Section A: KEY IDENTIFYING INFORMATION

A1. Echocardiogram Identification Number ___ ___ - ___ ___ ___ ___ ___ - ___

Replaced by blinded ID

blind_id	Blinded ID

A2. Date of echocardiogram ___ ___ / ___ ___ / ___ ___ ___ ___
M M D D Y Y Y Y

Replaced by age at echocardiogram

echo_age	A2. <created var>Age at echocardiogram, days

A3. Reader Identification Number ___

Removed to protect privacy

A4. Core Lab echocardiogram Accession Identifier ___ ___ ___ ___ ___ ___ ___ ___ ___

Removed to protect privacy

A5. Date of central reading ___ ___ / ___ ___ / ___ ___ ___ ___
M M D D Y Y Y Y

Replaced by age at central reading

read_age	A5. <created var>Age at central reading, days

A6. Acceptable YES ..... 1 NO 2

STOP – FORM COMPLETE

ACPTECHO	A6. Acceptable

a. Image quality EXCELLENT ..... 1 GOOD ..... 2 FAIR 3

ECHOQLTY	A6a. Image Quality

A7. Baseline (enrollment) echo YES ..... 1 NO 2

ONLY COMPLETE SECTION B **ONLY COMPLETE SECTION C**

BASELINE	A7. Baseline (enrollment) echo

Section B: BASELINE ECHOCARDIOGRAM RESULTS

B1. Left atrioventricular valve regurgitation

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

LAVREGRB	B1. Left atrioventricular valve regurgitation

a. Severity MILD ..... 1 MODERATE ..... 2 SEVERE 3

LAVRSVB	B1a. Severity

B2. Right atrioventricular valve regurgitation

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

RAVREGRB	B2. Right atrioventricular valve regurgitation

a. Severity MILD ..... 1 MODERATE ..... 2 SEVERE 3

RAVRSVB	B2a. Severity

B3. Common atrioventricular valve regurgitation

YES 1
NO 2 (**B4**)
STRUCTURE NOT PRESENT ..... -1 (**B4**)
INDETERMINATE ..... -8 (**B4**)

CAVREGRB	B3. Common atrioventricular valve regurgitation

a. Severity MILD ..... 1 MODERATE ..... 2 SEVERE 3

CAVRSVB	B3a. Severity

B4. Systemic ventricular dysfunction

NONE.....1
MILD 2
MODERATE.....3
SEVERE 4
INDETERMINATE.....-8

SVDYSFUB	B4. Systemic ventricular dysfunction

Section C: FOLLOW-UP ECHOCARDIOGRAM RESULTS

C1. Left atrioventricular valve regurgitation

YES 1
NO 2 (**C2**)
STRUCTURE NOT PRESENT....-1 (**C2**)
INDETERMINATE.....-8 (**C2**)

LAVREGRG	C1. Left atrioventricular valve regurgitation

a. Severity MILD.....1 MODERATE .....2 SEVERE..... 3

LAVRSVR	C1a. Severity

b. Lateral proximal jet width ___ . ___ ___ cm

LAVRPJLW	C1b. Lateral proximal jet width, cm

c. Anteroposterior proximal jet width ___ . ___ ___ cm

LAVRPJAW	C1c. Anteroposterior proximal jet width, cm

C2. Left atrioventricular valve stenosis

YES 1
NO 2 (**C3**)
STRUCTURE NOT PRESENT....-1 (**C3**)
INDETERMINATE.....-8 (**C3**)

LAVSTEN	C2. Left atrioventricular valve stenosis

a. Severity MILD..... 1 MODERATE ..... 2 SEVERE..... 3

LAVSSVR	C2a. Severity

b. Heart rate ___ ___ ___ beats/min

LAVSHRTR	C2b. Heart rate, beats/min

c. Peak jet velocity ___ **.** ___ ___ m/sec

LAVSPKJT	C2c. Peak jet velocity, m/sec

d. Mean jet velocity ___ **.** ___ ___ m/sec

LAVSMNJT	C2d. Mean jet velocity, m/sec

C3. Right atrioventricular valve regurgitation

YES 1
NO 2 (**C4**)
STRUCTURE NOT PRESENT....-1 (**C4**)
INDETERMINATE.....-8 (**C4**)

RAVREGRG	C3. Right atrioventricular valve regurgitation

a. Severity MILD..... 1 MODERATE .....2 SEVERE..... 3

RAVRSVR	C3a. Severity

b. Lateral proximal jet width ___ **.** ___ ___ cm

RAVRPJLW	C3b. Lateral proximal jet width, cm

c. Anteroposterior proximal jet width ___ . ___ ___ cm

RAVRPJAW	C3c. Anteroposterior proximal jet width, cm

C4. Right atrioventricular valve stenosis

YES 1
NO 2 (**C5**)
STRUCTURE NOT PRESENT....-1 (**C5**)
INDETERMINATE.....-8 (**C5**)

RAVSTEN	C4. Right atrioventricular valve stenosis

a. Severity MILD..... 1 MODERATE 2

RAVSSVR	C4a. Severity

b. Heart rate ___ ___ ___ beats/min

RAVSHRTR	C4b. Heart rate, beats/min

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

RAVSPKJT	C4c. Peak jet velocity, m/sec

d. Mean jet velocity ___ . ___ ___ m/sec

RAVSMNJT	C4d. Mean jet velocity, m/sec

C5. Common atrioventricular valve regurgitation

YES 1
NO 2 (**C6**)
STRUCTURE NOT PRESENT....-1 (**C6**)
INDETERMINATE.....-8 (**C6**)

CAVREGRG	C5. Common atrioventricular valve regurgitation

a. Severity MILD..... 1 MODERATE 2

CAVRSVR	C5a. Severity

b. Lateral proximal jet width ___ . ___ ___ cm

CAVRPJLW	C5b. Lateral proximal jet width, cm

c. Anteroposterior proximal jet width ___ . ___ ___ cm

CAVRPJAW	C5c. Anteroposterior proximal jet width, cm

C6. Common atrioventricular valve stenosis

YES 1
NO 2 (**C7**)
STRUCTURE NOT PRESENT....-1 (**C7**)
INDETERMINATE.....-8 (**C7**)

CAVSTEN	C6. Common atrioventricular valve stenosis

a. Severity MILD..... 1 MODERATE 2

CAVSSVR	C6a. Severity

b. Heart rate ___ ___ ___ beats/min

CAVSHRTR	C6b. Heart rate, beats/min

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

CAVSPKJT	C6c. Peak jet velocity, m/sec

d. Mean jet velocity ___ . ___ ___ m/sec

CAVSMNJT	C6d. Mean jet velocity, m/sec

C7. Native aortic valve regurgitation

YES.....1
NO 2 (**C8**)
STRUCTURE NOT PRESENT... -1 (**C8**)
INDETERMINATE..... -8 (**C8**)

NAVREGRG	C7. Native aortic valve regurgitation

a. Severity MILD.....1 MODERATE .....2 SEVERE.....3

NAVSEVER	C7a. Severity

b. Anteroposterior proximal jet width ___ . ___ ___ cm

NAVPJTW	C7b. Anteroposterior proximal jet width, cm

C8. Native pulmonary valve regurgitation

YES 1
NO 2 (**C9**)
STRUCTURE NOT PRESENT....-1 (**C9**)
INDETERMINATE.....-8 (**C9**)

NPVREGRG	C8. Native pulmonary valve regurgitation

a. Severity MILD.....1 MODERATE .....2 SEVERE.....3

NPVSEVER	C8a. Severity

b. Anteroposterior proximal jet width ___ . ___ ___ cm

NPVPJTW	C8b. Anteroposterior proximal jet width, cm

C9. Systemic ventricular outflow tract obstruction

YES 1
NO 2 (**C10**)
INDETERMINATE.....-8 (**C10**)

SVOTRCOB	C9. Systemic ventricular outflow tract obstruction

a. Severity MILD..... 1 MODERATE ..... 2 SEVERE..... 3

SVOSEVER	C9a. Severity

b. Peak jet velocity ___ . ___ ___ m/sec

SVOPKJT	C9b. Peak jet velocity, m/sec

c. Mean jet velocity ___ . ___ ___ m/sec

SVOMNJT	C9c. Mean jet velocity, m/sec

C10. Aortopulmonary anastomosis obstruction

YES 1
NO 2 (**C11**)
STRUCTURE NOT PRESENT....-1 (**C11**)
INDETERMINATE.....-8 (**C11**)

AAOBSTR	C10. Aortopulmonary anastomosis obstruction

a. Severity MILD..... 1 MODERATE ..... 2 SEVERE..... 3

AASEVER	C10a. Severity

b. Peak jet velocity ___ . ___ ___ m/sec

AAPKJET	C10b. Peak jet velocity, m/sec

c. Mean jet velocity ___ . ___ ___ m/sec

AAMNJET	C10c. Mean jet velocity, m/sec

C11. Aortic arch obstruction

YES.....1
NO 2 (**C12**)
INDETERMINATE..... -8 (**C12**)

AARCHOB	C11. Aortic arch obstruction

a. Severity MILD .....1 MODERATE.....2 SEVERE..... 3

AARCHSV	C11a. Severity

b. Peak jet velocity ___ **.** ___ ___ m/sec

AARCHPKJ	C11b. Peak jet velocity, m/sec

c. Mean jet velocity ___ **.** ___ ___ m/sec

AARCHMNJ	C11c. Mean jet velocity, m/sec

C12. Pulmonary venous obstruction

YES 1
NO 2 (**C13**)
INDETERMINATE..... -8 (**C13**)

PVOBSTR	C12. Pulmonary Venous Obstruction

a. Severity MILD .....1 MODERATE..... 2 SEVERE 3

PVSEVERE	C12a. Severity

b. Peak jet velocity ___ **.** ___ ___ m/sec

PVPKJET	C12b. Peak jet velocity, m/sec

c. Mean jet velocity ___ **.** ___ ___ m/sec

PVMNJET	C12c. Mean jet velocity, m/sec

C13. Pulmonary vein Doppler

RECORDED 1
NOT RECORDED.....2 (**C14**)
INADEQUATE 3 (**C14**)

PULVDPLR	C13. Pulmonary vein Doppler

a. Duration of flow reversal during atrial systole ___ ___ ___ msec

PVDFLRVS	C13a. Duration of flow reversal, msec

C14. Pericardial effusion

YES 1
NO 2 (**C15a**)
INDETERMINATE..... -8 (**C15a**)

PERIEFF	C14. Pericardial effusion

a. Severity MILD ..... 1 MODERATE .....2 SEVERE 3

PERIEFSV	C14a. Severity

C15.a Left-sided ventricular dysfunction

NONE 1
MILD 2
MODERATE.....3
SEVERE 4
STRUCTURE NOT PRESENT ... -1 (**C15b**)
INDETERMINATE..... -8 (**C15b**)

LVDYSFUN	C15a. Left-sided ventricular dysfunction

1. Heart rate ___ ___ ___ beats/min

LVHRTRT	C15a1. Heart rate, beats/min

2. 2D end-diastolic volume ___ ___ ___ **.** ___ ml

LVEDV2D	C15a2. 2D end-diastolic volume, mL

3. 2D end-systolic volume ___ ___ ___ . ___ ml

LVESV2D	C15a3. 2D end-systolic volume, mL

4. 2D end-diastolic volume epi ___ ___ ___ . ___ ml

LVEDVEPI	[Ver. A Only] C15a4. 2D end-diastolic volume epi, mL
LVEPIV2D	[Added Ver. B] C15a4. 2D end-diastolic volume epi, mL

5. 2D ejection fraction ___ ___ . ___ %

LVEF2D	C15a5. 2D ejection fraction, %

6. 2D mass ___ ___ ___ . ___ gm

LVMASS2D	C15a6. 2D mass, gm

C15.b Right-sided ventricular dysfunction

NONE 1
MILD 2
MODERATE.....3
SEVERE 4
STRUCTURE NOT PRESENT ... -1 (**C16**)
INDETERMINATE..... -8 (**C16**)

RVDYSFUN	C15b. Right-sided ventricular dysfunction

1. Heart rate ___ ___ ___ beats/min

RVHRTRT	C15b1. Heart rate, beats/min

2. 2D end-diastolic volume ___ ___ ___ . ___ ml

RVEDV2D	C15b2. 2D end-diastolic volume, mL

3. 2D end-systolic volume ___ ___ ___ . ___ ml

RVESV2D	C15b3. 2D end-systolic volume, mL

4. 2D end-diastolic volume epi ___ ___ ___ . ___ ml

RVEDVEPI	[Ver. A Only] C15b4. 2D end-diastolic volume epi, mL
RVEPIV2D	[Added Ver. B] C15b4. 2D end-diastolic volume epi, mL

5. 2D ejection fraction ___ ___ . ___ %

RVEF2D	C15b5. 2D ejection fraction, %
RVCI	<created var> Cardiac Index (L/min per sq. m.)

6. 2D mass ___ ___ ___ . ___ gm

RVMASS2D	C15b6. 2D mass, gm
RVCI	<created var> Cardiac Index (L/min per sq. m.)

C16. Ventricular dominance

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

VENDOM	C16. Ventricular dominance

C17. Left atrioventricular valve inflow velocity

RECORDED 1
NOT RECORDED..... 2 (**C18**)
INADEQUATE..... 3 (**C18**)
STRUCTURE NOT PRESENT...-1 (**C18**)

MITINFV	C17. Left atrioventricular valve inflow velocity

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

MITINFRH	C17a. Rhythm

a1. If OTHER, specify: _____

MITINFRO	C17a1. Specify other

b. Heart rate ___ ___ ___ beats/min

MITINFHR	C17b. Heart rate, beats/min

c. Summation wave YES..... 1 NO 2

(**If C17c=1, SKIP to C18**)

MITINFSW	C17c. Summation wave

d. Peak early velocity ___ . ___ ___ m/sec

MITINPEV	C17d. Peak early velocity, m/sec

e. Peak atrial velocity ___ . ___ ___ m/sec

MITINPAV	C17e. Peak atrial velocity, m/sec

f. Early deceleration time ___ ___ ___ ___ msec

MITINEDT	C17f. Early deceleration time, msec

g. A-wave duration ___ ___ ___ msec

MITINAWV	C17g. A-wave duration, msec

C18. Right atrioventricular valve inflow velocity

RECORDED..... 1
NOT RECORDED 2 (**C19**)
INADEQUATE 3 (**C19**)
STRUCTURE NOT PRESENT .. -1 (**C19**)

TRICINV	C18. Right atrioventricular valve inflow velocity

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

TRICINRH	C18a. Rhythm

a1. If OTHER, specify: _____

TRICINRO	C18a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

TRICINHR	C18b. Heart rate, beats/min

c. Summation wave YES .....1 NO 2

(**If C18c=1, SKIP to C19**)

TRICINSW	C18c. Summation wave

d. Peak early velocity ___ **.** ___ ___ m/sec

TRICIPEV	C18d. Peak early velocity, m/sec

e. Peak atrial velocity ___ **.** ___ ___ m/sec

TRICIPAV	C18e. Peak atrial velocity, m/sec

f. Early deceleration time ___ ___ ___ ___ msec

TRICIEDT	C18f. Early deceleration time, msec

g. A-wave duration ___ ___ ___ msec

TRICIAWV	C18g. A-wave duration, msec

C19. Common atrioventricular valve inflow velocity

RECORDED..... 1
NOT RECORDED 2 (**C20**)
INADEQUATE 3 (**C20**)
STRUCTURE NOT PRESENT .. -1 (**C20**)

CAVINFV	C19. Common atrioventricular valve inflow velocity

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

CAVIVRH	C19a. Rhythm

a1. If OTHER, specify: _____

CAVIVRO	C19a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

CAVIVHR	C19b. Heart rate, beats/min

c. Summation wave YES .....1 NO.....2

(**If C19c=1, SKIP to C20**)

CAVIVSW	C19c. Summation wave

d. Peak early velocity ___ **.** ___ ___ m/sec

CAVIVPEV	C19d. Peak early velocity, m/sec

e. Peak atrial velocity ___ **.** ___ ___ m/sec

CAVIVPAV	C19e. Peak atrial velocity, m/sec

f. Early deceleration time ___ ___ ___ ___ msec

CAVIVEDT	C19f. Early deceleration time, msec

g. A-wave duration ___ ___ ___ msec

CAVIVAWV	C19g. A-wave duration, msec

C20. Left lateral atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
NOT RECORDED..... 2 (**C21**)
INADEQUATE..... 3 (**C21**)
STRUCTURE NOT PRESENT....-1 (**C21**)

LLAVAV	C20. Left lateral atrioventricular valve annulus velocity

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

LLAVAVRH	C20a. Rhythm

a1. If OTHER, specify: _____

LLAVAVRO	C20a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

LLAVAVHR	C20b. Heart rate, beats/min

c. Summation wave YES .....1 (**C20e**) NO.....2

LLAVAVSW	C20c. Summation wave

d. Peak atrial diastolic velocity ___ ___ **.** ___ cm/sec

LLAVAADV	C20d. Peak atrial diastolic velocity, cm/sec

e. Peak early diastolic velocity ___ ___ **.** ___ cm/sec

LLAVAEDV	C20e. Peak early diastolic velocity, cm/sec

f. Peak systolic velocity ___ ___ **.** ___ cm/sec

LLAVAPSV	C20f. Peak systolic velocity, cm/sec

g. Isovolumic contraction time ___ ___ ___ msec

LLAVAICT	C20g. Isovolumic contraction time, msec

h. Isovolumic relaxation time ___ ___ ___ msec

LLAVAIRT	C20h. Isovolumic relaxation time, msec

i. Systolic time ___ ___ ___ msec

LLAVAVST	C20i. Systolic time, msec

j. Diastolic time ___ ___ ___ msec

LLAVAVDT	C20j. Diastolic time, msec

C21. Septal atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
NOT RECORDED..... 2 (**C22**)
INADEQUATE 3 (**C22**)
STRUCTURE NOT PRESENT ... -1 (**C22**)

SAVAV	C21. Septal atrioventricular valve annulus velocity

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

SAVAVRHY	C21a. Rhythm

a1. If OTHER, specify: _____

SAVAVROT	C21a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

SAVAVHR	C21b. Heart rate, beats/min

c. Summation wave YES .....1 (**C21e**) NO.....2

SAVAVSW	C21c. Summation wave

d. Peak atrial diastolic velocity ___ ___ **.** ___ cm/sec

SAVAVPAV	C21d. Peak atrial diastolic velocity, cm/sec

e. Peak early diastolic velocity ___ ___ . ___ cm/sec

SAVAVPEV	C21e. Peak early diastolic velocity, cm/sec

f. Peak systolic velocity ___ ___ . ___ cm/sec

SAVAVPSV	C21f. Peak systolic velocity, cm/sec

g. Isovolumic contraction time ___ ___ ___ msec

SAVAVICT	C21g. Isovolumic contraction time, msec

h. Isovolumic relaxation time ___ ___ ___ msec

SAVAVIRT	C21h. Isovolumic relaxation time, msec

i. Systolic time ___ ___ ___ msec

SAVAVST	C21i. Systolic time, msec

j. Diastolic time ___ ___ ___ msec

SAVAVDT	C21j. Diastolic time, msec

C22. Right lateral atrioventricular valve annulus velocity (tissue Doppler)

RECORDED 1
NOT RECORDED..... 2 (**C23**)
INADEQUATE 3 (**C23**)
STRUCTURE NOT PRESENT ... -1 (**C23**)

RLAVAV	C22. Right lateral atrioventricular valve annulus velocity

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

RLAVAVRH	C22a. Rhythm

a1. If OTHER, specify: _____

RLAVAVRO	C22a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

RLAVAVHR	C22b. Heart rate, beats/min

c. Summation wave YES .....1 (**C22e**) NO.....2

RLAVAVSW	C22c. Summation wave

d. Peak atrial diastolic velocity ___ ___ . ___ cm/sec

RLAVAVPA	C22d. Peak atrial diastolic velocity, cm/sec

e. Peak early diastolic velocity ___ ___ . ___ cm/sec

RLAVAVPE	C22e. Peak early diastolic velocity, cm/sec

f. Peak systolic velocity ___ ___ . ___ cm/sec

RLAVAVPS	C22f. Peak systolic velocity, cm/sec

g. Isovolumic contraction time ___ ___ ___ msec

RLAVAVIC	C22g. Isovolumic contraction time, msec

h. Isovolumic relaxation time ___ ___ ___ msec

RLAVAVIR	C22h. Isovolumic relaxation time, msec

i. Systolic time ___ ___ ___ msec

RLAVAVST	C22i. Systolic time, msec

j. Diastolic time ___ ___ ___ msec

RLAVAVDT	C22j. Diastolic time, msec

C23. Left-sided ventricular flow propagation rate (M-mode color Doppler)

RECORDED..... 1
NOT RECORDED 2 (**C24**)
INADEQUATE 3 (**C24**)
STRUCTURE NOT PRESENT ... -1 (**C24**)

LVFPR	C23. Left-sided ventricular flow propagation rate

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

LVFPRRH	C23a. Rhythm

a1. If OTHER, specify: _____

LVFPRROT	C23a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

LVFPRHR	C23b. Heart rate, beats/min

c. Flow propagation rate ___ ___ ___ **.** ___ cm/sec

LVFPRFPR	C23c. Flow propagation rate, cm/sec

C24. Right-sided ventricular flow propagation rate (M-mode color Doppler)

RECORDED..... 1
NOT RECORDED 2 (**C25**)
INADEQUATE 3 (**C25**)
STRUCTURE NOT PRESENT ... -1 (**C25**)

RVFPR	C24. Right-sided ventricular flow propagation rate

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

RVFPRRH	C24a. Rhythm

a1. If OTHER, specify: _____

RVFPRRO	C24a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

RVFPRHR	C24b. Heart rate, beats/min

c. Flow propagation rate ___ ___ ___ . ___ cm/sec

RVFPRFPR	C24c. Flow propagation rate, cm/sec

C25. Common ventricular flow propagation rate (M-mode color Doppler)

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

CVFPR	C25. Common ventricular flow propagation rate

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

CVFPRRH	C25a. Rhythm

a1. If OTHER, specify: _____

CVFPRRO	C25a1. If OTHER, specify

b. Heart rate ___ ___ ___ beats/min

CVFPRHR	C25b. Heart rate, beats/min

c. Flow propagation rate ___ ___ ___ . ___ cm/sec

CVFPRFPR	C25c. Flow propagation rate, cm/sec

Appendix A
Created variables: Anatomy

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

lloop	<created var> L-loop configuration

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 S101 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
	A1.07.01	Other single ventricle, mostly left ventricle
	A3.01	Pulmonary atresia with intact ventricular septum
	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
	A1.07.02	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

vent_type	<created var> Ventricular type

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 and DT < 140), where

E/A = ratio of early to late AV valve diastolic velocities
DT = AV valve deceleration time.

RESTRICT	<created var> Restrictive diastolic filling pattern: 1=present 2=absent

Appendix B
Created variables: Regurgitation

OAVVREGURG (0=None, 1=Mild, 2=Moderate, 3=Severe, -8 Indetermine)
OAVVREGB: Same as OAVVREGURG, but only if measured at baseline

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 C1a (left AV valve regurgitation) and C3a (right AV valve regurgitation) from S302 (Core Lab Echo Form) as follows:

Left regurg. (C1a)	Operator	Right regurg. (C3a)	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. (C3a)
Available	AND	Unavailable	Left regurg. (C1a)
Unavailable	AND	Unavailable	Common AV valve regurg. (C5a)

oavvregb	<created var> Baseline overall AV valve regurgitation degree 0=None 1=Mild 2=Moderate 3=Severe -8=Indetermine
oavvregrg	<created var> Follow up overall AV valve regurgitation degree 0=None 1=Mild 2=Moderate 3=Severe -8=Indeterminate

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 C7a (native aortic valve regurgitation) and BC8a (native pulmonary valve regurgitation) from S302 (Core Lab Echo Form) as follows:

NAoV regurg. (C7a)	Operator	NPV regurg. (C8a)	Semilunar regurg. (SLVREGURG)
Indeterminate	OR	Indeterminate	Indeterminate
None	--	--	None
Structure not present	--	--	NPV regurg. (C8a)
--	--	None	None
--	--	Structure not present	NAoV regurg. (C7a)
Severe	OR	Severe	Severe
Moderate	AND	Moderate	Severe
Moderate	OR	Moderate	Moderate
Mild	AND	Mild	Moderate
Mild	OR	Mild	Mild

slvregurg	<created var> Follow up semilunar valve regurgitation degree 0=None 1=Mild 2=Moderate 3=Severe -8=Indeterminate

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: (total EDV – total ESV) / (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	--

ovdysfun	<created var> Overall ventricular dysfunction (same as total EF, %)

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 ≤ 2) and (DT ≥ 140 msec) and (E/TDE ≤ 10)
Impaired relaxation	E/A ≤ 1
Pseudo-normalization	(1<E/A ≤ 2) and [(DT < 140 msec) or (E/TDE > 10) or (FP < 55 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

GRADE	<created var> Diastolic dysfunction grade 0=normal, 1=impaired relaxation, 2=pseudonormalization, 3=restrictive

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 C19 (common AV valve inflow velocity) is recorded:

TDE1 = C20c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDE2 = C22c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDA1 = C20d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)
TDA2 = C22d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If C6 (common AV valve stenosis) = no and
C19a (common AV valve inflow velocity) = sinus rhythm then:

E1 = C19d (common AV valve inflow velocity, peak early velocity, m/sec)

If C6 (common AV valve stenosis) = no and
C25a (common ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = C25c (common ventricular flow propagation rate, cm/sec)

If C6 (common AV valve stenosis) = no and
C19a (common AV valve inflow velocity) = sinus rhythm and
C19c (common AV valve inflow velocity, summation wave) = no then:

A1 = C19e (common AV valve inflow velocity, peak atrial velocity, m/sec)
DT1 = C19f (common AV valve inflow velocity, early deceleration time, msec)
AT1 = C19g (common AV valve inflow velocity, A-wave duration, msec)

Otherwise if right ventricular morphology:

TDE1 = C21c (septal AV annulus velocity, peak early diastolic velocity, cm/sec)
TDE2 = C22c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDA1 = C21d (septal AV annulus velocity, peak atrial diastolic velocity, cm/sec)
TDA2 = C22d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If C4 (right AV valve stenosis) = no and
C18a (right AV valve inflow velocity) = sinus rhythm then:

E1 = C18d (right AV valve inflow velocity, peak early velocity, m/sec)

If C4 (right AV valve stenosis) = no and
C24a (right-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = C24c (right-sided ventricular flow propagation rate, cm/sec)

If C4 (right AV valve stenosis) = no and
C18a (right AV valve inflow velocity) = sinus rhythm and
C18c (right AV valve inflow velocity, summation wave) = no then:

A1 = C18e (right AV valve inflow velocity, peak atrial velocity, m/sec)
DT1 = C18f (right AV valve inflow velocity, early deceleration time, msec)
AT1 = C18g (right AV valve inflow velocity, A-wave duration, msec)

Otherwise if left ventricular morphology:

TDE1 = C20c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDE2 = C21c (septal AV annulus velocity, peak early diastolic velocity, cm/sec)
TDA1 = C20d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)
TDA2 = C21d (septal AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If C2 (left AV valve stenosis) = no and
C17a (left AV valve inflow velocity) = sinus rhythm then:

E1 = C17d (left AV valve inflow velocity, peak early velocity, m/sec)

If C2 (left AV valve stenosis) = no and
C23a (left-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = C23c (left-sided ventricular flow propagation rate, cm/sec)

If C2 (left AV valve stenosis) = no and
C17a (left AV valve inflow velocity) = sinus rhythm and
C17c (left AV valve inflow velocity, summation wave) = no then:

A1 = C17e (left AV valve inflow velocity, peak atrial velocity, m/sec)
DT1 = C17f (left AV valve inflow velocity, early deceleration time, msec)
AT1 = C17g (left AV valve inflow velocity, A-wave duration, msec)

Otherwise if mixed ventricular morphology:

TDE1 = C20c (left lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDE2 = C22c (right lateral AV annulus velocity, peak early diastolic velocity, cm/sec)
TDA1 = C20d (left lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)
TDA2 = C22d (right lateral AV annulus velocity, peak atrial diastolic velocity, cm/sec)

If C2 (left AV valve stenosis) = no and
C17a (left AV valve inflow velocity) = sinus rhythm then:

E1 = C17d (left AV valve inflow velocity, peak early velocity, m/sec)

If C2 (left AV valve stenosis) = no and
C23a (left-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP1 = C23c (left-sided ventricular flow propagation rate, cm/sec)

If C2 (left AV valve stenosis) = no and
C17a (left AV valve inflow velocity) = sinus rhythm and
C17c (left AV valve inflow velocity, summation wave) = no then:

A1 = C17e (left AV valve inflow velocity, peak atrial velocity, m/sec)
DT1 = C17f (left AV valve inflow velocity, early deceleration time, msec)

AT1 = C17g (left AV valve inflow velocity, A-wave duration, msec)

If C4 (right AV valve stenosis) = no and
C18a (right AV valve inflow velocity) = sinus rhythm then:

E2 = C18d (right AV valve inflow velocity, peak early velocity, m/sec)

If C4 (right AV valve stenosis) = no and
C24a (right-sided ventricular flow propagation rate: rhythm) = sinus rhythm then:

FP2 = C24c (right-sided ventricular flow propagation rate, cm/sec)

If C4 (right AV valve stenosis) = no and
C18a (right AV valve inflow velocity) = sinus rhythm and
C18c (right AV valve inflow velocity, summation wave) = no then:

A2 = C18e (right AV valve inflow velocity, peak atrial velocity, m/sec)
DT2 = C18f (right AV valve inflow velocity, early deceleration time, msec)
AT2 = C18g (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 ≠ missing and TDE2 ≠ missing
TDE = TDE1 if TDE2 = missing and TDE1 ≠ missing
TDE = TDE2 if TDE2 ≠ missing and TDE1 = missing
TDE = missing if TDE2 = missing and TDE1 = missing

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

TDA = (TDA1+TDA2)/2 if TDA1 ≠ missing and TDA2 ≠ missing
TDA = TDA1 if TDA2 = missing and TDA1 ≠ missing
TDA = TDA2 if TDA2 ≠ missing and TDA1 = missing
TDA = missing if TDA2 = missing and TDA1 = missing

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

E = (E1+E2)/2 if E1 ≠ missing and E2 ≠ missing
E = E1 if E2 = missing and E1 ≠ missing
E = E2 if E2 ≠ missing and E1 = missing
E = missing if E2 = missing and E1 = missing

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

A = (A1+A2)/2 if A1 ≠ missing and A2 ≠ missing
A = A1 if A2 = missing and A1 ≠ missing
A = A2 if A2 ≠ missing and A1 = missing
A = missing if A2 = missing and A1 = missing

Define DT = Atrioventricular valve deceleration time as follows:

DT = (DT1+DT2)/2 if DT1 ≠ missing and DT2 ≠ missing
DT = DT1 if DT2 = missing and DT1 ≠ missing
DT = DT2 if DT2 ≠ missing and DT1 = missing
DT = missing if DT2 = missing and DT1 = missing

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

AT = (AT1+AT2)/2 if AT1 ≠ 0 and AT2 ≠ missing
AT = AT1 if AT2 = missing and AT1 ≠ missing
AT = AT2 if AT2 ≠ missing and AT1 = missing
AT = missing if AT2 = missing and AT1 = missing

Define FP = Systemic ventricular flow propagation rate as follows:

FP = (FP1+FP2)/2 if FP1 ≠ missing and FP2 ≠ missing
FP = FP1 if FP2 = missing and FP1 ≠ missing
FP = FP2 if FP2 ≠ missing and FP1 = missing
FP = missing if FP2 = missing and FP1 = missing

Define ABS_FP = Absolue systemic ventricular flow propagation rate as follows:

ABS_FP = |FP|

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).

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)

Appendix E
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)	((ECHOEDV - ECHOESV) / ECHOEDV)*100
ECHOSV (Total stroke volume)	ECHOEDV – ECHOESV
ECHOMV (Total mass to volume ratio)	ECHOMASS / 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: $ECHOBSA = 0.024265 \times (height^{0.3964}) \times (weight^{0.5378})$

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

Where,

Height = S300 (B1): height at echocardiogram
Weight = S300 (B2): weight at echocardiogram

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

ECHOEDV_Z

ECHOEDV_Z = (ECHOEDV – mean) / sd

where

mean = $67.28691 \times ECHOBSA^{1.29588} + 0.22832$
sd = $-0.38083 + 12.14673 \times ECHOBSA$

ECHOESV_Z

ECHOESV_Z = (ECHOESV – mean) / sd

where

mean = $22.77436 \times \text{ECHOBSA}^{1.44988} + 0.89823$

sd = $-0.46362 + 5.80264 \times \text{ECHOBSA}$

ECHOEF_Z

ECHOEF_Z = (ECHOEF / 100 – mean) / sd

where

mean = $-0.00002 \times (\text{age at echo})^{1.0} + 0.63006$

sd = $(0.00260 \times (1 + 1/288 + ([(\text{age at echo}) – 6.46024]^2 / 10121.13302)))^{0.5}$

ECHOSV_Z

ECHOSV_Z = (ECHOSV – mean) / sd

where

mean = $44.47654 \times \text{ECHOBSA}^{1.20392} – 1.50044$

sd = $-0.06796 + 7.67581 \times \text{ECHOBSA}$

ECHOMASS_Z

ECHOMASS_Z = (ECHOMASS – mean) / sd

where

mean = $58.61147 \times \text{ECHOBSA}^{1.34317} + 0.61749$

sd = $-0.58231 + 11.07495 \times \text{ECHOBSA}$

ECHOMV_Z

ECHOMV_Z = (ECHOMV – mean) / sd

where

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

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

echoedv	<created var> Total EDV, ml (lvedv2d+rvedv2d)
echoesv	<created var> Total ESV, ml (lvesv2d+rvesv2d)
echosv	<created var> Total Stroke Volume, ml (echoedv-echoesv)
echoef	<created var> Total Ejection Fraction, % ((echoedv - echoesv)/ echoedv)*100
echomass	<created var> Total Ventricular Mass, gm (lvmass2d+rvmass2d)
echomv	<created var> Total mass:volume ratio (echomass / echoedv)
echoedv_z	<created var> Total Echo EDV z-score
echoesv_z	<created var> Total Echo ESV z-score
echosv_z	<created var> Total Echo SV z-score
echoef_z	<created var> Total Echo EF z-score
echomass_z	<created var> Total Echo ventricular mass z-score
echomv_z	<created var>Echo mass:volume ratio z-score