

SUPPLEMENTARY

Supplemental Table S1. Literature search syntax

MEDLINE SEARCH

Databases searched: Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE®, 1946 to Present.

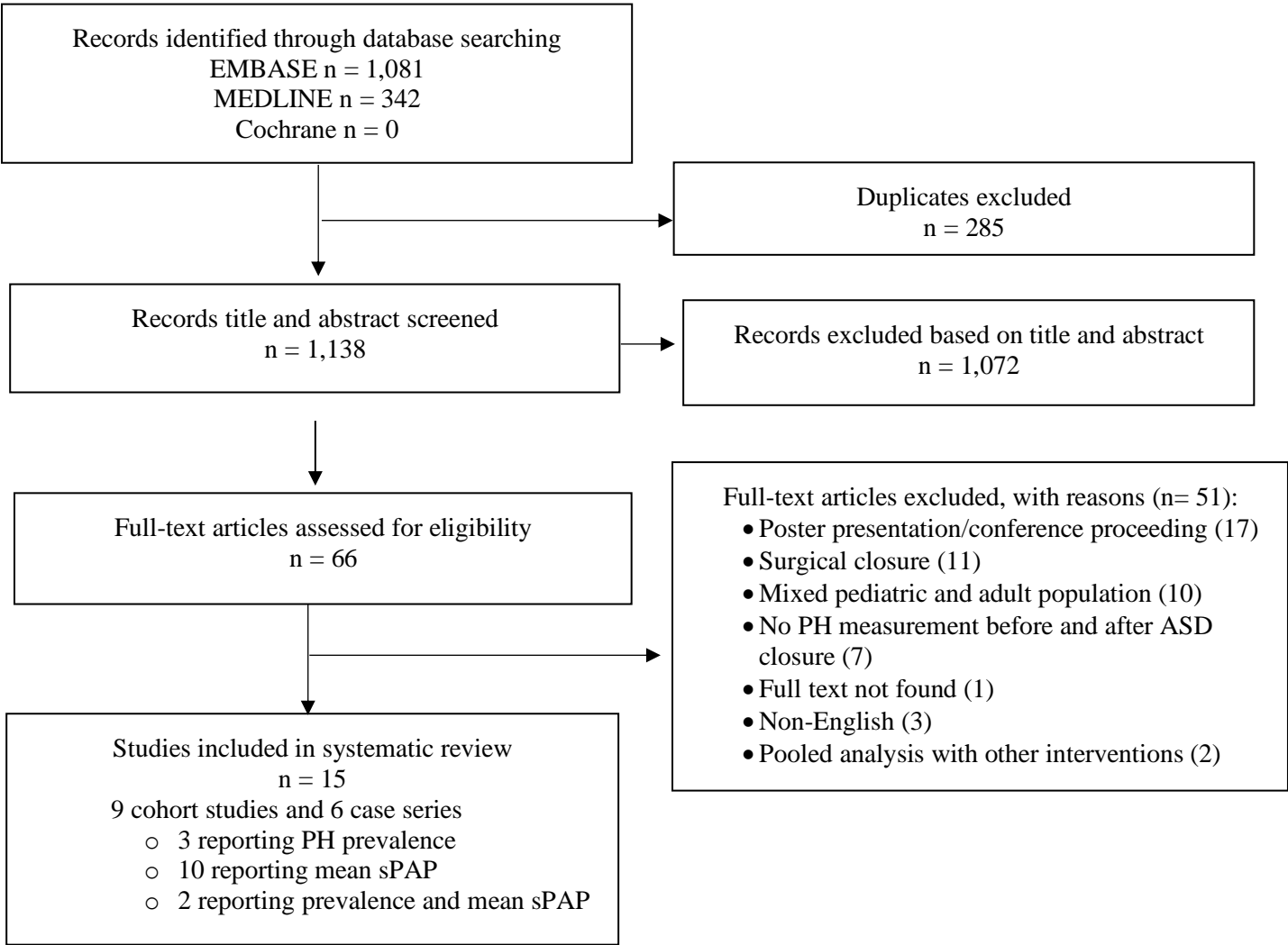
Date: July 13th, 2019

Limits: none

#	Searches	Results
1	Heart Septal Defects, Atrial/	12112
2	(atria* adj4 sept* adj4 defect*).mp,kw.	16764
3	(atria* adj2 sept* adj2 shunt*).mp,kw.	94
4	(interatria* adj3 sept* adj3 defect*).mp,kw.	357
5	(interatria* adj2 sept* adj2 shunt*).mp,kw.	10
6	(atrium adj2 sept* adj2 defect*).mp,kw.	33
7	(atrium adj2 sept* adj2 shunt*).mp,kw.	0
8	(cleft* adj2 heart* adj2 atrium*).mp,kw.	0
9	(secundum adj2 defect*).mp,kw.	380
10	(ostium adj2 secundum).mp,kw.	622
11	(primum adj2 defect*).mp,kw.	170
12	(ostium adj2 primum).mp,kw.	329
13	or/1-12	17060
14	Cardiac Catheterization/	47101
15	Septal Occluder Device/	2475
16	"Prostheses and Implants"/	44806
17	limit 16 to yr="1997 - 2009"	11150
18	(transcatheter* adj4 (closure? or intervention? or treatment? or procedure? or device? or method? or approach?? or technique? or occlus* or repair* or percutaneous)).mp,kw.	7503
19	(trans-catheter* adj2 (closure? or intervention? or treatment? or procedure? or device? or method? or approach?? or technique? or occlus* or repair* or percutaneous)).mp,kw.	123
20	(percutaneous adj5 (closure? or intervention? or treatment? or procedure? or device? or method? or approach?? or technique? or occlus* or repair*)).mp,kw.	68084
21	(device? adj7 (closure? or occlud*)).mp,kw.	7148
22	occluder?.mp,kw.	5914
23	amplatzer.mp,kw.	2744
24	cardio-o-fix.mp,kw.	11
25	cardia-atriasept.mp,kw.	0
26	cardiastar.mp,kw.	3
27	cardia-star.mp,kw.	3
28	cardiaseal.mp,kw.	0
29	cera.mp,kw.	463

30	clamshell.mp,kw.	363
31	das angel wing?.mp,kw.	10
32	intrasept.mp,kw.	8
33	memopart.mp,kw.	1
34	starflex.mp,kw.	96
35	star-flex.mp,kw.	1
36	gorehelex.mp,kw.	1
37	helex.mp,kw.	96
38	cardioform.mp,kw.	16
39	biostar.mp,kw.	86
40	figulla.mp,kw.	59
41	or/14-15,17-40	131259
42	Hypertension, Pulmonary/	33078
43	(Pulmonary adj3 hypertensi*).mp,kw.	51195
44	(Lung? adj3 hypertensi*).mp,kw.	1171
45	(Pulmonary adj3 high blood pressure?).mp,kw.	20
46	(Lung? adj3 high blood pressure?).mp,kw.	18
47	42 or 43 or 44 or 45 or 46	51523
48	13 and 41 and 47	342

Supplemental Figure S1. Flow diagram of literature search and selection of studies



Supplemental Table S2. Quality Assessment Checklist

JBI Critical Appraisal Checklist for Cohort studies*

1. Were the two groups similar and recruited from the same population
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups
3. Was the exposure/outcome (PH) measured in a valid and reliable way? (Did they use RHC?)
4. Were confounding factors identified
5. Were strategies to deal with confounding factors stated
6. Was the follow-up time reported and sufficient to be long enough for outcomes to occur?
7. Was follow-up complete, and if not, were the reasons to loss to follow-up described and explored? (was <20% of the original sample loss to follow-up?)
8. Were strategies to address incomplete follow-up utilized?
9. Was appropriate statistical analysis used?

*Since we were interested in PH before and after the intervention, we joined the original items 3 and 7 into one (item 3 here). For the same reason, we also excluded the original item 6 that was asking if the participants were free of the outcome at the start of the study.

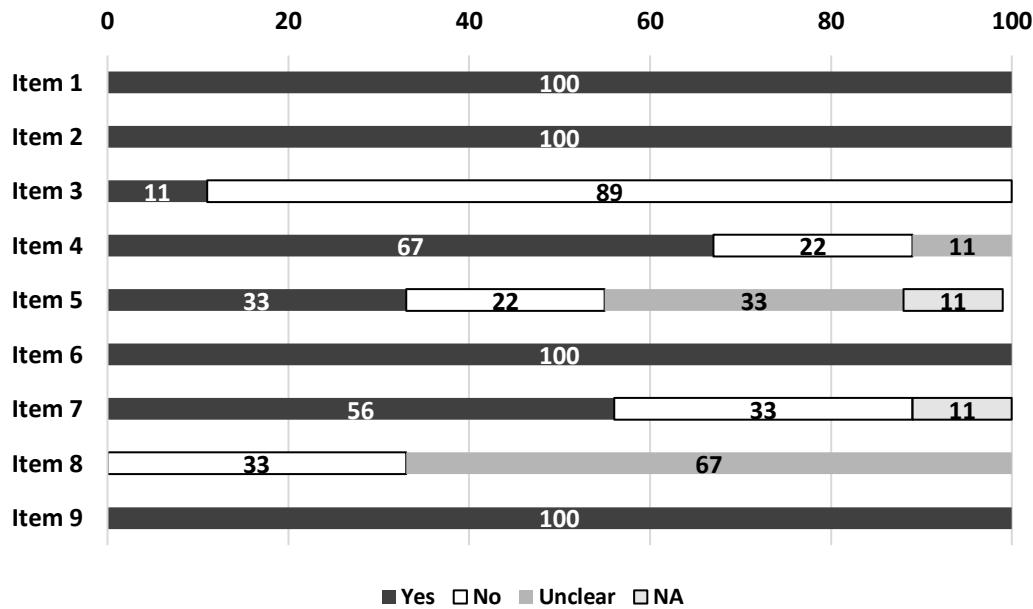
JBI Critical Appraisal Checklist for Case Series

1. Were there clear criteria for inclusion in the case series?
2. Was the condition measured in a standard, reliable way for all participants included in the case series?
3. Were valid methods used for identification of the condition for all participants included in the case series? (Did they use RHC?)
4. Did the case series have consecutive inclusion of participants?
5. Did the case series have complete inclusion of participants?
6. Was there clear reporting of the demographics of the participants in the study?
7. Was there clear reporting of clinical information of the participants?
8. Were the outcomes or follow-up results of cases clearly reported?
9. Was there clear reporting of the presenting clinics demographic information?
10. Was statistical analysis appropriate?

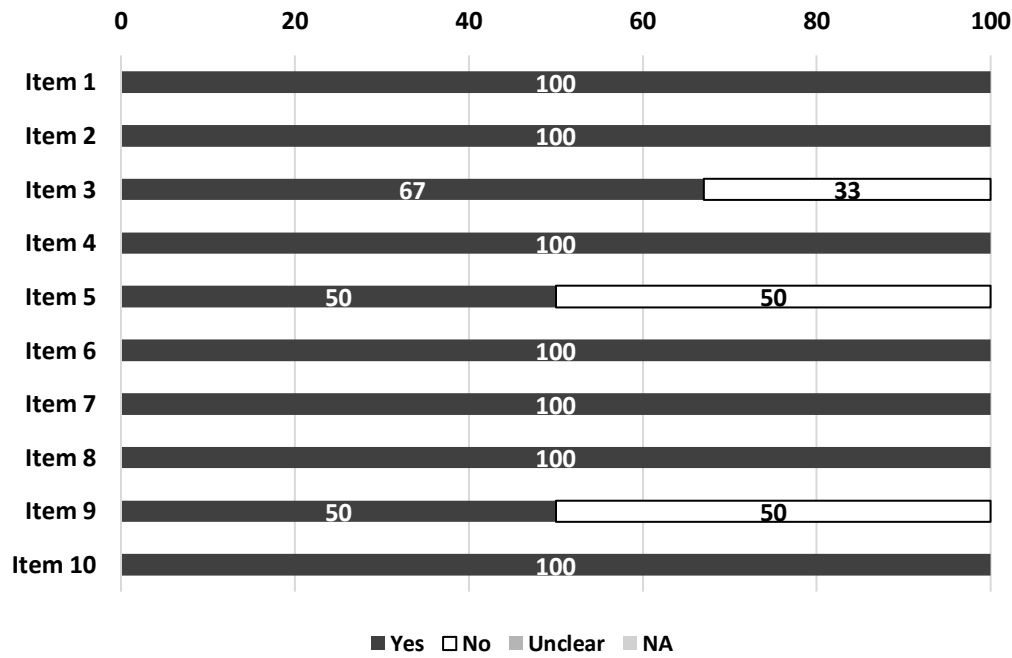
Full checklists available at: https://joannabriggs.org/critical_appraisal_tools

Supplemental Figure S2. Results from JBI critical appraisal checklist, (A) in cohort studies, (B) in case series

A. Critical Appraisal of Cohort Studies



B. Critical Appraisal of Case Series



Supplemental Table S3. Additional details on study characteristics

Study, Year	RVSP before closure (mmHg), Mean, (SD)	RVSP after closure (mmHg), Mean, (SD)	Cardiac medications	Reported outcomes
Veldtman, 2001 (27)	NR	NR	NR	Successful ASD closure in 100% of patients; residual shunts detected in 73% of patients after closure; persistent elevation of PA pressures and persistent RV enlargement at 1-year of follow-up in 29% of patients.
De Lezo, 2002 (28)	NR	NR	NR	Successful ASD closure in 100% of patients; a significant reduction in the percentage of patients with AF after repair (from 41% to 24%) at the mean follow-up of 21 ± 14 months.
Bruch, 2007 (29)	11.6 (4.9)*	9.4 (4.6)*	NR	Successful ASD closure in 100% of patients.
Balint, 2008 (30)	57 (11)	51 (17)	NR	At the late follow-up of 31 ± 15 months, 5% of patients died; overall mean RVSP decreased at late follow-up, but only 43.6% of patients had normalisation (<40 mm Hg); 15.4% of patients had persistent severe PAH.
Yong, 2009 (31)	NR	NR	NR	Successful ASD closure in 194/215 (90.2%), complete closure in 133/215 (71.5%) of patients, and a proportional reduction in atrial tachyarrhythmias of 37.5% at the median follow-up of 15 months (IQR 8 to 43).
Yalonetsky, 2009 (32)	NR	NR	NR	No significant TR observed in any patients at the latest follow-up of 12 months.
Altindag, 2010 (33)	NR	NR	Oral anticoagulants (n=13), antiplatelet drugs (n=8), beta-blockers (n=20), ACE inhibitors (n=10), diuretics (n=9), statins (n=5), cardiac	Successful ASD closure in 100% of patients; minor complications occurred in 10% of patients; at mean follow-up time of 15 months, 7% died during follow-up; 7% required surgical reintervention.

Study, Year	RVSP before closure (mmHg), Mean, (SD)	RVSP after closure (mmHg), Mean, (SD)	Cardiac medications	Reported outcomes
			glycosides (n=6), other medications (n=23)	
Humenberger, 2011 (34)	9 (7,11)*	NR	NR	At early follow-up (< 3 months) successful ASD closure was reported in 100% of patients. After 5 years of closure, one patient developed a large thrombus, three cerebral events were observed, two patients with an ischaemic event, one patient receiving oral anticoagulation for AF had minor cerebellar bleeding.
Huang, 2012 (35)	NR	NR	NR	NR
Kefer, 2012 (36)	47 (7)	47 (8)	NR	No recurrent stroke; symptoms reported before the procedure improved in 88% of patients; freedom from death, cardiac surgery or recurrent embolism was 99% at 1-year and 98% at 5-year follow-up.
Nakagawa, 2012 (37)	40.8 (6.0)*	31.6 (4.5)*	Diuretics, warfarin, antihypertension and anti-arrhythmia drugs	Successful ASD closure in 93% of patients; 8% had residual shunt and 8% died at a mean follow-up of 19.1 ± 11.3 months; pacemaker implantation in 4%; left ventricular remodeling and TR improvement reported.
Mangiafico, 2013 (38)	23.1 (4.7)**	23.7 (3.5)**	NR	At 12 months of follow-up, 63% of patients experienced feelings of fatigue, 77% reported headaches and dyspnea, 57% insomnia, and 87% palpitations; significant reductions in RVEDD, RAD, RV MPI, sPAP and LVEDD.
Akagi, 2015 (39) PHM group 1	NR	NR	Endothelinreceptor antagonists Bosentan (n=5), ambrisentan (n=2), phosphodiesterase type-5 inhibitors (sildenafil (n=5), tadalafil (n=1)),	No adverse events were observed.

Study, Year	RVSP before closure (mmHg), Mean, (SD)	RVSP after closure (mmHg), Mean, (SD)	Cardiac medications	Reported outcomes
Non-PHM group 2			beraprost (n=3), epoprostenol (n=3) None	
Wang, 2017 (40)	NR	NR	NR	At early follow-up of 3 months, 13% of patients developed new onset arrhythmia; 74% of these patients returned to normal sinus rhythm at 12 months of follow-up, 2.3% of patients developed persistent AF, and 8.7% required a pacemaker.
Dalvi, 2019 (41)	NR	NR	All the patients were put on Sildenafil and/or Bosentan at least 3 months before device closure of the ASD.	All patients reported significant symptomatic improvement; reversed remodeling of the right atrium and the right ventricle was seen in all the patients at mean follow-up of 39.5 ± 8.5 months.

ACE, Angiotensin-converting enzyme; AF, atrial fibrillation; IQR, Interquartile range; LVEDD, left ventricle end-diastolic diameter; NR, not reported; PAH, pulmonary arterial hypertension; PHM, pulmonary hypertension medication; RAD, right atrium diastolic size; RVEDD, right ventricle end-diastolic diameter; RV MPI, right ventricle myocardial performance index; RVSP, right ventricular systolic function; sPAP, systolic pulmonary artery pressure; TR, tricuspid regurgitation.

*Estimates for right ventricular end diastolic pressure.

**Estimates for tricuspid annular plane systolic excursion.