Mahidol University
Faculty of Medicine Ramathibodi Hospital
Department of Clinical Epidemiology and Biostatistics

Usage of Propensity score-based studies in NMA: a scoping review

Lertkong Nitiwarangkul, MD.

Last search from PubMed 24/01/2024

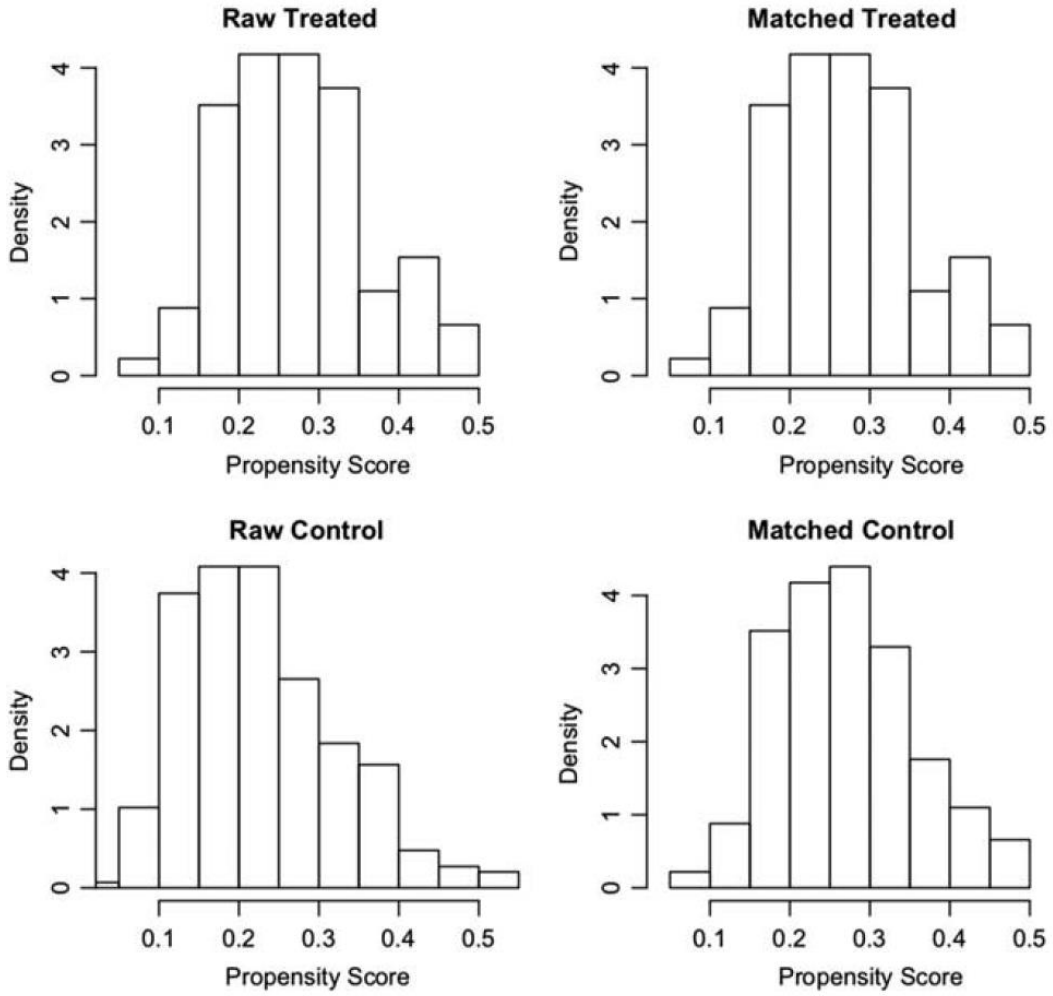
What is propensity score?

- Developed to remove confounding bias when comparing treatment effect in observational study
- By creating new control group
  - Better matched with treatment subject
  - Base on similar probability to receive the treatment
- Use characteristic data to run logistic regression
  - Estimate correlation of each variable
  - Then predicted probability from 0 to 1

Propensity score matching (PSM)

- Each patient from treatment group is matched with patient from control group based on closet probability of treatment

- One method to check after matching
  - Should be no significant difference in covariate characteristics between treatment and control group


Raw Treated
Matched Treated
Raw Control
Matched Control
Density
Propensity Score
0
1
2
3
4
0.1
0.2
0.3
0.4
0.5

Propensity score matching (PSM)

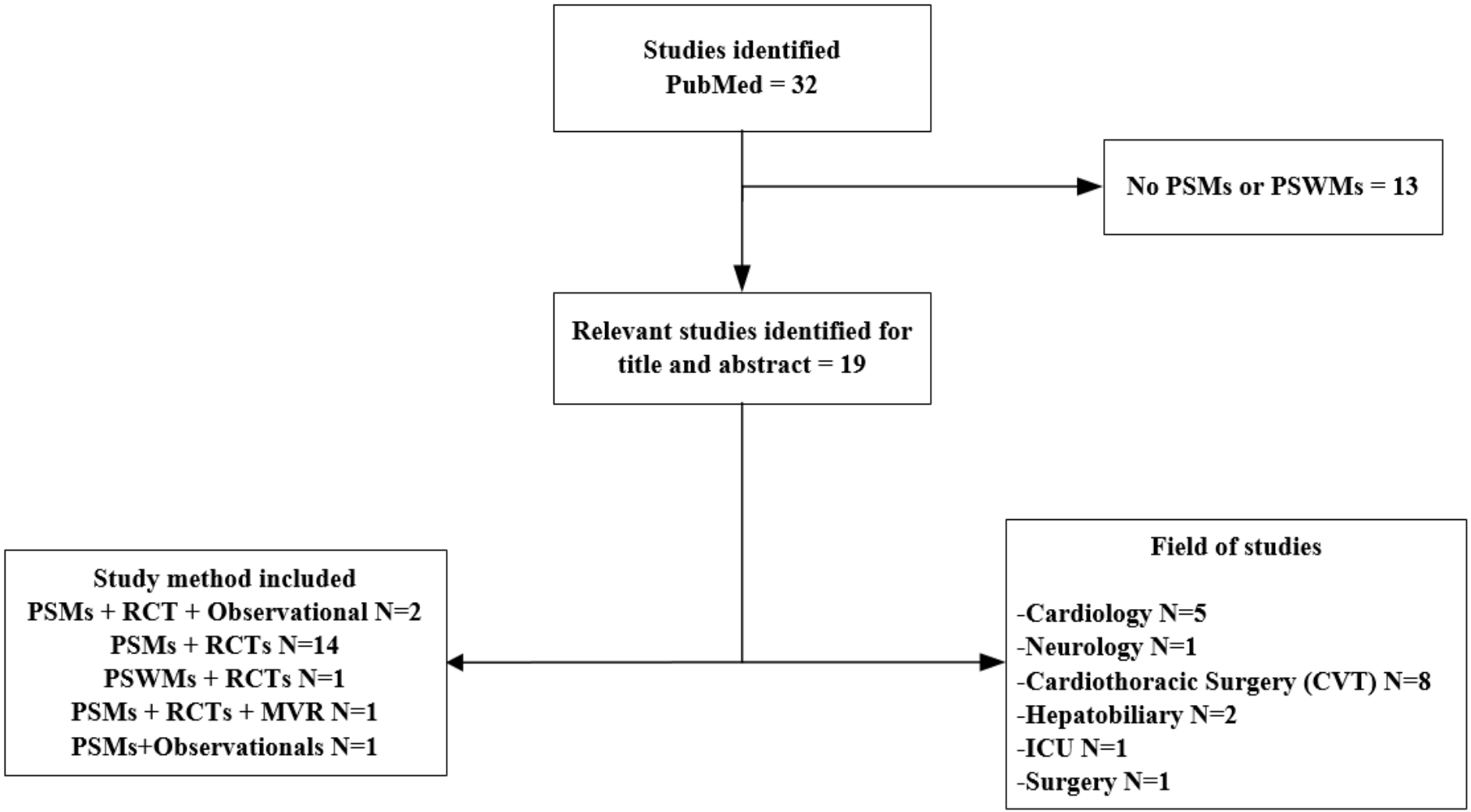
- Limitation
  - Removal of unmatched controls → Discarding of information → Reduce sample size
  - Quality of PSM study → limited by the quality of PS model which depend on availability and selection of confounding predictors

- The reason why PSM not equal to RCT

Search term 24/01/2024

Search	Actions	Details	Query	Results	Time
#5	•••	›	Search: **#3 AND #4** Sort by: **Most Recent**	32	23:15:51
#4	•••	›	Search: **"network meta-analysis"** Sort by: **Most Recent**	10,240	23:15:42
#3	•••	›	Search: **#1 OR #2** Sort by: **Most Recent**	52,665	23:15:34
#2	•••	›	Search: **"inverse probability"** Sort by: **Most Recent**	7,816	23:15:18
#1	•••	›	Search: **"propensity score"** Sort by: **Most Recent**	47,201	23:15:07

Figure 1


Studies identified
PubMed = 32
No PSMs or PSWMs = 13
Relevant studies identified for title and abstract = 19
Study method included
PSMs + RCT + Observational N=2
PSMs + RCTs N=14
PSWMs + RCTs N=1
PSMs + RCTs + MVR N=1
PSMs+Observationals N=1
Field of studies
-Cardiology N=5
-Neurology N=1
-Cardiothoracic Surgery (CVT) N=8
-Hepatobiliary N=2
-ICU N=1
-Surgery N=1

Summarization of presenter paper

Optimal temperature management in aortic arch surgery: A systematic review and network meta-analysis			
Outcome	Intervention	OR (95%CI)	
		Pool All study	Pool only RCT and PSM
Operative mortality	Deep	1.71 (1.23, 2.39)	1.29 (0.85, 1.95)
	Moderate	1.50 (1.12, 2.00)	1.45 (1.05, 2.00)
	Mild	1	1
Postoperative incidence of stroke	Deep	1.50 (1.14, 1.98)	1.74 (1.09, 2.77)
	Moderate	1.03 (0.81, 1.32)	1.08 (0.73, 1.60)
	Mild	1	1
Postoperative incidence of acute kidney insufficiency	Deep	1.09 (0.65, 1.83)	0.91 (0.57, 1.44)
	Moderate	1.07 (0.65, 1.77)	0.81 (0.52, 1.27)
	Mild	1	1

Summarization of studies in a scoping review

Mahidol Unive
Faculty of Medicine Ran
Department of Clinical E

Table 1

Author (Year)	Journal (IF)	NMA method	Study type included	Subgroup or sensitivity analysis
Fong KY (2022)	Annals of the Academy of Medicine, Singapore (8.713)	Frequentist NMA	1.RCTs (18) 2.PSMs (6)	Include only RCTs
Fong KY (2023)	The American Journal of Cardiology (2.778)	Frequentist NMA	1.RCTs (9) 2.PSMs (18)	NA
Kuno T (2021)	Journal of the American Heart Association (6.107)	Frequentist NMA	1.RCTs (4) 2.PSMs (2) 3.Retrospective study (1)	Include only RCTs
Iannaccone M (2020)	Catheter Cardiovascular Intervention (2.585)	Bayesian random effects NMA	1.RCTs (16) 2.PSWMs (17)	Include only RCTs
Ogami T (2022)	Journal of Cardiac Surgery (1.778)	Frequentist NMA	1.RCTs (13) 2.PSMs (29)	Include only RCTs
Stryczyńska KP (2022)	Journal of Neurology and Neurosurgery (10.154)	Bayesian	1.RCTs (2) 2.PSMs (6)	NA
Verardi R (2018)	Journal of Interventional Cardiology (1.783)	Bayesian random effects NMA	1.RCTs (7) 2.PSMs (1)	NA
Yokoyama Y (2022)	The Journal of Cardiovascular Surgery (1.4)	Frequentist NMA	1.RCTs (2) 2.PSMs (19)	NA
Yokoyama Y (2023)	Journal of the American Heart Association (6.107)	Frequentist NMA	1.RCTs (2) 2.PSMs (8)	NA
Yokoyama Y (2021)	Journal of Cardiac Surgery (1.778)	Frequentist NMA	1.RCTs (7) 2.PSMs (5)	Include only RCTs
Yokoyama Y (2021)	Journal of Cardiac Surgery (1.778)	Frequentist NMA	1.RCTs (3) 2.PSMs (10)	NA
Fong KY 3 (2023)	Journal of the American College (1.75)	Frequentist NMA	1.PSMs (6) 2.Cohort (4)	NA
Zhang Y (2022)	Frontiers in Oncology (5.738)	Bayesian random effects NMA	1.RCTs (10) 2.PSMs (15)	NA
Rhee TM (2022)	Frontiers in Cardiovascular Medicine (3.6)	Frequentist NMA of Each DOACs and Warfarin	1.RCTs (5) 2.PSMs (10) 3.MVRs (4)	Direct DOAC vs Warfarin 1.Pool All studies 2.RCTs+PSMs
Kabir T (2022)	Journal of surgery (15.3)	Frequentist NMA	1.RCTs (4) 2.PSMs (23)	NA
Lloyd D (2018)	Journal of Thoracic Disease (2.5)	Bayesian	1.RCTs (7) 2.PSMs (25)	NA
Chow R (2021)	Acta Oncologica (4.311)	Frequentist NMA	1.RCTs (6) 2.PSMs (18)	NA
Low CJW (2024)	Intensive Care Medicine (41.79)	Frequentist NMA	1.RCTs (13) 2.PSMs (25)	NA

Result of individual study

Compare result among pooling methods

Ablation therapies for paroxysmal atrial fibrillation: A systematic review and patient-level network meta-analysis

Outcome	Intervention	HR (95%CI)	
		Pool All study	Pool only RCT
Atrial fibrillation recurrence	CBA+RFA	0.14 (0.07, 0.30)	0.14 (0.06, 0.32)
	CBA	0.35 (0.25, 0.48)	0.34 (0.23, 0.50)
	RFA	0.34 (0.25, 0.47)	0.34 (0.24, 0.49)
	HBA	0.20 (0.10, 0.41)	0.21 (0.09, 0.50)
	LBA	0.43 (0.15, 1.26)	0.38 (0.10, 1.42)
	PVAC	0.33 (0.18,0.62)	0.33 (0.17, 0.66)
	AAD	1	1

AAD: antiarrhythmic drugs; CBA: cryoballoon ablation; CBA + RFA: combined cryoballoon plus radiofrequency ablation; HBA: hot balloon ablation; LBA: laser balloon ablation; PVAC: pulmonary vein ablation catheter; RFA: radiofrequency ablation

League table HR all studies

CBA + RFA						
0.41 (0.20–0.83)	CBA					
0.41 (0.21–0.83)	1.01 (0.79–1.29)	RFA				
0.70 (0.25–1.94)	1.71 (0.80–3.65)	1.69 (0.79–3.63)	HBA			
0.33 (0.09–1.13)	0.80 (0.29–2.21)	0.79 (0.28–2.25)	0.47 (0.13–1.66)	LBA		
0.43 (0.18–1.02)	1.04 (0.59–1.86)	1.03 (0.61–1.74)	0.61 (0.24–1.54)	1.30 (0.40–4.20)	PVAC	
0.14 (0.07–0.30)	**0.35 (0.25–0.48)**	**0.34 (0.25–0.47)**	**0.20 (0.10–0.41)**	0.43 (0.15–1.26)	**0.33 (0.18–0.62)**	AAD

League table HR only RCT studies

CBA+RFA						
0.41 (0.19-0.90)	CBA					
0.41 (0.19-0.90)	1.00 (0.73-1.37)	RFA				
0.68 (0.20-2.30)	1.66 (0.63-4.33)	1.65 (0.64-4.29)	HBA			
0.37 (0.08-1.63)	0.90 (0.26-3.16)	0.90 (0.25-3.28)	0.54 (0.11-.64)	LBA		
0.43 (0.16-1.13)	1.04 (0.53-2.01)	1.03 (0.57-1.86)	0.62 (0.20-1.92)	1.15 (0.28-4.78)	PVAC	
0.14 (0.06-0.32)	**0.34 (0.23-0.50)**	**0.34 (0.24-0.49)**	**0.21 (0.09-0.50)**	0.38 (0.10-1.42)	**0.33 (0.17-0.66)**	AAD

Duration of Antiplatelet Therapy Following Transcatheter Aortic Valve Replacement: Systematic Review and Network Meta-Analysis

Outcome	Intervention	RR (95%CI)	
		Pool All study	Pool only RCT
Major or life-threatening bleeding	3-month DAPT	2.13 (1.33, 3.40)	2.13 (1.33, 3.40)
	6-month DAPT	2.54 (1.49, 4.33)	1.33 (0.31, 5.70)
	SAPT	1	1
Stroke	3-month DAPT	1.13 (0.62, 2.04)	1.13 (0.62, 2.04)
	6-month DAPT	**1.32 (0.62, 2.81)**	**0.50 (0.05, 5.37)**
	SAPT	1	1
All-cause mortality	3-month DAPT	0.98 (0.60, 1.61)	0.98 (0.60, 1.61)
	6-month DAPT	1.05 (0.87, 1.26)	1.00 (0.21, 4.76)
	SAPT	1	1

DAPT: dual antiplatelet therapy; SAPT: single antiplatelet therapy

Comparison between functional and intravascular imaging approaches guiding percutaneous coronary intervention: A network meta-analysis of randomized and propensity matching studies

Outcome	Intervention	OR (95%CI)	
		Pool All study	Pool only RCT
Major Adverse Cardiovascular Events	FFR	0.91 (0.59, 1.39)	0.81 (0.64, 1.02)
	IVUS	0.66 (0.45, 0.97)	0.71 (0.52, 0.88)
	OCT	**0.69 (0.28, 1.74)**	**1.43 (0.25, 18.33)**
	CA	1	1
All-cause death	FFR	0.83 (0.62, 1.13)	0.78 (0.63, 0.98)
	IVUS	0.72 (0.52, 0.97)	0.75 (0.50, 0.97)
	OCT	**0.44 (0.25, 0.79)**	**1.65 (0.22, 13.49)**
	CA	1	1
Myocardial infarction	FFR	**0.75 (0.53, 1.07)**	**0.74 (0.57, 0.99)**
	IVUS	0.67 (0.49, 0.90)	0.82 (0.54, 0.94)
	OCT	0.78 (0.41, 1.51)	0.85 (0.01, 29.18)
	CA	1	1

CA: coronary angiography; FFR: fractional flow reserve; IVUS: intravascular ultrasound; OCT: optical coherence tomography

Minimally invasive versus conventional aortic valve replacement: The network meta-analysis

Outcome	Intervention	RR (95%CI)	
		Pool All study	Pool only RCT
Operative mortality	MS	**0.60 (0.41, 0.90)**	**0.87 (0.36, 2.09)**
	RMT	1.19 (0.61, 2.31)	-
	FS	1	1
Reoperation for bleeding	MS	0.83 (0.64, 1.08)	0.72 (0.36, 1.45)
	RMT	1.37 (0.99, 1.90)	-
	FS	1	1

FS: full sternotomy; MS: mini-sternotomy; RMT: right mini-thoracotomy

Harvesting techniques of the saphenous vein graft for coronary artery bypass: Insights from a network meta-analysis

Outcome	Intervention	HR (95%CI)	
		Pool All study	Pool only RCT
All-cause mortality	EVH	**0.77 (0.65, 0.92)**	**0.77 (0.38, 1.58)**
	NT	0.96 (0.79, 1.15)	0.74 (0.29, 1.88)
	OVH	1	1

Outcome	Intervention	RR (95%CI)	
		Pool All study	Pool only RCT
Graft failure	EVH	1.39 (0.76, 2.56)	1.53 (0.73, 3.24)
	NT	**0.54 (0.32 0.90)**	**0.54 (0.29, 1.02)**
	OVH	1	1

OVH: open vein harvesting; EVH: endoscopic vein harvesting; NT: no-touch vein harvesting

Thank you for your attention