, msec)
AT1 = B24g (left AV valve inflow velocity, A-wave duration, msec)

If B11 (right AV valve stenosis) = no and
B25a (right AV valve inflow velocity) = sinus rhythm then:

E2 = B25d (right AV valve inflow velocity, peak early velocity, m/sec)

If B11 (right AV valve stenosis) = no and
B32a (right-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP2 = B32c (right-sided ventricular flow propagation rate, cm/sec)

If B11 (right AV valve stenosis) = no and
B25a (right AV valve inflow velocity) = sinus rhythm and
B25c (right AV valve inflow velocity, summation wave) = no then:

A2 = B25e (right AV valve inflow velocity, peak atrial velocity, m/sec)
DT2 = B25f (right AV valve inflow velocity, early deceleration time, msec)
AT2 = B25g (right AV valve inflow velocity, A-wave duration, msec)

Define TDE = Tissue Doppler peak early diastolic velocity as follows:

$TDE = (TDE1 + TDE2) / 2$ if TDE1 $\neq$ missing and TDE2 $\neq$ missing
 $TDE = TDE1$ if TDE2 = missing and TDE1 $\neq$ missing
 $TDE = TDE2$ if TDE2 $\neq$ missing and TDE1 = missing
 $TDE = \text{missing}$ if TDE2 = missing and TDE1 = missing

Define TDA = Tissue Doppler peak late diastolic velocity as follows:

$TDA = (TDA1 + TDA2) / 2$ if TDA1 $\neq$ missing and TDA2 $\neq$ missing
 $TDA = TDA1$ if TDA2 = missing and TDA1 $\neq$ missing
 $TDA = TDA2$ if TDA2 $\neq$ missing and TDA1 = missing
 $TDA = \text{missing}$ if TDA2 = missing and TDA1 = missing

Define E = Atrioventricular valve peak early diastolic velocity as follows:

$E = (E1 + E2) / 2$ if E1 $\neq$ missing and E2 $\neq$ missing
 $E = E1$ if E2 = missing and E1 $\neq$ missing
 $E = E2$ if E2 $\neq$ missing and E1 = missing
 $E = \text{missing}$ if E2 = missing and E1 = missing

Define A = Atrioventricular valve peak late diastolic velocity as follows:

$A = (A1 + A2) / 2$ if A1 $\neq$ missing and A2 $\neq$ missing
 $A = A1$ if A2 = missing and A1 $\neq$ missing
 $A = A2$ if A2 $\neq$ missing and A1 = missing
 $A = \text{missing}$ if A2 = missing and A1 = missing

Define E/A = Ratio of early to late atrioventricular valve diastolic velocities.

Define E/TDE = Ratio of AV to tissue Doppler peak early diastolic velocity ($E * 100 / TDE$).

Define AT = Duration of atrioventricular valve late diastolic inflow as follows:

$AT = (AT1 + AT2) / 2$ if AT1 $\neq 0$ and AT2 $\neq$ missing
 $AT = AT1$ if AT2 = missing and AT1 $\neq$ missing
 $AT = AT2$ if AT2 $\neq$ missing and AT1 = missing
 $AT = \text{missing}$ if AT2 = missing and AT1 = missing

Define DT = Atrioventricular valve deceleration time as follows:

$DT = (DT1 + DT2) / 2$ if DT1 $\neq$ missing and DT2 $\neq$ missing
 $DT = DT1$ if DT2 = missing and DT1 $\neq$ missing
 $DT = DT2$ if DT2 $\neq$ missing and DT1 = missing
 $DT = \text{missing}$ if DT2 = missing and DT1 = missing

Define FP = Systemic ventricular flow propagation rate as follows:

$FP = (FP1 + FP2) / 2$ if FP1 $\neq$ missing and FP2 $\neq$ missing
 $FP = FP1$ if FP2 = missing and FP1 $\neq$ missing
 $FP = FP2$ if FP2 $\neq$ missing and FP1 = missing
 $FP = \text{missing}$ if FP2 = missing and FP1 = missing

APPENDIX E**CREATED VARIABLES: TEI INDEX****TEI_INDEX**

The Tei Index (Ref. J Cardiol. 1995 Dec; 26(6):357-66) was created as follows:

B28f ... Left lateral AV valve annulus velocity: isovolumic contraction time (msec)

B28g .. Left lateral AV valve annulus velocity: isovolumic relaxation time (msec)

B28h .. Left lateral AV valve annulus velocity: systolic time (msec)

B29f ... Septal AV valve annulus velocity: isovolumic contraction time (msec)

B29g .. Septal AV valve annulus velocity: isovolumic relaxation time (msec)

B29h .. Septal AV valve annulus velocity: systolic time (msec)

B30f ... Right lateral AV valve annulus velocity: isovolumic contraction time (msec)

B30g .. Right lateral AV valve annulus velocity: isovolumic relaxation time (msec)

B30h .. Right lateral AV valve annulus velocity: systolic time (msec)

LL = (B28f + B28g)/B28h (left lateral AV valve annulus velocity)

SEPTAL = (B29f + B29g)/B29h (Septal AV valve annulus velocity)

RL = (B30f + B30g)/B30h (Right lateral AV valve annulus velocity)

TEI_INDEX = (LL + SEPTAL + RL)/3

APPENDIX F**CREATED VARIABLES: MASS AND VOLUMES**

Total mass and volumetric measurement variables were created taking into account each subject's ventricular morphology, as follows:

Morphology	Looping	Left-sided ventricular dysfunction	Right-sided ventricular dysfunction	Then	Otherwise
Left	L-loop	Structure not present	> 0	Use right-sided	Use left-sided
Right	L-loop	> 0	Structure not present	Use left-sided	Use right-sided
Mixed	--	--	--	Use Left + Right	--

Once new variables were created for total EDV (ECHOEDV), total ESV (ECHOESV), and total mass (ECHOMASS), the following variables were created by simple calculation:

CREATED VARIABLE	CODE
ECHOEF (Total ejection fraction)	$((\text{ECHOEDV} - \text{ECHOESV}) / \text{ECHOEDV}) * 100$
ECHOSV (Total stroke volume)	$\text{ECHOEDV} - \text{ECHOESV}$
ECHOMV (Total mass to volume ratio)	$\text{ECHOMASS} / \text{ECHOEDV}$

Additional variables were created in order to index these measures to body surface area (BSA). BSA was calculated using the Haycock formula (J Pediatr 1978; 93:62-66) as follows:

If height>0 and weight>0: $\text{ECHOBSA} = 0.024265 \times (\text{height}^{0.3964}) \times (\text{weight}^{0.5378})$

Otherwise: $\text{ECHOBSA} = e^{0.6666 \cdot \log(\text{weight})} \times 0.1$

Where,

Height = F12A (B1): height at echocardiogram
Weight = F12A (B2): weight at echocardiogram

Volume and mass variables indexed to BSA were then created as follows:

$\text{ECHOEDVi} = \text{ECHOEDV} / \text{ECHOBSA}^{1.3}$

$\text{ECHOESVi} = \text{ECHOESV} / \text{ECHOBSA}^{1.3}$

$\text{ECHOMASSi} = \text{ECHOMASS} / \text{ECHOBSA}^{1.3}$

$\text{ECHOSVi} = \text{ECHOSV} / \text{ECHOBSA}$

Z-scores for the volume and mass variables were created using the above variables as follows:

ECHOEDV_Z

$$\text{ECHOEDV_Z} = (\text{ECHOEDV} - \text{mean}) / \text{sd}$$

where

$$\begin{aligned} \text{mean} &= 67.28691 \times \text{ECHOBSA}^{1.29588} + 0.22832 \\ \text{sd} &= -0.38083 + 12.14673 \times \text{ECHOBSA} \end{aligned}$$

ECHOESV_Z

$$\text{ECHOESV_Z} = (\text{ECHOESV} - \text{mean}) / \text{sd}$$

where

$$\begin{aligned} \text{mean} &= 22.77436 \times \text{ECHOBSA}^{1.44988} + 0.89823 \\ \text{sd} &= -0.46362 + 5.80264 \times \text{ECHOBSA} \end{aligned}$$

ECHOEF_Z

$$\text{ECHOEF_Z} = (\text{ECHOEF} / 100 - \text{mean}) / \text{sd}$$

where

$$\begin{aligned} \text{mean} &= -0.00002 \times (\text{age at echo})^{1.0} + 0.63006 \\ \text{sd} &= (0.00260 \times (1 + 1/288 + ((\text{age at echo} - 6.46024)^2 / 10121.13302)))^{0.5} \end{aligned}$$

ECHOSV_Z

$$\text{ECHOSV_Z} = (\text{ECHOSV} - \text{mean}) / \text{sd}$$

where

$$\begin{aligned} \text{mean} &= 44.47654 \times \text{ECHOBSA}^{1.20392} - 1.50044 \\ \text{sd} &= -0.06796 + 7.67581 \times \text{ECHOBSA} \end{aligned}$$

ECHOMASS_Z

$$\text{ECHOMASS_Z} = (\text{ECHOMASS} - \text{mean}) / \text{sd}$$

where

$$\begin{aligned} \text{mean} &= 58.61147 \times \text{ECHOBSA}^{1.34317} + 0.61749 \\ \text{sd} &= -0.58231 + 11.07495 \times \text{ECHOBSA} \end{aligned}$$

ECHOMV_Z

$$\text{ECHOMV_Z} = (\text{ECHOMV} - \text{mean}) / \text{sd}$$

where

$$\text{mean} = -0.00181 \times \text{AGE} + 0.90954$$

$$\text{sd} = 0.15576 - 0.00277 \times \text{AGE}$$