Supplementary material: Meta-analysis of randomized controlled trials using tool-assisted target weight adjustments in chronic dialysis patients.

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Appendix 1: Search strategy

Table S1: Search strategy across included databases

Database	Study design:	Population:	Intervention										
	randomized trial	chronic dialysis	Bioimpedance	Blood volume monitoring	Lung ultrasound	Inferior vena cava ultrasound	Natriuretic peptides	Chest X-ray					
MEDLINE (Pubmed)	(randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR drug therapy[sh] OR randomly[tiab] OR trial[tiab] OR groups[tiab] NOT (animals [mh] NOT humans [mh])) Validated filter from Lefebvre et al.1	(dialysis[tiab] OR peritoneal dialysis[tiab] OR hemodialysis[tiab] OR hemodialysis[tiab] OR hemodiafiltration[tiab] OR haemodiafiltration[tiab] OR haemofiltration OR extracorporeal blood cleansing[tiab] OR haemodialysis[tiab] OR Renal Dialysis[mh] OR Renal replacement[tiab] OR end stage kidney[tiab] OR stage 5 kidney[tiab] OR stage 5 renal[tiab])	(bioimpedance[tiab] OR body composition monitor*[tiab] OR electrical impedance[tiab] OR impedance cardiography[tiab] OR impedance spectroscopy[tiab] OR bioelectrical impedance[tiab] OR dielectric spectroscopy[tiab] OR impedance plethysmography[tiab])	(blood volume monitor*[tiab] OR plasma volume monitor*[tiab] OR BVM[tiab] OR continuous volume monitor*[tiab] OR biofeedback[tiab] OR blood volume[tiab] OR plasma volume[tiab] OR crit line[tiab] OR hematocrit[tiab])	(lung ultraso*[tiab] OR pleural ultraso*[tiab] OR pleural ultraso*[tiab] OR B line[tiab] OR B line[tiab] OR extravascular lung water[tiab] OR LUS[tiab] OR B-line[tiab] OR B lines[tiab] OR B lines[tiab] OR pulmonary echo*[tiab] OR lung echo*[tiab]	(vena cava ultraso*[tiab] OR IVC ultraso*[tiab] OR vena cava diameter[tiab] OR IVC diameter[tiab] OR vena cava measurement*[tiab] OR IVC measurement*[tiab])	(B-type[tiab] OR Atrial Natriuretic[tiab] OR ANP[tiab] OR BNP[tiab] OR NT-pro- BNP[tiab] OR pro-BNP[tiab] OR brain natriuretic[tiab] OR natriuretic peptide[tiab] OR N- terminal pro-B-type[tiab] OR proBNP[tiab] OR cyclic GMP[tiab] OR GMP[tiab] or Brain Natriuretic Peptide[mh] OR Atrial Natriuretic Factor[mh])	Chest X-ray[tiab] OR pulmonary X-ray[tiab] OR lung radiography [tiab] OR lung X-ray[tiab] OR chest radiography[tiab] OR chest roentgenogram[tiab] OR lung roentgenogram[tiab] OR pulmonary roentgenogram[tiab]					
EMBASE (Ovid)	crossover-procedure/ or double-blind procedure/ or randomized controlled trial/ or single-blind procedure/ or (random* or factorial* or crossover* or cross over* or placebo* or (doubl* adj blind*) or (singl* adj blind*) or assign* or allocat* or volunteer*).tw. Validated filter from Lefebvre et al.¹	#1 (dialysis or peritoneal dialysis or hemodiafiltration or haemodiafiltration or extracorporeal blood cleansing or haemodialysis or Renal replacement or end stage kidney or end stage renal or stage 5 kidney or stage 5 renal).ab. #2(end stage renal disease or dialysis).sh. #1 OR #2	(bioimpedance or body composition monitor\$ or electrical impedance or impedance cardiography or impedance spectroscopy or dielectric spectroscopy or impedance plethysmography).ab.	(blood volume monitor\$ or plasma volume monitor\$ or BVM or continuous volume monitor\$ or biofeedback or blood volume or plasma volume or crit line).ab.	(lung ultraso\$ or pleural effusion or comet tail or B line or extravascular lung water or LUS or B-line or B-lines or B lines or pulmonary echo\$ or lung echo\$).ab.	(vena cava ultraso\$ or IVC ultraso\$ or vena cava diameter or IVC diameter or vena cava measurement\$ or IVC measurement\$).ab.	(B-type or Atrial Natriuretic or ANP or BNP or brain natriuretic or natriuretic peptide or N-terminal pro-B- type or proBNP or cyclic GMP or GMP).ab.	(Chest X-ray OR pulmonary X-ray OR lung radiography OR lung X-ray OR chest radiography OR lung radiography OR chest roentgenogram OR lung roentgenogram OR pulmonary roentgenogram).ab.					
CENTRAL	Not needed	(dialysis OR peritoneal dialysis OR hemodialysis OR hemodialitration OR haemodiafiltration or extracorporeal blood cleansing OR haemodialysis OR Renal Dialysis[mh] OR Renal replacement OR end stage kidney OR end stage renal OR stage 5 kidney OR stage 5 renal)	(bioimpedance OR body composition monitor\$OR electrical impedance OR impedance cardiography OR impedance spectroscopy OR bioelectrical impedance OR dielectric spectroscopy OR impedance plethysmography)	(blood volume monitor\$ OR plasma volume monitor\$ OR BVM OR continuous volume monitor\$ OR biofeedback crit line)	(lung ultrasound OR pleural ultrasound OR comet tail OR B line OR extravascular lung water OR LUS OR B-line OR B- lines OR B lines OR pulmonary echography OR lung echography)	(vena cava ultrasound OR IVC ultrasound OR vena cava diameter OR IVC diameter OR vena cava measurement\$ OR IVC measurement\$)	(B-type OR Atrial Natriuretic OR ANP OR BNP OR NT-pro- BNP OR pro-BNP OR brain natriuretic OR natriuretic peptide OR N-terminal pro-B- type OR proBNP OR cyclic GMP OR GMP or Brain Natriuretic Peptide[mh] OR Atrial Natriuretic Factor[mh])	(Chest X-ray OR pulmonary X-ray OR lung radiography OR lung X-ray OR chest radiography OR lung radiography OR lung radiography OR chest roentgenogram OR lung roentgenogram OR pulmonary roentgenogram)					

Appendix 2: Details on data extraction

Table S2: Summary of items included in data extraction

Table 32. Summary of items included in data extraction	
Identification and eligibility	
Study ID and Report ID	Citation and contact details
Review author ID	Eligibility or primary reason for exclusion
Methods	
Study design	Blinding of participants, personnel and blinding of outcome assessment
Study duration	Other concerns of bias
Sequence generation and concealment	Is a sample size has been calculated and if yes for which outcome
Participants	
Total number of participants	
Setting: Country, Date of study, Type of treatment: in-center hemodialysis or home dialysis	Inclusion and exclusion criteria for the participants
Patient characteristics	
- Age	- Dialysis vintage
- Sex	- Proportion of anuric patients
- Heart failure	- Type of vascular access
- Coronary disease	- Duration of dialysis treatment session
- Diabetes	- Baseline ambulatory and pre-dialysis blood pressure
- Peripheral artery disease	- Baseline number of anti-hypertensive medications
- Etiology of ESRD	- Baseline Left Ventricular Mass Index
Interventions	
Number of intervention groups	Frequency of measurement
Specific intervention details:	
- Type of technology classified in the following categories:	Frequency of treatment modifications
Bioimpendance (Body composition monitoring)	
 Whole body vs segmental, Single frequency, multiple frequency or spectroscopy, Type 	
of analysis: classic analysis vs vector plot, Timing of assessment: before or after dialysis	
Plasma volume monitoring	Integrity of intervention:
Type of measurements: slope during treatment vs minimum value	 Protocol used from target weight adjustments in response to measurements
 Pulmonary ultrasound Method of assessment used and scoring method, Timing of assessment: before or after 	- Compliance to protocol and fidelity:
dialysis, interobserver reproducibility	 Adherence (delivery as prescribed),
IVC ultrasound	o Exposure (frequency and number),
 Timing of assessment: before or after dialysis, Type of measurements performed: 	 Program modification and crossover
absolute diameter and/or respiratory variability (%), interobserver reproducibility	
Outcomes (for each)	
Outcomes and time points collected and reported	Outcome definition with diagnosis criteria
Results	
Number of participants in each group	Summary data
Sample size and achieved statistical power (for each outcome)	Estimate of effect with confidence interval p- value
Missing participants	Sub-group analysis and whether they were planned in advance
Miscellaneous	
Funding source	Reference to other relevant studies
Conclusions of the authors	Comment from the reviewer
Comments from the authors	Potential conflict of interest

Section 2.1: Assumptions during data extraction

For one report(1), the distribution of patients between the intervention and the comparator group was not reported but assumed to be equal. For the same report, the rate in person-time for all-cause hospitalisations was reported but not the total number of events in each group, which is necessary to calculate the standard error as described in the *summary measures and synthesis of results* section of the present manuscript. The number of events was thus approximated by multiplying the rate by the number of participants in each group. The same approach was also used for another report.(2)

For one report(3), the mean blood pressure change from baseline was reported without standard deviation. To approximate mean blood pressure at the end of the intervention period, change from baseline was substracted from mean baseline values and standard deviations from baseline values were used as an approximation to the standard deviation of calculated blood pressure values at the end of the intervention. Finally, one of the included study(4) was a nested randomized control trial and results were presented in the report according to geographical location and diuresis status. Interventions groups and comparator groups were combined to create a single pair-wise comparison as described in Cochrane handbook section 16.5.4.(5) For continuous outcomes, results from each groups were combined using the method described in Cochrane Handbook section 7.7.3.8.(5)

Section 2.2: Additional details about statistical analysis

We analyzed data from the eligible trials using Review Manager 5.3 (The Nordic Cochrane Center, the Cochrane Collaboration). For the measure of treatment effect for all-cause mortality, results were expressed as risk ratios (RR) and pooled using a random-effect model in a Mantel-Haenszel analysis. All randomized patients for whom outcome data were not available were assumed to have not experienced the event of interest. For outcomes reported as counts such as rates of an event that can occur multiple times in a single patient (hospitalizations, cardiovascular events, hypotension episodes during dialysis, patient's symptoms during dialysis), results were reported as rate ratios. The natural logarithm of the rate ratios and calculated standard error

inverse of variance analysis.(5) A correction of 0.5 was added to each count in the case of zero events. For outcomes reported on a continuous scale (systolic and diastolic blood pressure, left ventricular mass index, medication use), the mean differences were used and pooled using a random-effect model in an inverse of variance analysis.

Appendix 3: Forest plot for sub-groups analysis and secondary outcomes.

Section 3.1: All cause mortality

Figure S3.1.1: All cause mortality according to dialysis modality

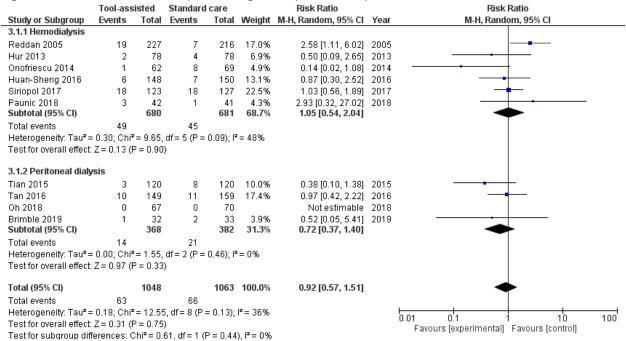


Figure S3.1.2: All cause mortality according to duration of follow-up

	Tool-ass	isted	Standard	care		Risk Ratio		Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year	M-H, Random, 95% CI
4.1.1 Duration ≤ 1 ye	аг							
Reddan 2005	19	227	7	216	17.0%	2.58 [1.11, 6.02]	2005	
Hur 2013	2	78	4	78	6.9%	0.50 [0.09, 2.65]	2013	
Tian 2015	3	120	8	120	10.0%	0.38 [0.10, 1.38]	2015	
Huan-Sheng 2016	6	148	7	150	13.1%	0.87 [0.30, 2.52]	2016	
Tan 2016	10	149	11	159	17.4%	0.97 [0.42, 2.22]	2016	
Oh 2018	0	67	0	70		Not estimable	2018	
Paunic 2018	3	42	1	41	4.3%	2.93 [0.32, 27.02]	2018	
Brimble 2019	1	32	2	33	3.9%	0.52 [0.05, 5.41]	2019	
Subtotal (95% CI)		863		867	72.6%	1.02 [0.57, 1.81]		•
Total events	44		40					
Heterogeneity: Tau² =	0.18; Chi²	= 8.81,	df = 6 (P =	$0.18); I^2$	= 32%			
Test for overall effect:	Z = 0.05 (F	P = 0.96)					
4.1.2 Duration > 1 yea	ar							
Onofriescu 2014	1	62	8	69	4.9%	0.14 [0.02, 1.08]	2014	-
Siriopol 2017	18	123	18	127	22.5%	1.03 [0.56, 1.89]	2017	
Subtotal (95% CI)		185		196	27.4%	0.48 [0.07, 3.44]		
Total events	19		26					
Heterogeneity: Tau² =	1.55; Chi ²	= 3.60,	df = 1 (P =	0.06); I^2	= 72%			
Test for overall effect:	Z = 0.73 (F	P = 0.46)					
Total (95% CI)		1048		1063	100.0%	0.92 [0.57, 1.51]		•
Total events	63		66					
Heterogeneity: Tau ^z =	0.18; Chi²	= 12.55	i, df = 8 (P	= 0.13);	I²= 36%			
Test for overall effect:	Z = 0.31 (F	P = 0.75) `	,,				0.01 0.1 1 10 100
Test for subgroup diff	erences: C	$hi^2 = 0.$	51, df = 1 (l	P = 0.47), $I^2 = 0\%$			Favours [experimental] Favours [control]

Figure S3.1.3: All cause mortality according to funding sources

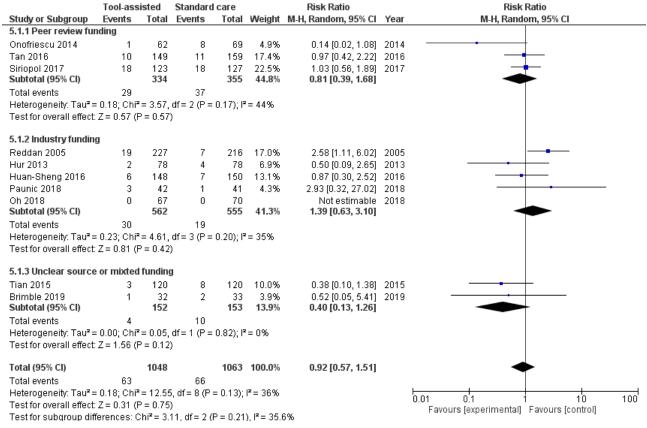
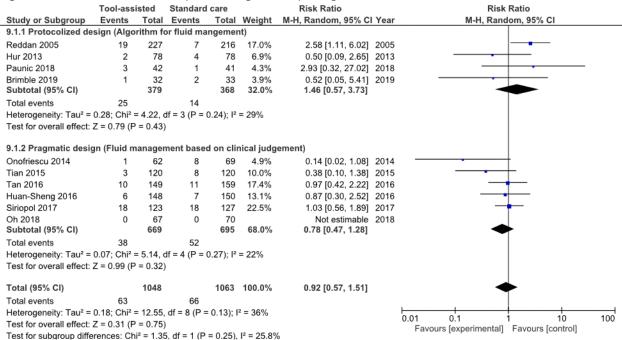


Figure S3.1.4: All cause mortality according to risk of bias

O			,		U					
	Tool-assisted		Standard	l care		Risk Ratio		Risk Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year	M-H, Random, 95% CI		
6.1.1 Low risk										
Reddan 2005	19	227	7	216	17.0%	2.58 [1.11, 6.02]	2005			
Hur 2013	2	78	4	78	6.9%	0.50 [0.09, 2.65]	2013			
Onofriescu 2014	1	62	8	69	4.9%	0.14 [0.02, 1.08]	2014			
Siriopol 2017	18	123	18	127	22.5%	1.03 [0.56, 1.89]	2017	-		
Oh 2018	0	67	0	70		Not estimable	2018			
Subtotal (95% CI)		557		560	51.3%	0.91 [0.35, 2.34]		-		
Total events	40		37							
Heterogeneity: Tau ² :	= 0.55; Chi ²	= 8.73,	df = 3 (P =	0.03); P	= 66%					
Test for overall effect	Z = 0.20 (F	P = 0.84)							
6.1.2 High risk										
Tian 2015	3	120	8	120	10.0%	0.38 [0.10, 1.38]	2015			
Tan 2016	10	149	11	159	17.4%	0.97 [0.42, 2.22]	2016			
Huan-Sheng 2016	6	148	7	150	13.1%	0.87 [0.30, 2.52]	2016			
Paunic 2018	3	42	1	41	4.3%	2.93 [0.32, 27.02]	2018	- •		
Brimble 2019	1	32	2	33	3.9%	0.52 [0.05, 5.41]	2019			
Subtotal (95% CI)		491		503	48.7%	0.82 [0.47, 1.42]		•		
Total events	23		29							
Heterogeneity: Tau2:	= 0.00; Chi ²	= 2.97,	df = 4 (P =	0.56); P	= 0%					
Test for overall effect	Z = 0.70 (F	P = 0.49)							
Total (95% CI)		1048		1063	100.0%	0.92 [0.57, 1.51]		•		
Total events	63		66							
Heterogeneity: Tau ^z :				= 0.13);	I= 36%			0.01 0.1 1 10 10		
Test for overall effect	: Z = 0.31 (F	P = 0.75)					Favours [experimental] Favours [control]		
Test for subgroup dif	fferences: C	$hi^2 = 0.$	03, df = 1 (P = 0.86), I² = 0%			. arears [experimental] arears [control]		

Figure S3.1.5: All cause mortality according to study design



Section 3.2: All-cause hospitalisations

Figure S3.2.1: All-cause hospitalisations according to technology used

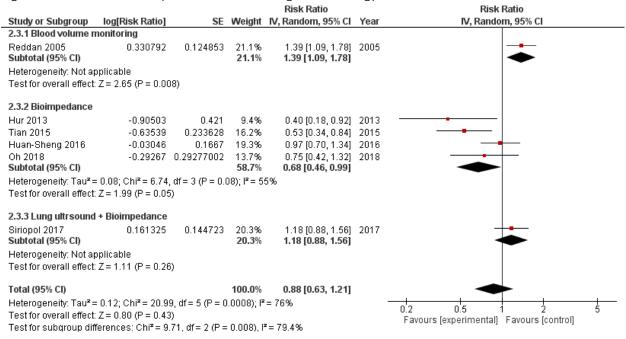


Figure S3.2.2: All-cause hospitalisations according to dialysis modality

				Risk Ratio		Risk Ratio
Study or Subgroup	log[Risk Ratio]	SE	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
3.3.1 Hemodialysis						
Reddan 2005	0.330792	0.124853	21.1%	1.39 [1.09, 1.78]	2005	_ -
Hur 2013	-0.90503	0.421	9.4%	0.40 [0.18, 0.92]	2013	
Huan-Sheng 2016	-0.03046	0.1667	19.3%	0.97 [0.70, 1.34]	2016	
Siriopol 2017	0.161325	0.144723	20.3%	1.18 [0.88, 1.56]	2017	
Subtotal (95% CI)			70.0%	1.05 [0.77, 1.44]		•
Heterogeneity: Tau² =	= 0.06; Chi² = 9.55,	df = 3 (P = 0.0	02); I² = 69	3%		
Test for overall effect:	Z = 0.32 (P = 0.75))				
3.3.2 Peritoneal dialy	/sis					
Tian 2015	-0.63539	0.233628	16.2%	0.53 [0.34, 0.84]	2015	
Oh 2018	-0.29267	0.29277002	13.7%	0.75 [0.42, 1.32]	2018	
Subtotal (95% CI)			30.0%	0.61 [0.42, 0.87]		•
Heterogeneity: Tau ^z =	= 0.00; Chi² = 0.84,	df = 1 (P = 0.3)	$86); I^2 = 0^9$	%		
Test for overall effect:	Z = 2.75 (P = 0.00)	6)				
Total (95% CI)			100.0%	0.88 [0.63, 1.21]		-
Heterogeneity: Tau ² =	= 0.12; Chi ² = 20.99	0, df = 5 (P = 0)	.0008); <mark>I</mark> ²	= 76%		
Test for overall effect:			,,			0.2 0.5 1 2 5
Test for subaroup diff	,	•	0.02), I ^z =	= 80.8%		Favours [experimental] Favours [control]

Figure S3.2.3: All-cause hospitalisations according to follow-up duration

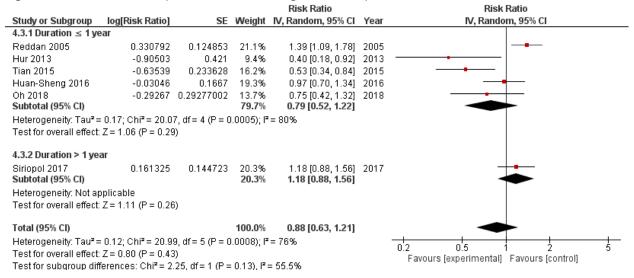


Figure S3.2.4: All-cause hospitalisations according to funding source

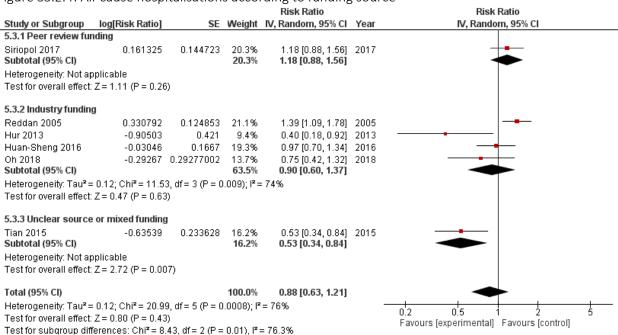


Figure S3.2.5: All-cause hospitalisations according to risk of bias

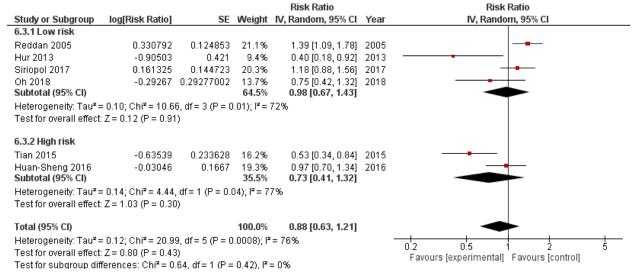
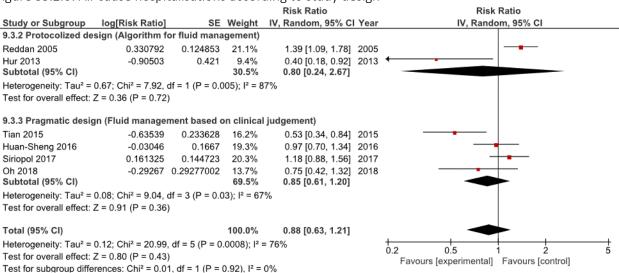


Figure S3.2.6: All-cause hospitalisations according to study design



Section 3.3: Cardiovascular events

Figure S3.3.1: Cardiovascular events according to technology used

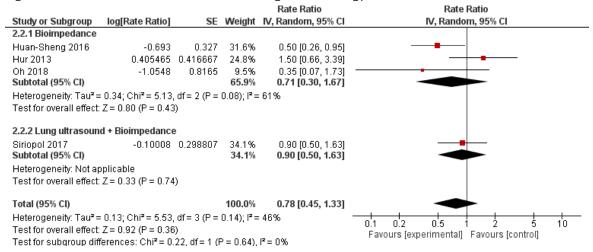


Figure 3.3.2: Cardiovascular events according to dialysis modality

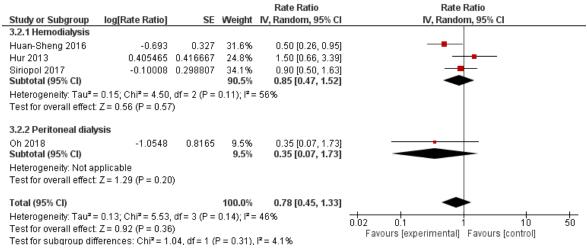


Figure 3.3.3: Cardiovascular events according to duration of intervention

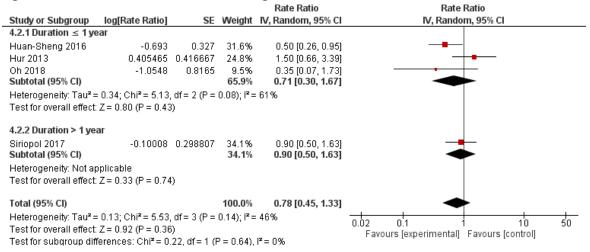


Figure S3.3.4: Cardiovascular events according to funding source

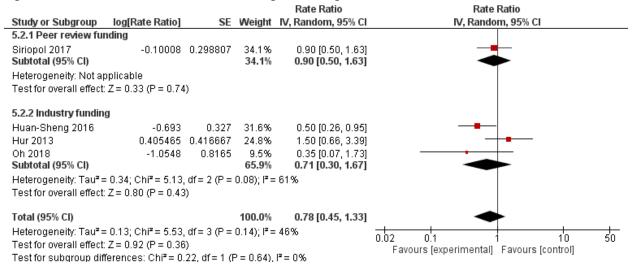
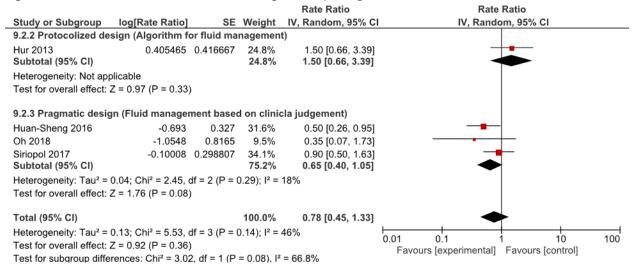


Figure S3.3.5: Cardiovascular events according to risk of bias

				Rate Ratio	Rate Ratio
Study or Subgroup	log[Rate Ratio]	SE	Weight	IV, Random, 95% CI	IV, Random, 95% CI
6.2.1 Low risk					
Hur 2013	0.405465	0.416667	24.8%	1.50 [0.66, 3.39]	
Oh 2018	-1.0548	0.8165	9.5%	0.35 [0.07, 1.73]	
Siriopol 2017 Subtotal (95% CI)	-0.10008	0.298807	34.1% 68.4 %	0.90 [0.50, 1.63] 0.97 [0.54, 1.72]	-
Heterogeneity: Tau ² =	= 0.07; Chi ² = 2.72,	df = 2 (P =	0.26); l ^z =	: 26%	
Test for overall effect	Z = 0.12 (P = 0.91)			
6.2.2 High risk					
Huan-Sheng 2016 Subtotal (95% CI)	-0.693	0.327	31.6% 31.6 %	0.50 [0.26, 0.95] 0.50 [0.26, 0.95]	-
Heterogeneity: Not ap	oplicable				
Test for overall effect	Z = 2.12 (P = 0.03))			
Total (95% CI)			100.0%	0.78 [0.45, 1.33]	•
Heterogeneity: Tau ² =	= 0.13; Chi ^z = 5.53,	df = 3 (P =	0.14); l ² =	: 46%	0.02 0.1 1 10 5
Test for overall effect:	Z = 0.92 (P = 0.36)	<i>,</i> ,		
Test for subgroup dif	•		P = 0.13).	I ² = 55.3%	Favours [experimental] Favours [control]

Figure S3.3.6: Cardiovascular events according to study design



Section 3.4: Rate of intra-dialytic hypotension

Figure S3.4.1: Rate of intra-dialytic hypotension according to technology used

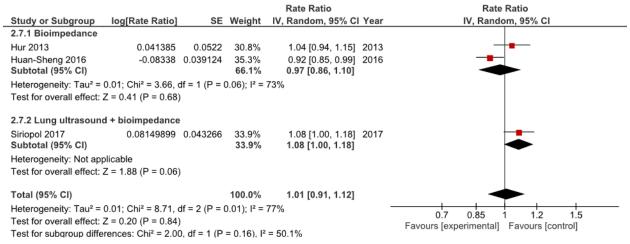


Figure S3.4.2: Rate of intra-dialytic hypotension according to duration of follow-up

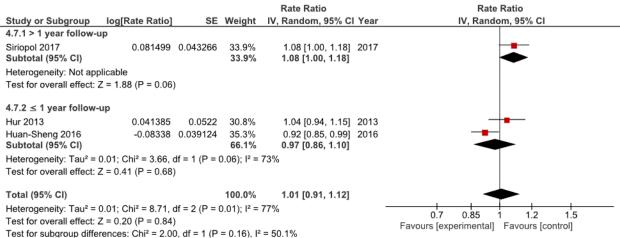


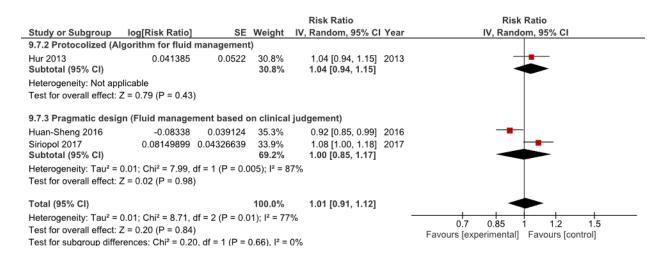
Figure S3.4.3: Rate of intra-dialytic hypotension according to source of funding

				Rate Ratio	Rate Ratio
Study or Subgroup	log[Rate Ratio]	SE	Weight	IV, Random, 95% CI Year	IV, Random, 95% CI
5.7.1 Academic					
Siriopol 2017	0.081499	0.043266	33.9%	1.08 [1.00, 1.18] 2017	-
Subtotal (95% CI)			33.9%	1.08 [1.00, 1.18]	
Heterogeneity: Not app	plicable				
Test for overall effect:	Z = 1.88 (P = 0.06))			
5.7.2 Industry sponse	ored				
Hur 2013	0.041385	0.0522	30.8%	1.04 [0.94, 1.15] 2013	
Huan-Sheng 2016	-0.08338	0.039124	35.3%	0.92 [0.85, 0.99] 2016	
Subtotal (95% CI)			66.1%	0.97 [0.86, 1.10]	
Heterogeneity: Tau ² =	0.01; Chi ² = 3.66,	df = 1 (P = 0	0.06); I ² = 1	73%	
Test for overall effect:	Z = 0.41 (P = 0.68))			
Total (95% CI)			100.0%	1.01 [0.91, 1.12]	
Heterogeneity: Tau ² =	0.01; Chi ² = 8.71,	df = 2 (P = 0)	0.01); I ² = 1	77%	1 1 1
Test for overall effect:	Z = 0.20 (P = 0.84))	•		0.7 0.85 1 1.2 1.5 Favours [experimental] Favours [control]
Test for subgroup diffe	erences: Chi² = 2.0	0, df = 1 (P	= 0.16), I ²	= 50.1%	r avours (experimental) Favours (control)

Figure S3.4.4: Rate of intra-dialytic hypotension according to risk of bias

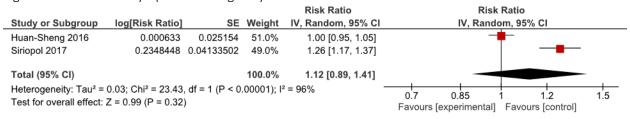


Figure S3.4.5: Rate of intra-dialytic hypotension according to study design



Section 3.5: Patient symptoms during dialysis

Figure S3.5.1: Patient symptoms during dialysis



Section 3.6: Systolic blood pressure before dialysis or at the peritoneal dialysis clinic

Figure S3.6.1: Systolic blood pressure according to dialysis modality

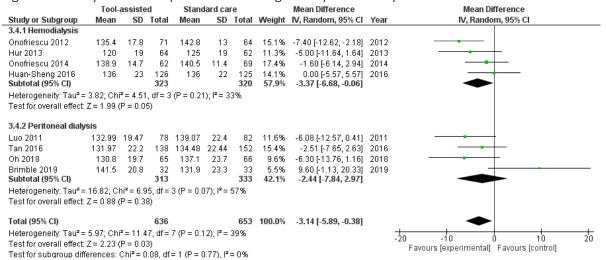


Figure S3.6.2 Systolic blood pressure according to duration of follow-up

	Tool-	assiste	ed	Stand	lard ca	re		Mean Difference		Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
4.4.1 Duration ≤ 1 ye	аг									
Luo 2011	132.99	19.47	78	139.07	22.4	82	11.6%	-6.08 [-12.57, 0.41]	2011	
Onofriescu 2012	135.4	17.8	71	142.8	13	64	15.1%	-7.40 [-12.62, -2.18]	2012	
Hur 2013	120	19	64	125	19	62	11.3%	-5.00 [-11.64, 1.64]	2013	
Huan-Sheng 2016	136	23	126	136	22	125	14.1%	0.00 [-5.57, 5.57]	2016	
Tan 2016	131.97	22.2	138	134.48	22.44	152	15.4%	-2.51 [-7.65, 2.63]	2016	
Oh 2018	130.8	19.7	65	137.1	23.7	66	9.6%	-6.30 [-13.76, 1.16]	2018	
Brimble 2019	141.5	20.8	32	131.9	23.3	33	5.5%	9.60 [-1.13, 20.33]	2019	_
Subtotal (95% CI)			574			584	82.6%	-3.40 [-6.66, -0.14]		•
Heterogeneity: Tau² =	8.41; Chi	i² = 10.8	86, df=	6 (P = 0.0)	09); l² =	45%				
Test for overall effect:	Z = 2.05 ((P = 0.0)	4)							
4.4.2 Duration > 1 yea	ar									
Onofriescu 2014	138.9	14.7	62	140.5	11.4	69	17.4%	-1.60 [-6.14, 2.94]	2014	
Subtotal (95% CI)	100.0		62			69	17.4%	-1.60 [-6.14, 2.94]	20	
Heterogeneity: Not ap	plicable									
Test for overall effect:		P = 0.4	9)							
			-,							
Total (95% CI)			636			653	100.0%	-3.14 [-5.89, -0.38]		•
Heterogeneity: Tau ² =	5.97; Chi	i ² = 11.4	7, df=	7 (P = 0.1)	(2); l² =	39%			-	20 -10 0 10 20
Test for overall effect:	Z = 2.23 ((P = 0.0)	3)	•						-20 -10 0 10 20 Favours [experimental] Favours [control]
Test for subgroup diff	erences:	Chi² = C).40. df	= 1 (P = I	0.53), P	= 0%				ravours (experimental) Favours (control)

Figure S3.6.3: Systolic blood pressure according to source of funding

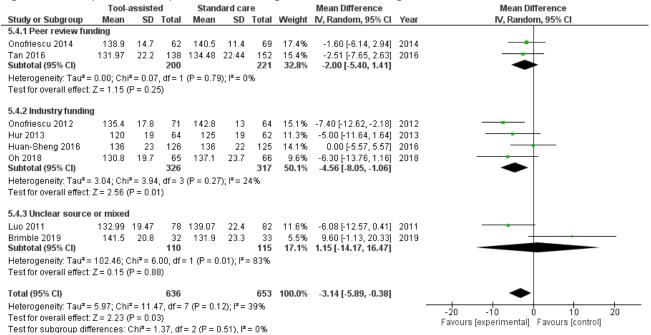


Figure S3.6.4: Systolic blood pressure according to risk of bias

Tool-assisted			Stand	dard ca	re		Mean Difference		Mean Difference		
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI	
6.4.1 Low risk											
Onofriescu 2012	135.4	17.8	71	142.8	13	64	15.1%	-7.40 [-12.62, -2.18]	2012		
Hur 2013	120	19	64	125	19	62	11.3%	-5.00 [-11.64, 1.64]	2013		
Onofriescu 2014	138.9	14.7	62	140.5	11.4	69	17.4%	-1.60 [-6.14, 2.94]	2014		
Tan 2016	131.97	22.2	138	134.48	22.44	152	15.4%	-2.51 [-7.65, 2.63]	2016		
Oh 2018	130.8	19.7	65	137.1	23.7	66	9.6%	-6.30 [-13.76, 1.16]	2018		
Subtotal (95% CI)			400			413	68.8%	-4.10 [-6.57, -1.63]		•	
Heterogeneity: Tau ² =	0.00; Chi	r = 3.47	7 , df = 4	(P = 0.48)	3); $I^2 = 0$	%					
Test for overall effect:	Z = 3.25 (P = 0.0	01)								
6.4.2 High risk											
Luo 2011	132.99	19.47	78	139.07	22.4	82	11.6%	-6.08 [-12.57, 0.41]	2011		
Huan-Sheng 2016	136	23	126	136	22	125	14.1%	0.00 [-5.57, 5.57]	2016	- + -	
Brimble 2019	141.5	20.8	32	131.9	23.3	33	5.5%	9.60 [-1.13, 20.33]	2019	 	
Subtotal (95% CI)			236			240	31.2%	0.14 [-7.27, 7.56]			
Heterogeneity: Tau ² =	: 28.41; CI	$hi^2 = 6.2$	22, df=	2 (P = 0.0	04); I² =	68%					
Test for overall effect:	Z = 0.04 (P = 0.9	7)								
Total (95% CI)			636			653	100.0%	-3.14 [-5.89, -0.38]		•	
Heterogeneity: Tau ² =	: 5.97; Chi	r = 11.4	17, df=	7 (P = 0.1	12); I*=	39%				-20 -10 0 10 20	
Test for overall effect:										-20 -10 0 10 20 Favours [experimental] Favours [control]	
Test for subgroup diff	ferences:	Chi ² = 1	I.13, df	= 1 (P = I	0.29), l ² :	= 11.79	%			i avours (experimental) Favours (control)	

Figure 3.6.5: Systolic blood pressure according to the nature of the report used

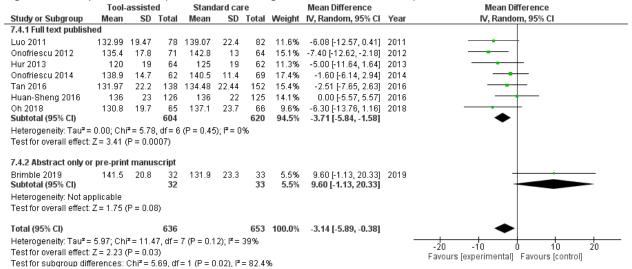


Figure 3.6.6: Systolic blood pressure according to the study design

Tool-assisted				dard ca			Mean Difference		Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% C	Year	IV, Random, 95% CI
9.4.2 Protocolized d	lesign (Alg	gorithm	for flu	id mana	gement	t)				
Onofriescu 2012	135.4	17.8	71	142.8	13	64	15.1%	-7.40 [-12.62, -2.18]	2012	
Hur 2013	120	19	64	125	19	62	11.3%	-5.00 [-11.64, 1.64]	2013	
Brimble 2019 Subtotal (95% CI)	141.5	20.8	32 167	131.9	23.3	33 1 59	5.5% 31.9 %	9.60 [-1.13, 20.33] -2.16 [-10.39, 6.07]	2019	
Heterogeneity: Tau ² :	= 38.36; CI	hi² = 7.8	4, df =	2 (P = 0.	02); I ² =	74%				
Test for overall effect	: Z = 0.51	(P = 0.6	1)							
9.4.3 Pragmatic des	ign (Fluid	manage	ement	based o	n clinic	al judg	gement)			
Luo 2011	132.99	19.47	78	139.07	22.4	82	11.6%	-6.08 [-12.57, 0.41]	2011	
Onofriescu 2014	138.9	14.7	62	140.5	11.4	69	17.4%	-1.60 [-6.14, 2.94]	2014	
Tan 2016	131.97	22.2	138	134.48	22.44	152	15.4%	-2.51 [-7.65, 2.63]	2016	
Huan-Sheng 2016	136	23	126	136	22	125	14.1%	0.00 [-5.57, 5.57]	2016	
Oh 2018	130.8	19.7	65	137.1	23.7	66	9.6%	-6.30 [-13.76, 1.16]	2018	
Subtotal (95% CI)			469			494	68.1%	-2.68 [-5.18, -0.18]		•
Heterogeneity: Tau ²	= 0.00; Chi	$i^2 = 3.07$, df = 4	(P = 0.5)	5); l ² = (0%				
Test for overall effect	: Z = 2.10	(P = 0.0)	4)							
Total (95% CI)			636			653	100.0%	-3.14 [-5.89, -0.38]		•
Heterogeneity: Tau ²	= 5.97; Chi	i ² = 11.4	7, df =	7 (P = 0.	12); l2 =	39%				-10 -5 0 5 10
Test for overall effect	: Z = 2.23	(P = 0.0)	3)							Favours [experimental] Favours [control]
Test for subgroup diff	ferences: 0	$Chi^2 = 0.0$	01. df :	= 1 (P = 0).91), I ²	= 0%				i avours [experimental] avours [control]

Section 3.7: Diastolic arterial blood pressure before hemodialysis or at the peritoneal dialysis clinic

Figure S3.7.1: Diastolic arterial blood pressure according to dialysis modality

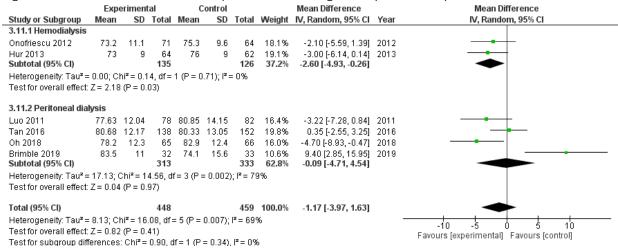


Figure S3.7.2: Diastolic arterial blood pressure according to funding source

G		eriment			ontrol			Mean Difference	Ü	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
5.11.1 Peer review fu	unding									
Tan 2016	80.68	12.17	138	80.33	13.05	152	19.8%	0.35 [-2.55, 3.25]	2016	
Subtotal (95% CI)			138			152	19.8%	0.35 [-2.55, 3.25]		—
- , ,										
Test for overall effect:	Z = 0.24	P = 0.8	31)							
5.11.2 Industry fundi	ng									
Onofriescu 2012	73.2	11.1	71	75.3	9.6	64	18.1%	-2.10 [-5.59, 1.39]	2012	
Hur 2013	73	9	64	76	9	62	19.1%	-3.00 [-6.14, 0.14]	2013	
Oh 2018	78.2	12.3	65	82.9	12.4	66	16.0%	-4.70 [-8.93, -0.47]	2018	
Subtotal (95% CI)			200			192	53.2%	-3.09 [-5.13, -1.04]		•
Subtotal (95% CI) 200 192 53.2% -3.09 [-5.13, -1.04] Heterogeneity: Tau² = 0.00; Chi² = 0.87, df = 2 (P = 0.65); I² = 0% Test for overall effect: Z = 2.96 (P = 0.003)										
Test for overall effect:	Z = 2.98	(P = 0.0	003)							
5.11.3 Unclear source	e or mix	ced fund	ling							
Luo 2011	77.63	12.04	78	80.85	14.15	82	16.4%	-3.22 [-7.28, 0.84]	2011	
Brimble 2019	83.5	11		74.1	15.6	33	10.6%		2019	
Subtotal (95% CI)			110			115	27.0%	2.82 [-9.54, 15.17]		
	Leterogeneity: Not applicable est for overall effect: Z = 0.24 (P = 0.81) .11.2 Industry funding Inoffiescu 2012 73.2 11.1 71 75.3 9.6 64 18.1% -2.10 [-5.59, 1.39] 2012 Indicative control of the con									
Test for overall effect:	Z = 0.45	(P = 0.6	35)							
Total (95% CI)			448			459	100.0%	-1.17 [-3.97, 1.63]		-
Hur 2013 73 9 64 76 9 62 19.1% -3.00 [-6.14, 0.14] 2013 Oh 2018 78.2 12.3 65 82.9 12.4 66 16.0% -4.70 [-8.93, -0.47] 2018 Subtotal (95% CI) 200 192 53.2% -3.09 [-5.13, -1.04] Heterogeneity: Tau² = 0.00; Chi² = 0.87, df = 2 (P = 0.65); i² = 0% Test for overall effect: Z = 2.96 (P = 0.003) 5.11.3 Unclear source or mixed funding Luo 2011 77.63 12.04 78 80.85 14.15 82 16.4% -3.22 [-7.28, 0.84] 2011 Brimble 2019 83.5 11 32 74.1 15.6 33 10.6% 9.40 [2.85, 15.95] 2019 Subtotal (95% CI) 110 115 27.0% 2.82 [-9.54, 15.17] Heterogeneity: Tau² = 71.90; Chi² = 10.30, df = 1 (P = 0.001); i² = 90% Test for overall effect: Z = 0.45 (P = 0.65) Total (95% CI) 448 459 100.0% -1.17 [-3.97, 1.63] Heterogeneity: Tau² = 8.13; Chi² = 16.08, df = 5 (P = 0.007); i² = 69% Total for overall effect: Z = 0.83 (P = 0.44)										
Subtotal (95% CI) 138 152 19.8% 0.35 [-2.55, 3.25] Heterogeneity: Not applicable Test for overall effect: Z = 0.24 (P = 0.81) 5.11.2 Industry funding Onofriescu 2012 73.2 11.1 71 75.3 9.6 64 18.1% -2.10 [-5.59, 1.39] 2012 Hur 2013 73 9 64 76 9 62 19.1% -3.00 [-6.14, 0.14] 2013 Oh 2018 78.2 12.3 65 82.9 12.4 66 16.0% -4.70 [-8.93, -0.47] 2018 Subtotal (95% CI) 200 192 53.2% -3.09 [-5.13, -1.04] Heterogeneity: Tau² = 0.00; Chi² = 0.87, df = 2 (P = 0.65); i² = 0% Test for overall effect: Z = 2.96 (P = 0.003) 5.11.3 Unclear source or mixed funding Luo 2011 77.63 12.04 78 80.85 14.15 82 16.4% -3.22 [-7.28, 0.84] 2011 Brimble 2019 83.5 11 32 74.1 15.6 33 10.6% 9.40 [2.85, 15.95] 2019 Subtotal (95% CI) 110 115 27.0% 2.82 [-9.54, 15.17] Heterogeneity: Tau² = 71.90; Chi² = 10.30, df = 1 (P = 0.001); i² = 90% Test for overall effect: Z = 0.45 (P = 0.65) Total (95% CI) 448 459 100.0% -1.17 [-3.97, 1.63]										
Test for subgroup diff	ferences	: Chi²=	4.16, c	f= 2 (P	= 0.12),	I ² = 52	.0%			rateata (aspannianta) Tareata (control)

Figure S3.7.3: Diastolic arterial blood pressure according to risk of bias

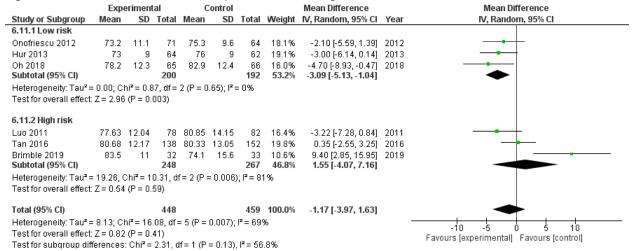
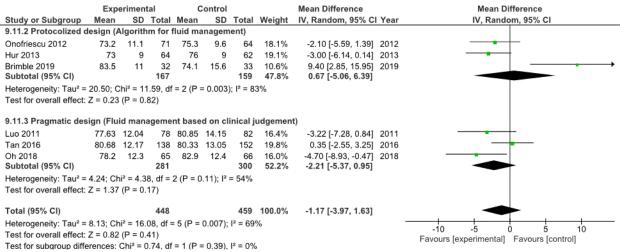
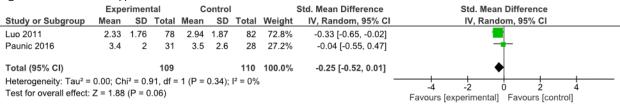


Figure S3.7.4: Diastolic arterial blood pressure according to study design



Section 3.8: Anti-hypertensive medication use in daily equivalent dose at the end of the intervention period

Figure S3.8.1: Anti-hypertensive medication use



Section 3.9: Left ventricular mass index at the end of the intervention period

Figure S3.9.1: Left ventricular mass index according to dialysis modality

	Tool-assisted			Standard care				Mean Difference		Mean Difference			
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI			
3.6.1 Hemodialysis													
Hur 2013	116	29	64	120	30	62	20.8%	-4.00 [-14.31, 6.31]	2013				
Paunic 2018	133.8	33.57	38	139.93	35.72	35	18.6%	-6.13 [-22.07, 9.81]	2018				
Subtotal (95% CI)			102			97	39.5%	-4.63 [-13.28, 4.03]		•			
Heterogeneity: Tau² =	= 0.00; Ch	$i^2 = 0.05$	i, df = 1	(P = 0.83)	3); $I^2 = 0$	%							
Test for overall effect	Z = 1.05	(P = 0.29)	9)										
3.6.2 Peritoneal dialy	/sis												
Tian 2015	200.12	47.43	120	253.88	71.59	120	18.9%	-53.76 [-69.12, -38.40]	2015	 -			
Oh 2018	103	29	65	105	28	66	21.0%	-2.00 [-11.76, 7.76]	2018				
Brimble 2019	66.9	19.4	32	72.1	25.2	33	20.6%		2019				
Subtotal (95% CI)			217			219	60.5%	-19.71 [-47.64, 8.22]					
Heterogeneity: Tau² =	= 570.50; (Chi ^z = 3:	3.86, di	f= 2 (P <	0.00001	$); ^2=9$	94%						
Test for overall effect:	Z=1.38	(P = 0.1)	7)										
Total (95% CI)			319			316	100.0%	-13.61 [-29.70, 2.48]		-			
Heterogeneity: Tau² =	= 295.63; (Chi ² = 3	6.00, di	f= 4 (P <	0.00001); I² = 8	39%			-50 -25 0 25 50			
Test for overall effect:	Z=1.66	(P = 0.1)	0)							Favours (experimental) Favours (control)			
Test for subgroup dif	ferences:	Chi ² = 1	.02, df	= 1 (P = I	0.31), l ^a :	= 2.2%				r avours (experimental) T avours (control)			

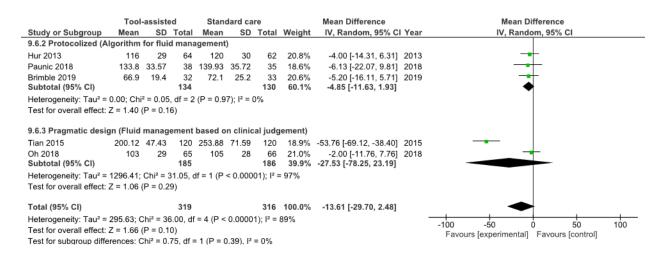
Figure S3.9.2: Left ventricular mass index according to source of funding

	0								_		0
Tool-assisted			Stand	lard ca	re		Mean Difference		Mean Difference		
	Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI
	5.6.1 Industry funding										
	Hur 2013	116	29	64	120	30	62	20.8%	-4.00 [-14.31, 6.31]	2013	
	Paunic 2018	133.8	33.57	38	139.93	35.72	35	18.6%	-6.13 [-22.07, 9.81]	2018	
	Oh 2018	103	29	65	105	28	66	21.0%	-2.00 [-11.76, 7.76]	2018	_
	Subtotal (95% CI)			167			163	60.5%	-3.47 [-9.95, 3.00]		•
	Heterogeneity: Tau² = 0	0.00; Chi	$i^2 = 0.20$	0, df = 2	(P = 0.90	$0); I^2 = 0$	%				
	Test for overall effect: 2	Z = 1.05 ((P = 0.2)	9)							
	5.6.2 Unclear source	or mixed	1								
	Tian 2015	200.12	47.43	120	253.88	71.59	120	18.9%	-53.76 [-69.12, -38.40]	2015	
	Brimble 2019	66.9	19.4	32	72.1	25.2	33	20.6%		2019	
	Subtotal (95% CI)			152			153	39.5%	-29.17 [-76.75, 18.42]		
	Heterogeneity: Tau² = 1	1132.81;	Chi ² =	25.50,	df=1 (P ·	< 0.000	01); P =	96%			
	Test for overall effect: 2	Z = 1.20 ((P = 0.2)	3)							
	Total (95% CI)			319				100.0%	-13.61 [-29.70, 2.48]		
	Heterogeneity: Tau ² = 2				f= 4 (P <	0.0000	1);	39%			-50 -25 0 25 50
	Test for overall effect: Z		•								Favours (experimental) Favours (control)
	Test for subgroup diffe	rences:	$Chi^2 = 1$	1∩ df	= 1 (P = 0)	1 291 P	= 9.1%				

Figure S3.9.3: Left ventricular mass index according to source of risk of bias

	Tool-	Tool-assisted			Standard care			Mean Difference		Mean Difference		
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year	IV, Random, 95% CI		
6.6.1 Low risk												
Hur 2013	116	29	64	120	30	62	20.8%	-4.00 [-14.31, 6.31]	2013			
Oh 2018	103	29	65	105	28	66	21.0%	-2.00 [-11.76, 7.76]	2018			
Subtotal (95% CI)			129			128	41.9%	-2.95 [-10.03, 4.14]		•		
Heterogeneity: Tau ² :	= 0.00; Ch	$i^2 = 0.08$	3, df = 1	(P = 0.7)	3); $I^2 = 0$	1%						
Test for overall effect	: Z= 0.81	(P = 0.4)	2)									
6.6.2 High risk												
Tian 2015	200.12	47.43	120	253.88	71.59	120	18.9%	-53.76 [-69.12, -38.40]	2015			
Paunic 2018	133.8	33.57	38	139.93	35.72	35	18.6%	-6.13 [-22.07, 9.81]	2018			
Brimble 2019	66.9	19.4	32	72.1	25.2	33	20.6%	-5.20 [-16.11, 5.71]	2019			
Subtotal (95% CI)			190			188	58.1%	-21.49 [-51.76, 8.78]				
Heterogeneity: Tau ^z :	= 662.95; (Chi ² = 2	8.22, d	f= 2 (P <	0.0000	1); l² = !	93%					
Test for overall effect	:: Z = 1.39	(P = 0.1	6)									
Total (95% CI)			319			316	100.0%	-13.61 [-29.70, 2.48]		-		
Heterogeneity: Tau ^z :	= 295.63; (Chi ^z = 3	6.00, d	f= 4 (P <	0.0000	1); l² = i	89%			-50 -25 0 25 50		
Test for overall effect	: Z = 1.66	(P = 0.1)	0)							-50 -25 0 25 50 Favours [experimental] Favours [control]		
Test for subaroup dif	fferences:	Chi² = 1	.37. df	= 1 (P = I	0.24), l ²	= 26.99	%			ravours (experimental) ravours (control)		

Figure S3.9.4: Left ventricular mass index according to study design



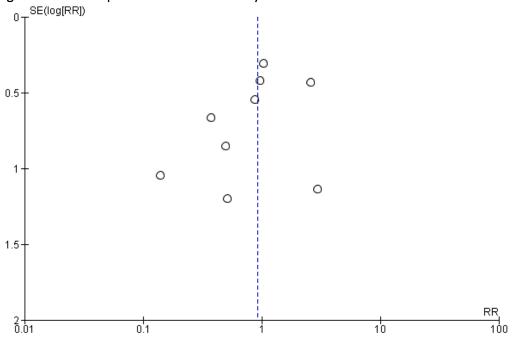
Appendix 4: Risk of bias assessment

Figure S4.1: Risk of bias assessment for the included studies

Figure S4.1: Risk of b	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	i stuu
	Random se	Allocation c	Blinding of	Blinding of	Incomplete	Selective re	Other bias
Brimble 2019	•	•	•	•	•	•	?
Huan-Sheng 2016	•	?	•	•		•	•
Hur 2013	?	?	?	•	•	•	•
Luo 2011	?	?	?	?	•	?	
Oh 2018	•	?	?	•	•	•	•
Onofriescu 2012	•	?		•	•	?	•
Onofriescu 2014	•	?	•	•	•	•	•
Paunic 2016	?	?	?	?	?	?	?
Paunic 2018	•	?	•	•	•	?	
Reddan 2005	•	•	•	•	•	?	•
Siriopol 2017	•	?	•	•	•	•	•
Tan 2016	?	•	?	•	•	•	•
Tian 2015	?	?	?	?	?	?	?

Appendix 5: Assessment of publication bias.

Figure S5.1 Funnel plot for all-cause mortality across included studies.



Appendix 6: Quality of the body of evidence assessment

Table S6.1: Evaluation of the quality of evidence for the estimated measure effect for the rate of mortality according to the GRADE methodology.

Factors	Effect on the quality of evidence	Comments
Limitations in the design and implementation	Serious	Multiples domains associated with high risk of bias in multiple studies including randomized sequence generation, allocation concealment and incomplete outcome data.
Indirectness of evidence	Minimal	The main review question was assessed in the included studies
Unexplained heterogeneity of results	Minor	Almost all statistical heterogeneity was explained in subgroup analysis according to technology type.
Imprecision of the results	Serious	As mortality was a rare event in most of the included studies, and few studies were available in each sub-group, a wide confidence interval is observed over the effect estimate.
Probability of publication bias	Minor	Insufficient information is available to determine if a publication bias is present but as most of the included studies reported no association between the intervention and mortality, this should not affect the quality of evidence on the conclusion.

Table S6.2: Evaluation of the quality of evidence for the estimated measure effect for secondary outcomes according to the GRADE methodology.

Secondary outcomes	Cardiovascular events	All-cause hospitalisations	Intradialytic hypotension	Symptoms during dialysis	Systolic blood pressure	Diastolic blood pressure	Left ventricular mass index	Anti- hypertensive medications
Limitations in	Serious	Serious	Serious	Serious	Serious	Serious	Serious	Serious
the design and								
implementation								
Indirectness of	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal
evidence								
Unexplained	Serious:	Serious:	Minor:	Serious:	Minimal:	Moderate:	Serious:	Minimal
heterogeneity of	(Significant	(Significant	(Significant	(Significant	(Minor	(Significant	(Significant	(No statistical
results	statistical	statistical	statistical	statistical	statistical	statistical	statistical	heterogeneity.)
	heterogeneity	heterogeneity	heterogeneity	heterogeneity	heterogeneity	heterogeneity	heterogeneity	
	unexplained by	unexplained by	explained by	and only 2	explained in	partially by	unexplained by	
	subgroup	subgroup	subgroup	studies	sub-group	subgroup	subgroup	
	analysis)	analysis)	analysis for the	available)	analysis.)	analysis)	analysis)	
			risk of bias)					
Imprecision of	Serious	Serious	Moderate	Serious	Moderate	Moderate	Serious	Serious
the results								
Probability of	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor
publication bias								
Quality of the	Very low	Very low	Moderate	Very Low	Moderate	Low	Very Low	Low
body of								
evidence								

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