LiDCO

Hemodynamic Monitoring

- Optimise your patients hemodynamic status
- Non-Invasive, Minimally Invasive, Calibrated, Depth of Anesthesia
- Parameters include CO, SV, SVV, SVR, PPV

250+

Clinically proven with 250+ Clinical Papers

Operating Theatre, ICU, Emergency Department and Other High Risk Areas

Distributor Brochure

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Features

LiDCO hemodynamic monitoring enables vital risk assessment in time-critical situations and determining patients' fluid response for early fluid resuscitation.

The clinician can choose which mode is most appropriate to the clinical situation. The LiDCOrapid can be used non-invasively, minimally invasively with a radial arterial line.

The LiDCOrapid uses the PulseCO™ algorithm which converts blood pressure to its constituent parts of flow (CO, SV) and resistance (SVR). The PulseCO™ algorithm is scaled to each patient with the nomogram using age, height and weight.

LiDCOrapid delivers

- 3 in 1 platform for monitoring in any clinical situation;
- Non-invasive monitoring, minimally invasive monitoring via the radial arterial line, calibrated values;
- Very easy to set up and use;
- Designed to be used to allow for early and prompt monitoring in sepsis;
- The clinician can see why the blood pressure has changed which helps with important clinical decisions;
- The LiDCOrapid also provides parameters which help to decide when to start and stop giving fluid;
- One disposable for both arterial line and non-invasive which is cost effective;
- Depth of anesthesia monitoring with BIS™;
- Refer to the screen guide tab for further insights into how the flexibility of the displays can help meet your needs.

Hemodynamic Monitoring for the entire patient pathway

From the ED to the OR to Critical Care and other High Care departments. LiDCOrapid has the flexibility to enable continuity of measurement across patient acuity levels

Emergency Department

LiDCO is used in the emergency department to assist with the early identification of sepsis and the resuscitation of trauma patients

- Evaluate hemodynamic status
- Exclude haemorrhage
- Early hypovolemia diagnosis
- Guide fluid resuscitation
- Early identification of Sepsis
- Guide fluid titration of inotropes

Operating Room

The goal in the OR is to optimise fluid and drug therapy prior and during surgery. Successful hemodynamic monitoring in OR reduces the resources need for high-dependency (ICU)

- Switch seamlessly between Non-Invasive and Minimally Invasive
- Measure Depth of Anesthesia using BIS
- Elected bowel surgery, Aortic aneurism, Vascular surgery

ICU

Recent guidelines published by a Task Force of the ESICM and by the Surviving Sepsis Campaign highlight a need for continuous advanced hemodynamic measurements to guide fluid and drug management

- Can be used with an existing radial arterial line
- Monitoring can be started on admission
- Assess if the patient is fluid responsive
- Start appropriate drug therapy

Other High Risk Areas

LiDCO hemodynamic monitoring systems are used within other high-risk areas. The goal in other high-risk areas is to provide continuous blood pressure monitoring during high-risk procedures such as emergency caesareans

- Maternity
- Cath Lab
- Burns
- Transplant
- Other high dependent areas

CONTACT

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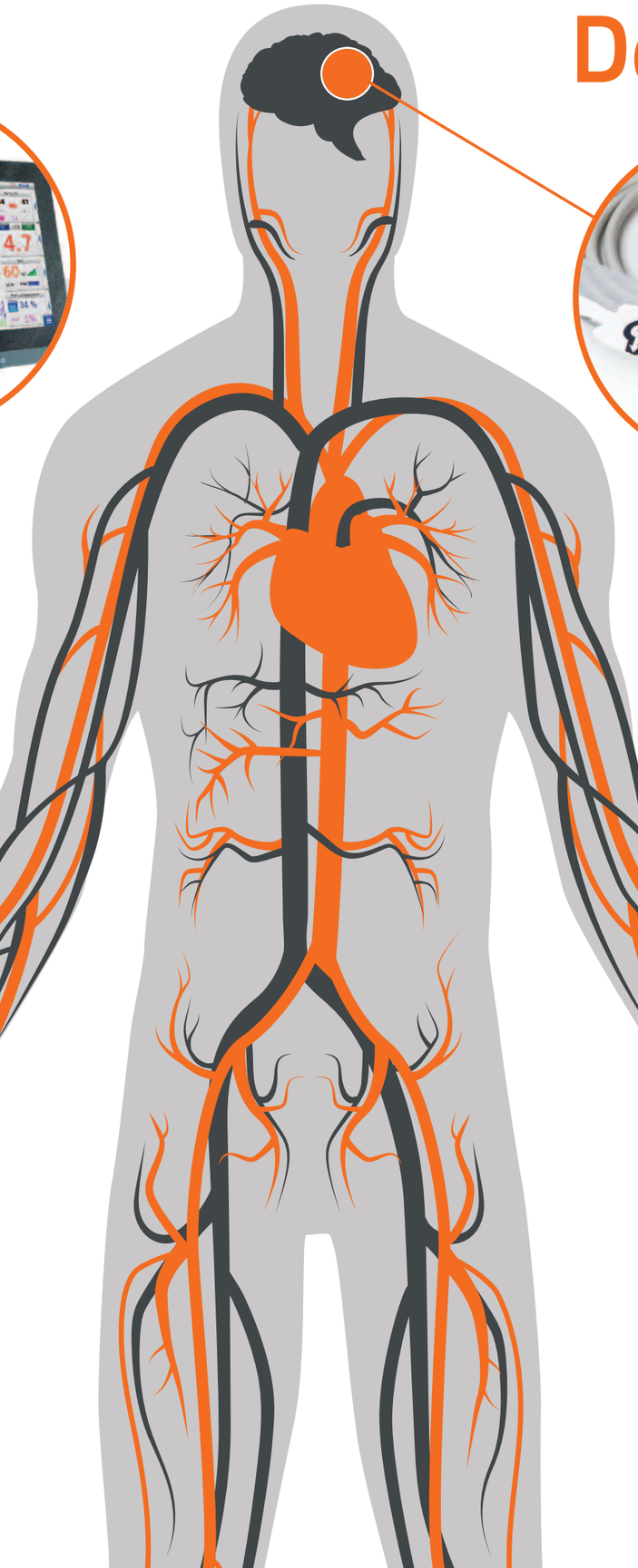
LiDCOrapid

Minimally Invasive

- Plug and play from existing vital signs monitor
- Arterial line input without needing to change your pressure transducer
- Validated PulseCO™ algorithm reliably tracks hemodynamic changes in the presence of inotropes and vasoactive drugs
- Beat-to-beat analysis and display of hemodynamic parameters



Depth of Anesthesia

- Integrated into the LiDCO
- Enables clinicians to titrate anesthesia with its hemodynamic effects
- Stops over-anesthetising, nor under-anesthetising
- Stops dramatic falls in blood pressure and flow

LiDCOBIS

Calibrate

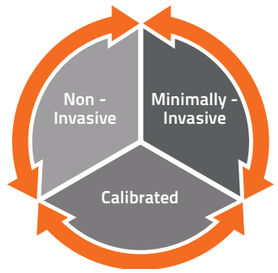
- Continuous real-time measurement with lower risk and high precision
- Calibrate using measured cardiac output value or ECHO
- Reduced infection risk with less invasive catheter

LiDCOrapid

Non-Invasive

- Quick and easy to set-up
- Real-time continuous non-invasive blood pressure (CNAP™) and hemodynamic parameters
- Proven to be as effective as an arterial line to monitor fluids when used with the PulseCO™ algorithm
- Dual finger sensor with automatic finger switching for safer non-invasive use

LiDCOCNAP



One Disposable

- Switch monitoring seamlessly with one disposable Smartcard
- Smartcard carries key patient information between different LiDCO Monitors to ease set-up and monitoring

Screen Guide

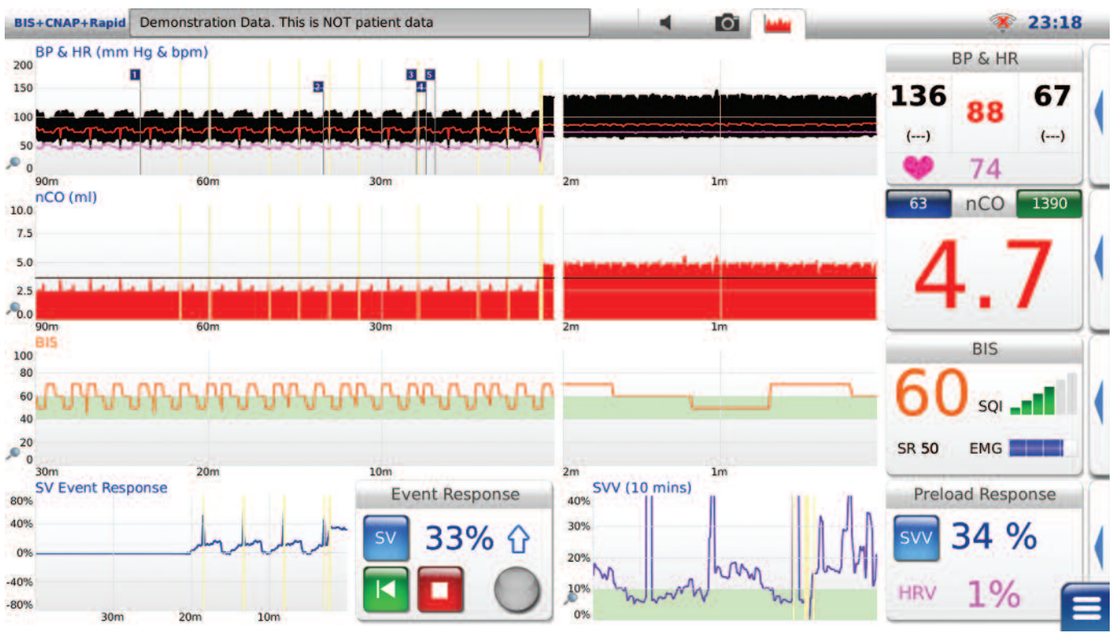
Designed to support your clinical decision making

Long Term Trend

Easy interpretation of trends from the start of monitoring, which can be customised to the parameters you need

Short Term Trend

2 minute window for greater focus on the immediate response to interventions



Numeric data display to assist in recording values for routine clinical charts. The chart display Long term, 2-minute short term trend, event response and preload response screens for LiDCOrapid.

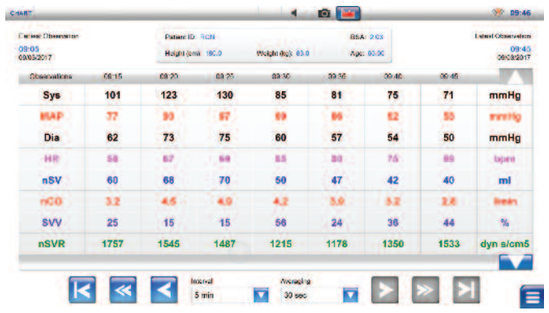
Event Response

Marking and monitoring events like a fluid challenge

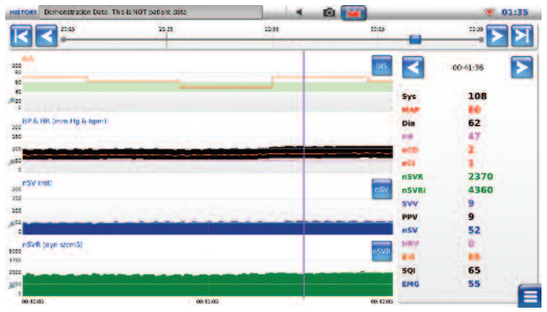
Preload Response

Window displays preload response values or volume status indicators of: Pulse Pressure Variation (PPV%) and Stroke Volume Variation (SVV%)

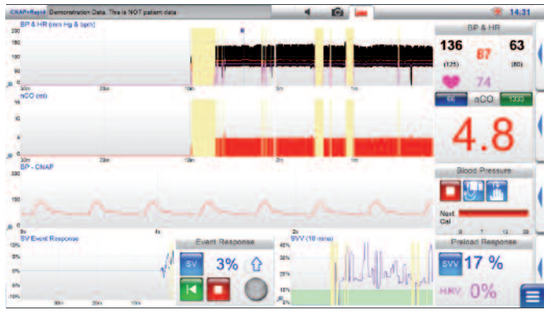
Flexibility of displays to meet your needs



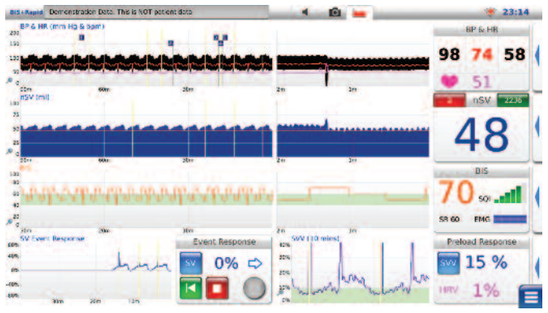
Numeric data display to assist in recording values for routine clinical charts. The chart display displays all absolute and index values



Touch on any point of the history to review hemodynamic values and review key events



Driving the PulseCO™ algorithm with arterial pressure data from the LiDCO CNAP™ module to monitor fluid responsiveness



Monitor brain activity with the BIS trend screen

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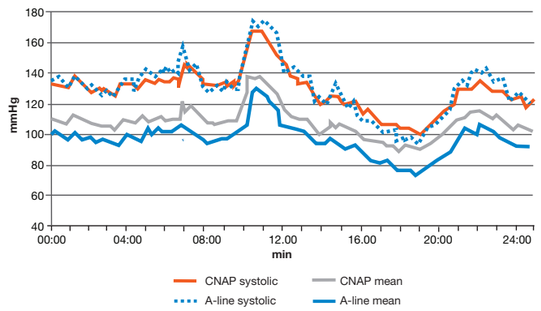
Validation

CNAP when compared to the arterial line

Driving the PulseCO™ algorithm with arterial pressure data from the LiDCO CNAP™ module is as effective as when using an arterial line in monitoring fluid responsiveness in surgery patients.



The LiDCO has shown to improve outcomes in:

Colorectal surgery

Miller T, Thacker J, White W, Mantyh C, Migaly J, Roche A, Eisentstein E, Edwards R, Moon R, Gan J (2014) Reduced length of stay in colorectal surgery after implementation of an enhanced recovery protocol Anaesthesia and Analgesia 118, (5) 1052-1061.

Vascular Surgery

Green D, Bidd H, Rashid H (2014) Multimodal intraoperative monitoring: An observational case series in high risk patients undergoing major peripheral vascular surgery. International Journal of Surgery 1a2 (3) 231 - 236.

Emergency Laparotomy

Huddart S Peden C, Swart M, McCormick B, Dickinson M, Mohammed M and Quiney N, (2015) Use of a care bundle to reduce mortality following emergency laparotomy. Br J Hosp Med Jun;76(6):358-62.

Total hip replacement

Han G, Liu K, Xue H, Zhao P (2016) Application of LiDCOrapid in perioperative fluid therapy in ages patients undergoing total hip replacement Int J Clin exp Med 2016 9 (2) 4473-4478.

Liver Resection

Jones C, Kelliher L, Dickinson M, Riga A, Worthington T, Scott M J, Vandrevala T, Fry C H, Karanjia N and Quiney N. (2013) Randomized clinical trial on enhanced recovery versus standard care following open liver resection. Br J Surg Jul;100(8):1015-24. Doi: 10.1002/bjs.9165.

Oesophagectomy

Preston S, Markar S, Baker C, Soon Y, Singh S, Low D (2012) Impact of multidisciplinary standardized clinical pathway on perioperative outcomes in patients with oesophogeal cancer. Br J Surg; DOI: 10.1002/bjs.8974.

Bariatric surgery

Jain A & Dutta A (2010) Stroke volume variation as a guide to fluid administration in morbidly obese patients undergoing laparoscopic bariatric surgery. Obes Surg DOI 10.1007/s11695-009-0070.

Cardiac Surgery

Thomson R, Meeran H, Valencia O, Al-Subaie N. (2014) Goal-directed therapy after cardiac surgery and the incidence of acute kidney injury. J Crit Care. Dec;29(6):997-1000.

Osawa et al Effect of Perioperative Goal-Directed hemodynamic resuscitation therapy on outcomes following cardiac surgery: A randomized clinical trial and systematic review. Journal Crit Care med (44) 4 724-733.

High risk abdominal surgery

Lobo S, Ronchi L, Oliveira N, Brandão P, Froes A, Cunrath G, Nishiyama K, Netinho J, Lobo F. (2011) Restrictive strategy of intraoperative fluid maintenance during optimization of oxygen delivery decreases major complications after high-risk surgery. Critical Care vol 15: R226 doi:10.1186/cc10466.

Koff M, Richard K, Novak M, Canneson M, Dodds T (2010) Elevated PPV predicts an increased length of stay and morbidity during high risk abdominal surgery. Proceedings of the 2010 Annual Meeting of the ASA, San Diego, USA.

Caesarean section

Xia W, Duan Q, Zhao L, Chi X, Wang F, Ma D, (2015) Goal-directed fluid therapy may improve hemodynamic stability in parturient women under combined spinal epidural anesthesia for cesarean section and new born well-being. J. Obstet. Gynaecol. Res. 41, (10) 1547–1555.

High risk surgical patients in ICU

Pearse R, Dawson D, Fawcett J, Rhodes A, Grounds RM, Bennett ED (2005) Early goal-directed therapy after major surgery reduces complications and duration of hospital stay. A randomised, controlled trial. Crit Care 9 (6) 687-693.

Shock patients in ICU

Hata J, Stotts C, Shelsky C, Bayman E, Frazier A, Wang J, Nickel E (2011) Reduced mortality with noninvasive hemodynamic monitoring of shock. J Crit Care vol 26 (2):224. E1-8.

Hemodynamic Parameters

Parameter	Equation	Normal Range
Normal Hemodynamic Parameters - Adult		
Arterial Blood Pressure (BP)	Systolic (SBP)	90 - 140 mmHg
	Diastolic (DBP)	60 - 90 mmHg
Mean Arterial Pressure (MAP)	SBP + (2 x DBP)/3	70 - 105 mmHg
Systolic Pressure Variation (SPV)	(SPmax-SPmin)▼	<5 mmHg unlikely to be preload responsive >5mmHg likely to be preload responsive
Pulse Pressure Variation (PPV)%	(PPmax-PPmin)/[(PPmax + PPmin)/2] x100▼	<10% unlikely to be preload responsive >13-15% likely to be preload responsive
Stroke Volume Variation (SVV)%	(SVmax-SVmin)/[(SVmax + SVmin)/2] x100▼	<10% unlikely to be preload responsive >13-15% likely to be preload responsive
	▼= averaged over 10 sec. of BP data updated every 4 beats	
Right Atrial Pressure (RAP)		2 - 6 mmHg
Right Ventricular Pressure (RVP)	Systolic (RVSP)	15 - 25 mmHg
	Diastolic (RVDP)	0 - 8 mmHg
Pulmonary Artery Pressure (PAP)	Systolic (PASP)	15 - 25 mmHg
	Diastolic (PADP)	8 - 15 mmHg
Mean Pulmonary Artery Pressure (MPAP)	[PASP + (2 x PADP)]/3	10 - 20 mmHg
Pulmonary Artery Wedge Pressure (PAWP)		6 - 12 mmHg
Left Atrial Pressure (LAP)		6 - 12 mmHg
Cardiac Output (CO)	HR x SV/1000	4.0 - 8.0 l/min
Cardiac Index (CI)	CO/BSA	2.5 - 4.0 l/min/m^2
Stroke Volume (SV)	CO/HR x 1000	60 - 100 ml/beat
Stroke Volume Index (SVI)	CI/HR x 1000	33 - 47 ml/m^2/beat
Systemic Vascular Resistance (SVR)	80 x (MAP - RAP)/CO	800 - 1200 dynes • sec/cm^5
Systemic Vascular Resistance Index (SVRI)	80 x MAP - RAP)/CI	1970 - 2390 dynes • sec/cm^5/m^2
Pulmonary Vascular Resistance (PVR)	80 x (MPAP - PAWP)/CO	<250 dynes • sec/cm^5
Pulmonary Vascular Resistance Index (PVRI)	80 x (MPAP - PAWP)/CI	255 - 285 dynes • sec/cm^5/m^2
Hemodynamic Parameters - Adult		
Left Ventricular Stroke Work (LVSW)	SV x (MAP - PAWP) x 0.0136	58 - 104 gm-m/beat
Left Ventricular Stroke Work Index (LVSWI)	SVI x (MAP - PAWP) x 0.0136	50 - 62 gm-m/m^2/beat
Right Ventricular Stroke Work (RVSW)	SV x (MPAP - RAP) x 0.0136	8 - 16 gm-m/beat
Right Ventricular Stroke Work Index (RVSWI)	SVI x (MPAP - RAP) x 0.0136	5 - 10 gm-m/m^2/beat
Coronary Artery Perfusion Pressure (CPP)	Diastolic BP - PAWP	60 - 80 mmHg
Right Ventricular End-Diastolic Volume (RVEDV)	SV/EF	100 - 160 ml
Right Ventricular End-Systolic Volume (RVESV)	EDV - SV	50 - 100 ml
Right Ventricular Ejection Fraction (RVEF)	SV/EDV	40 - 60%
Oxygenation Parameters - Adult		
Partial Pressure of Arterial Oxygen (PaO_2)		80 - 100 mmHg
Partial Pressure of Arterial CO_2 ($PaCO_2$)		35 - 45 mmHg
Bicarbonate (HCO_3)		22 - 28 mEg/l
pH		7.38 - 7.42
Arterial Oxygen Saturation (SaO_2)		95 - 100%
Mixed Venous Saturation (SvO_2)		60 - 80%
Arterial Oxygen Content (CaO_2)	(0.0138 x Hgb x SaO_2) + (0.0031 x PaO_2)	17 - 20 ml/dl
Venous Oxygen Content (CvO_2)	(0.0138 x Hgb x SvO_2) + (0.0031 x PvO_2)	12 - 15 ml/dl
A-V Oxygen Content Difference ($C(a\text{-}v)O_2$)	CaO_2 - CvO_2	4 - 6 ml/dl
Oxygen Delivery (DO_2)	CaO_2 x CO x 10	950 - 1150 ml/min
Oxygen Delivery Index (DO_2I)	CaO_2 x CI x 10	500 - 600 ml/min/m^2
Oxygen Consumption (VO_2)	$(C(a\text{-}v)O_2$ x CO x 10	200 - 250 ml/min
Oxygen Consumption Index (VO_2I)	$(C(a\text{-}v)O_2$ x CI x 10	120 - 160 ml/min/m^2
Oxygen Extraction Ratio (O_2ER)	[(CaO_2 - CvO_2)/CaO_2] x 100	22 - 30%
Oxygen Extraction Index (O_2EI)	[SaO_2 - SvO_2)/SaO_2 x 100	20 - 25%

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Meta-Analysis

15 meta-analysis confirm clinical benefit of hemodynamic monitoring

References	Reduction In	Average odd or risk ratios (confidence interval)	Number of studies
Ripollésa J, Espinosa A, Martínez-Hurtado M, et al. Intraoperative goal directed hemodynamic therapy in non-cardiac surgery: a systematic review and meta-analysis. Journal of Clinical Anesthesia 2016 Feb; 28: 105–115.	Mortality rate	0.63 (CI: 0.42-0.94)	12
Corcoran T. et al. Perioperative Fluid Management Strategies in Major Surgery: A Stratified Meta-Analysis. Anesthesia -Analgesia 2012; 114(3): 640-651.	Acute kidney injury Pneumonia	0.67 (0.46-0.98) 0.74 (0.57-0.96)	23
Gurgel ST, do Nascimento Jr. P. Maintaining Tissue Perfusion in High-Risk Surgical Patients: A Systematic Review of Randomized Clinical Trials. 2011 International Anesthesia Research Society. DOI: 10.1213/ANE.Ob013e3182055384.	Mortality Organ dysfunction	0.67 (0.55-0.82) 0.62 (0.55-0.70)	32
Aya HD, Cecconi M, Hamilton M, et al. Goal directed therapy in cardiac surgery: a systematic review and meta-analysis. British Journal of Anaesthesia, 2013 Apr;110(4):51D-7.	Postoperative complications Hospital length of stay	0.33 (CI: 0.15-0.73) -2.44 (CI: -4.03 to -0.84)	5
Arulkumaran N, Corredor C, Hamilton MA, et al. Cardiac complications associated with goal-directed therapy in high-risk surgical patients: a meta-analysis. British Journal of Anaesthesia 2014 Apr;112(4):648-59.	Cardiovascular complications Arrythmias	0.54 (CI: 0.38-0.76) 0.54 (CI: 0.35-0.85)	22
Cecconi M, Corredor C, Arulkumaran N, et al. Clinical review: Goal-directed therapy-what is the evidence in surgical patients? The effect on different risk groups.Critical Care Medicine 2013, 17:209.	Complications	0.45 (CI: 0.34-Q.60)	32
Dalfino L, Giglio MT, Puntillo F, Marucci M, Brienza N. Haemodynamic goal-directed therapy and postoperative infections: earlier is better. A systematic review and meta-analysis. Critical Care Medicine 2011; 15(3): R154.	Surgical site infection Urinary tract infection Pneumonia	0.58 (0.46-0.74) 0.44 (0.22-0.88) 0.71 (0.55-0.92)	26
Grocott MP, Dushianthan A, Hamiltom MA. et al. Perioperative increase in global blood flow to explicit defined goals and outcomes after surgery: a Cochrane systematic review British Journal of Anaesthesia 2013;111(4):535-548.	Acute kidney injury Surgical site infection Respiratory failure Total morbidity rate	0.71 (0.57-0.90) 0.65 (0.50-0.84) 0.51 (0.28-0.93) 0.68 0.58-0.80	31
Hamilton MA, Cecconi M, Rhodes A. A systematic review and meta-analysis on the use of preemptive hemodynamic intervention to improve postoperative outcomes in moderate and high risk surgical patients. Anesthesia -Analgesia 2011; 112: 1392-402.	Total morbidity rate	0.44 (0.35-0.55)	29
Brienza N, Giglio MT, Marucci M, et al. Does perioperative hemodynamic optimization protect renal function in surgical patients? A meta-analytic study.Critical Care Medicine 2009;37:2079-90.	Acute kidney injury	0.64 (0.50-0.83)	20
Poeze M, Willem M Greve J, Ramsay G. Meta-analysis of hemodynamic optimization: relationship to methodological quality. Critical Care 2005, 9:R771-R779.	Mortality rate	0.61 (0.46-0.81)	30
Giglio MT, Marucci M, Testini M, et al. Goal-directed haemodynamic therapy and gastrointestinal complications in major surgery: a meta-analysis of randomized controlled trials. British Journal of Anaesthesia; 2009;103(5):637-646.	Minor gastrointestinal complication Major gastrointestinal complication	0.29 (0.17-0.50) 0.42 (0.27-0.65)	16
Bundgaard-Nielsen M, Holte K, Secher NH, et al. Monitoring of peri-operative fluid administration by individualized goal-directed therapy. Acta Anaesthesiologica Scandinavica 2007 Mar;51(3):331-40.	Hospital length of stay Post-op nausea & vomiting Total morbidity rate	NA	9

What Our Customers Say...

> I use the LiDCO Rapid hemodynamic monitor since 2011 in the ICU. It is very easy to set up and use with a radial arterial line and helps me with fluid and drug management
>
> Dr Urszula Zielińska-Borkowska
> ICU Szpital Kliniczny im. prof. W. Orłowskiego - Centrum Medycznego Kształcenia Podyplomowego
> ul. Czerniakowska 231, 00-416 Warszawa, Poland

> I use the LiDCO in the ICU because it is easy to set up and use with a radial arterial line and helps me with fluid and drug management
>
> Prof. Wojciech Gaszynski
> Department of Anaesthesiology and Intensive Therapy
> Uniwersytecki Szpital Kliniczny nr 1 im. Norberta Barlickiego Uniwersytetu Medycznego/ Medical University of Lodz
> ul. Kopcińskiego 22, 90-153 Łódź, Poland

> What I like is that the LiDCO provides me with more information from a standard radial line
>
> Prof. Ryszard Gajdosz
> Department of Anaesthesiology and Intensive Therapy
> Szpital św. Rafała, ul. Bochenka 12, 30-693 Kraków

> I routinely use the LiDCO early in sepsis to manage fluid and drug therapy
>
> Doc. dr. Tomislav Mirkovic, dr. med
> Department of Anaesthesiology and Surgical Intensive Therapy
> Medical Centre Ljubljana, Slovenia

> Using the LiDCO helps guide my fluid management
>
> Prim. mag. Dusan Vlahovic, dr. med
> Department of Anaesthesiology and Surgical Intensive Therapy
> Medical Centre Ljubljana, Slovenia

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