

Appendix 1. Keywords and Mesh Terms

Critically ill OR critical OR critical care AND cumulative positive fluid balance OR positive cumulative fluid balance OR fluid overload AND outcome AND mortality

("critical illness"[MeSH Terms] OR ("critical"[All Fields] AND "illness"[All Fields]) OR "critical illness"[All Fields] OR ("critically"[All Fields] AND "ill"[All Fields]) OR "critically ill"[All Fields]) OR ("critical"[All Fields] OR "critically"[All Fields]) OR ("critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields])) AND (("cumulated"[All Fields] OR "cumulative"[All Fields]) AND ("positive"[All Fields] OR "positively"[All Fields] OR "positiveness"[All Fields] OR "positives"[All Fields] OR "positivities"[All Fields] OR "positivity"[All Fields]) AND ("water electrolyte balance"[MeSH Terms] OR ("water electrolyte"[All Fields] AND "balance"[All Fields]) OR "water electrolyte balance"[All Fields] OR ("fluid"[All Fields] AND "balance"[All Fields]) OR "fluid balance"[All Fields])) OR (("positive"[All Fields] OR "positively"[All Fields] OR "positiveness"[All Fields] OR "positives"[All Fields] OR "positivities"[All Fields] OR "positivity"[All Fields]) AND ("cumulated"[All Fields] OR "cumulative"[All Fields]) AND ("water electrolyte balance"[MeSH Terms] OR ("water electrolyte"[All Fields] AND "balance"[All Fields]) OR "water electrolyte balance"[All Fields] OR ("fluid"[All Fields] AND "balance"[All Fields]) OR "fluid balance"[All Fields])) OR (("fluid"[All Fields] OR "fluid s"[All Fields] OR "fluids"[All Fields]) AND ("overload"[All Fields] OR "overloaded"[All Fields] OR "overloading"[All Fields] OR "overloadings"[All Fields] OR "overloads"[All Fields])) AND ("outcome"[All Fields] OR "outcomes"[All Fields]) AND ("mortality"[MeSH Terms] OR "mortality"[All Fields] OR "mortalities"[All Fields] OR "mortality"[MeSH Subheading])

Translations

critically ill: "critical illness"[MeSH Terms] OR ("critical"[All Fields] AND "illness"[All Fields]) OR "critical illness"[All Fields] OR ("critically"[All Fields] AND "ill"[All Fields]) OR "critically ill"[All Fields]

critical: "critical"[All Fields] OR "critically"[All Fields]

critical care: "critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields]

cumulative: "cumulated"[All Fields] OR "cumulative"[All Fields]

positive: "positive"[All Fields] OR "positively"[All Fields] OR "positiveness"[All Fields] OR "positives"[All Fields] OR "positivities"[All Fields] OR "positivity"[All Fields]

fluid balance: "water-electrolyte balance"[MeSH Terms] OR ("water-electrolyte"[All Fields] AND "balance"[All Fields]) OR "water-electrolyte balance"[All Fields] OR ("fluid"[All Fields] AND "balance"[All Fields]) OR "fluid balance"[All Fields]

positive: "positive"[All Fields] OR "positively"[All Fields] OR "positiveness"[All Fields] OR "positives"[All Fields] OR "positivities"[All Fields] OR "positivity"[All Fields]

cumulative: "cumulated"[All Fields] OR "cumulative"[All Fields]

fluid balance: "water-electrolyte balance"[MeSH Terms] OR ("water-electrolyte"[All Fields] AND "balance"[All Fields]) OR "water-electrolyte balance"[All Fields] OR ("fluid"[All Fields] AND "balance"[All Fields]) OR "fluid balance"[All Fields]

fluid: "fluid"[All Fields] OR "fluid's"[All Fields] OR "fluids"[All Fields]

overload: "overload"[All Fields] OR "overloaded"[All Fields] OR "overloading"[All Fields] OR "overloadings"[All Fields] OR "overloads"[All Fields]

outcome: "outcome"[All Fields] OR "outcomes"[All Fields]

mortality: "mortality"[MeSH Terms] OR "mortality"[All Fields] OR "mortalities"[All Fields] OR "mortality"[Subheading]

Appendix 2. Characteristics of studies included in meta-analysis

No	Author	Year	Country	Study Population	Study Design	Total Sample	Fluid balance assessment
1.	Teixeira et al	2013	Italy	AKI patients admitted to ICU	Prospective	573	Per 1 Litre of Fluid
2	Schmidt et al	2014	Australia	Adult patients with respiratory failure and cardiogenic shock receiving ECMO	Retrospective	172	Cumulative Fluid Balance
3	Silversides et al	2014	Canada	AKI patients receiving CRRT	Prospective	492	Fluid Overload $\geq$ 10 % from baseline
4	Sadaka et al	2014	United States	Septic or septic shock patients	Retrospective	427	Cumulative Fluid Balance
5	Barmparas et al	2014	United States	Acute care surgery patients in ICU	Retrospective	144	Daily Mean Balance
6	Wang et al	2015	China	AKI patients admitted to ICU	Prospective	1172	Cumulative Fluid Balance

7	Kelm et al	2015	United States	Septic or septic shock patients	Retrospective	587	Cumulative Fluid Balance
8	Koonrangsomboon et al	2015	Thailand	Septic shock	Retrospective	1048	Cumulative Fluid Balance
9	Neyra et al	2016	United States	Septic or Septic shock	Retrospective	2632	Per 1 Litre of Fluid
10	Sakr et al	2016	Worldwide	Septic or Septic shock	Retrospective	1808	Cumulative Fluid Balance
11	Kim et al	2017	South Korea	AKI patients receiving CRRT	Retrospective	341	Fluid Overload $\geq$ 10 %
12	Chao et al	2018	Taiwan	Severe Pneumonia in ICU	Retrospective	296	Per 1 Litre of Fluid
13	Codes et al	2018	Brazil	Post surgery patients in ICU	Retrospective	121	Cumulative Fluid Balance
14	Kim et al	2018	South Korea	AKI patients receiving CRRT	Retrospective	341	Cumulative Fluid Balance
15	Silversides et al	2018	Canada and United Kingdom	Patients receiving invasive mechanical ventilation in ICU	Retrospective	400	Per 1 Litre of Fluid
16	Alamanza et al	2019	Colombia	Septic or	Retrospective	213	Fluid

				Septic shock				Overload $\geq$ 5% and $\geq$ 10 %
17	Huang et al	2019	Taiwan	Septic or Septic shock	Retrospective	104	Cumulative Fluid Balance	
18	Mourik et al	2019	Netherland	Acute respiratory distress syndrome patients in ICU	Retrospective	600	Cumulative Fluid Balance	
19	Oh et al	2019	South Korea	Post elective or emergency surgery in ICU	Retrospective	7896	Cumulative Fluid Balance	
20	Branan et al	2020	United States	General patients in ICU	Retrospective	219	Cumulative Fluid Balance	
21	Gunning et al	2020	United States	AKI patients requiring CRRT in ICU	Retrospective	98	Cumulative Fluid Balance	
22	Hall et al	2020	United Kingdom	AKI patients requiring CRRT in ICU	Prospective	820	Per 1 Litre of Fluid	
23	Jhee et al	2020	South Korea	AKI patients requiring	Retrospective	607	Cumulative Fluid	

				CRRT in			Balance
				ICU			
24	Wang et al	2020	China	General patients in ICU	Prospective	1529	Cumulative Fluid Balance
25	Wang et al	2020	China	AKI patients admitted to ICU	Prospective	2501	Fluid Overload $\geq$ 10 %
26	Fang et al	2021	China	AKI patients requiring CRRT in ICU	Retrospective	90	Fluid Overload $\geq$ 10 %
27	Lee et al	2021	South Korea	Acute respiratory distress syndrome treated with ECMO	Retrospective	74	Cumulative Fluid Balance
28	Lin et al	2021	China	Septic patients with AKI receiving CRRT in ICU	Retrospective	227	Cumulative Fluid Balance
29	Chiu et al	2021	Taiwan	Acute respiratory distress syndrome treated with ECMO	Retrospective	152	Per 1 Litre of Fluid

30	Wang et al	2021	China	General patients in ICU	Prospective	986	Cumulative Fluid Balance
31	Zhang et al	2021	China	Septic or Septic shock patients	Retrospective	19557	Daily Mean Balance
32	Shah et al	2022	United States	Acute respiratory distress syndrome treated with ECMO	Retrospective	146	Per 1 Litre of Fluid
33	Waskowski et al	2022	Switzerland	Cardiogenic shock and/or heart failure patients in ICU	Retrospective	2158	Fluid Overload $\geq$ 5% and $\geq$ 10 %
34	Zhang et al	2022	China	Heart Failure and Septic patients in ICU	Retrospective	936	Cumulative Fluid Balance

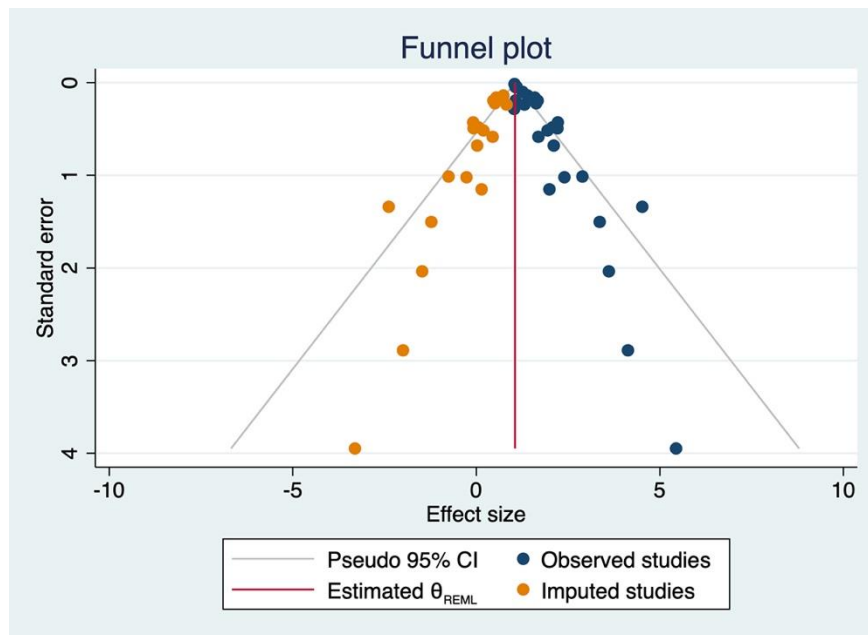
AKI: Acute Kidney Injury ; *ICU*: Intensive Care Unit; *ECMO*: Extracorporeal Membrane Oxygenation ; *CRRT*: Continuous Renal Replacement

Appendix 3. Quality Assessment by using The Newcastle Ottawa Scale

	Studies	Texeira et al (2014)	Schmidt et al (2014)	Silversides et al (2014)	Sadaka et al (2014)	Bamparas et al (2014)	Wang et al (2015)	Kelm et al (2015)	Koonrangsombon et al (2015)	Neyra et al (2016)	Sakr et al (2016)	Kim et al (2017)	Chao et al (2018)	Codes et al (2018)	Kim et al (2018)	Silversides et al (2018)	Alamanza et al (2019)	Huang et al (2019)	Mourik et al (2019)	Oh et al (2019)	Branan et al (2020)	Gunning et al (2020)	Hall et al (2020)	Jhee et al (2020)
Selection	Representativeness of the exposed cohort	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Selection of the non-exposed cohort	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	Ascertainment of exposure	*		*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*			*
	Demonstration that outcome of interest was not present at start of the study	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Comparability	Comparability of cohorts on the basis of the design or analysis	*	*	*	*	*	*	*	**	*	*	*	*	*	*	*	*	*	**	*	*	*	*	*
Outcome	Assessment of outcome	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Sufficient follow-up time	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Adequacy of follow-up	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary		8	7	8	8	7	8	7	9	8	8	8	8	8	7	8	8	8	9	7	8	7	7	8

	Studies	Wang et al (2020)	Wang et al (2020)	Fang et al (2021)	Lee et al (2021)	Lin et al (2021)	Chiu et al (2021)	Wang et al (2021)	Zhang et al (2021)	Shah et al (2022)	Waskowski et al (2022)	Zhang et al (2022)
Selection	Representativeness of the exposed cohort	*	*	*	*	*	*	*	*	*	*	*
	Selection of the non-exposed cohort	*	*	*	*	*	*	*	*	*	*	*
	Ascertainment of exposure	*		*	*	*	*	*		*	*	*
	Demonstration that outcome of interest was not present at start of the study	*	*	*	*	*	*	*	*	*	*	*
Comparability	Comparability of cohorts on the basis of the design or analysis	*	*	*	**	*	*	*	*	**	*	*
Outcome	Assessment of outcome	*	*	*	*	*	*	*	*	*	*	*
	Sufficient follow-up time	*	*	*	*	*	*	*	*	*	*	*
	Adequacy of follow-up	*	*	*	*	*	*	*	*	*	*	*
Summary		8	7	8	9	8	8	8	7	9	8	8

Appendix 4. Funnel plot positive fluid balance on 30-day mortality (after trim-and-fill analysis)



Appendix 6. Funnel plot positive fluid balance on hospital mortality (trim-and-fill analysis)

