

Randomized Controlled Trials Showing a Benefit in Perioperative Goal-Directed Therapy

More than 3000 patients have been enrolled in these 32 positive RCTs.

PAC, n = 8 (1175 patients)	Doppler, n = 10 (954)	Pulse Contour, n = 12 (995)	A line, n = 1 (33)	CVC, n = 1 (135)
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#	Title, Author and Year	n	Parameters Optimized	Surgery	Tool	Main Benefits
1	Prospective trial of supranormal values of survivors as therapeutic goals in high-risk patients. Shoemaker 1988	310	DO2	General	PAC-1	Morbidity Mortality (21vs34%) Cost-savings
2	Preoperative optimization of cardiovascular hemodynamics improves outcomes in peripheral vascular surgery. Berlauk 1991	89	CI, PCWP, SVR	Vascular	PAC-2	Morbidity
3	Prospective trial of supranormal values as goals of resuscitation in severe trauma. Fleming 1992	67	DO2	Trauma	PAC-3	Morbidity
4	A randomized clinical trial of the effect of deliberate perioperative increase of oxygen delivery on mortality in high-risk patients. Boyd 1993	107	DO2	General	PAC-4	Morbidity Mortality (6vs22%) Cost-savings
5	Perioperative plasma volume expansion reduces the incidence of gut mucosal hypoperfusion during cardiac surgery. Mythen 1995	60	SV	Cardiac	Doppler-1	Morbidity Hospital LOS

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#	Title, Author and Year	n	Parameters Optimized	Surgery	Tool	Main Benefits
6	Intraoperative intravascular volume optimisation and length of hospital stay after repair of proximal femoral fracture: randomised controlled trial. Sinclair 1997	40	SV	Hip	Doppler-2	Hospital LOS
7	Response of patients with cirrhosis who have undergone partial hepatectomy to treatment aimed at achieving supranormal oxygen delivery and consumption. Ueno 1998	34	DO2	Hepatectomy	PAC-5	Morbidity
8	Reducing the risk of major elective surgery: randomised controlled trial of preoperative optimization of oxygen delivery. Wilson 1999	138	DO2	General and vascular	PAC-6	Morbidity Hospital LOS Cost-savings
9	A prospective, randomized study of goal-oriented hemodynamic therapy in cardiac surgical patients. Polonen 2000	393	SvO2	Cardiac	PAC-7	Morbidity Hospital LOS
10	Effects of maximizing oxygen delivery on morbidity and mortality in high-risk surgical patients. Lobo 2000	37	DO2	General	PAC-8	Morbidity Mortality (16vs50%)
11	Randomized controlled trial to investigate influence of the fluid challenge on duration of hospital stay and perioperative morbidity in patients with hip fractures. Venn 2002	59	SV	Hip	Doppler-3	Morbidity
12	Goal-directed Intraoperative fluid administration reduces length of hospital stay after major surgery. Gan 2002	100	SV	General	Doppler-4	Morbidity Hospital LOS
13	Randomised controlled trial investigating the influence of intravenous fluid titration using oesophageal Doppler monitoring during bowel surgery. Conway 2002	57	SV	Bowel	Doppler-5	Morbidity

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Continued**

#	Title, Author and Year	n	Parameters Optimized	Surgery	Tool	Main Benefits
14	Randomised controlled trial assessing the impact of a nurse delivered, flow monitored protocol for optimisation of circulatory status after cardiac surgery. McKendry 2004	174	SV	Cardiac	Doppler-6	Hospital LOS
15	Intraoperative oesophageal Doppler guided fluid management shortens postoperative hospital stay after major bowel surgery. Wakeling 2005	128	SV	Bowel	Doppler-7	Morbidity Hospital LOS
16	Early goal-directed therapy after major surgery reduces complications and duration of hospital stay. A randomised, controlled trial. Pearse 2005	122	DO2	General	LidCO-1	Morbidity Hospital LOS
17	Randomized clinical trial assessing the effect of Doppler-optimized fluid management on outcome after elective colorectal resection. Noblett 2006	108	SV	Bowel	Doppler-8	Morbidity Hospital LOS
18	Esophageal Doppler-guided fluid management decreases blood lactate levels in multiple-trauma patients: a randomized controlled trial. Chytra 2007	162	SV	Trauma	Doppler-9	Morbidity Hospital LOS
19	Goal-directed fluid management based on pulse pressure variation monitoring during high-risk surgery: a pilot randomized controlled trial. Lopes 2007	33	PPV	General	A line-1	Morbidity Hospital LOS
20	Goal-directed intraoperative therapy reduces morbidity and length of hospital stay in high-risk surgical patients. Donati 2007	135	ERO2	General and vascular	CVC-1	Morbidity Hospital LOS
21	Goal-directed intraoperative therapy based on Autocalibrated arterial pressure waveform analysis reduces hospital stay in high-risk surgical patients: a randomized, controlled trial. Mayer 2009	60	SVV, SVI, CI	Abdominal	FloTrac-1	Morbidity Hospital LOS
22	Intraoperative fluid optimization using stroke volume variation in high risk surgical patients: results of prospective randomized study. Benes 2010	120	SVV, CI	Abdominal and vascular	FloTrac-2	Morbidity

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#	Title, Author and Year	n	Parameters Optimized	Surgery	Tool	Main Benefits
23	Haemodynamic optimisation improves tissue microvascular flow and oxygenation after major surgery: a randomised controlled trial. Jhanji 2010	135	SV, DO2	Abdominal	LidCO-2	Morbidity
24	Goal-directed haemodynamic therapy during elective total hip arthroplasty under regional anaesthesia. Cecconi 2011	40	DO2	Hip	FloTrac-3	Morbidity
25	A double-blind randomized controlled clinical trial to assess the effect of doppler optimized intraoperative fluid management on outcome following radical cystectomy. Pillai 2011	66	SV	Cyctectomy	Doppler-10	Morbidity
26	Haemodynamic optimisation in lower limb arterial surgery: room for improvement? Bisgaard 2012	40	SV, DO2	Vascular	LidCO-3	Morbidity
27	Outcome impact of goal directed fluid therapy during high risk abdominal surgery in low to moderate risk patients: a randomized controlled trial. Ramsingh 2012	38	SVV	Abdominal	FloTrac-4	Morbidity Hospital LOS
28	Goal-directed intraoperative fluid therapy guided by stroke volume and its variation in high-risk surgical patients: a prospective randomized multicentre study. Scheeren 2012	40	SVV, SV	Abdominal	FloTrac-5	Morbidity
29	Intraoperative fluid management in open gastrointestinal surgery: goal-directed versus restrictive. Zhang 2013	80	SVV, CI	Thoracic	FloTrac-6	Morbidity
30	Individually optimized hemodynamic therapy reduces complications and length of stay in the Intensive Care Unit. Goepfert 2013	100	SVV, GEDI, CI, EVLW	Cardiac	PiCCO-1	Morbidity

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#	Title, Author and Year	n	Parameters Optimized	Surgery	Tool	Main Benefits
31	Perioperative goal-directed hemodynamic therapy based on radial arterial pulse pressure variation and continuous cardiac index trending reduces postoperative complications after major abdominal surgery: a multi-center, prospective, randomized study. Salzwedel 2013	160	PPV, CI	Abdominal	ProAQT-1	Morbidity Hospital LOS
32	Goal-directed fluid therapy in gastrointestinal surgery in older coronary heart disease patients: randomized trial. Zheng 2013	60	SVV, SVI, CI	Abdominal	FloTrac-7	Morbidity Hospital LOS

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