introducing the new ...

LiDCO*rapid*^{v2}
with Unity Software

LiDCO Cardiac Sensor Systems

introducing the new ...

LiDCO*rapid*^{v2}

with Unity Software

LiDCO now brings you a new multi parameter monitoring solution for fluid and drug management of high-risk surgery patients

additional features

- LiDCO have now added the display of both **continuous non invasive blood pressure** (**CNAP**™) and level of consciousness (BIS™) to the LiDCO*rapid*^{v2} monitor platform.*
- Now monitoring **consciousness and hemodynamic parameters can be achieved in all high-risk surgery patients** non invasively.
- The display of LiDCO CNAP™ module **non invasively derived pressure and hemodynamic parameters** can be used for monitoring hemodynamic parameters that have been shown to be central to improving outcomes in high-risk surgery patients.

satisfying NICE recommendations:

- The LiDCO*rapid*^{v2} with Unity software satisfies **National Institute for Clinical Excellence** (**NICE**) **recommendations for fluid monitoring** (**MTG3**) in patients undergoing major or high-risk surgery or other surgical patients in whom a clinician would consider using invasive cardiovascular monitoring.
- When installed with the optional depth of anesthesia (BIS™) module LiDCO*rapid*^{v2} additionally **satisfies NICE recommendations for depth of anesthesia monitoring in patients at higher risk of awareness during surgery** or at higher risk of excessively deep anesthesia, and in all patients receiving total intravenous anesthesia (recommendation DG6).

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

Rigby et al., 2012; Biais et al., 2011 & Monnet et al., 2012

multi parameter and non invasive monitoring

continuous
non-invasive
blood pressure
and level of
consciousness

BIS™ is a consciousness monitoring technology proven in rigorous prospective clinical studies to help clinicians reduce the incidence of awareness in adults

Myles et al., 2004 & Kaplan et al., 2000

peri operative pathway

1 pre-induction

baseline hemodynamic values

using **either** an **arterial** line or the **non invasive** CNAP™ module the clinician is able to establish a hemodynamic baseline for pre-induction blood pressure, stroke volume and cardiac output values

non invasive CNAP™

- CNAP™ is easy to set up and use pre induction and throughout the case
- Continuous arterial blood measurement with CNAP™ dual finger cuff system scaled to the brachial artery with an arm cuff
- CNAP™ derived arterial waveform can reliably drive the PulseCO™ algorithm
- SVV, PPV, HR and ΔSV will be comparable to those derived from an invasive arterial line

- LiDCO*rapid*v2 is easy to set up and use
- The monitor is designed to provide information that allows the user to optimise fluid and drug management immediately prior to induction and throughout surgery
- Preventing a significant debt of oxygen during high risk surgery can reduce complications and length of stay
- PulseCO™ 'pulse power' algorithm reliably tracks hemodynamic change in the presence of inotropes and vasoactive drugs

2 during surgery

optimising blood flow and level of consciousness

The LiDCO*rapid*^{v2} monitor is designed to display hemodynamic parameters that have been used in the monitoring of goal directed fluid therapy and drug interventions aimed at optimizing blood flow in high risk surgery patients.

Monitoring of circulatory blood volume guided by SVV% / PPV% and ΔSV response can be achieved with an arterial line or now non invasively with the LiDCO CNAP™ module.

Intraoperative management using additional haemodynamic parameters such as fluid responsiveness, cardiac output and stroke volume is associated with reduced complications and length of stay.

BIS™

The BIS™ system processes raw EEG signals to produce a single number, called the 'Bispectral Index™' which correlates with the patients level of hypnosis or consciousness.

The anesthetist can now monitor both hemodynamics and level of consciousness on a single screen.

3 recovery, PACU/HDU and ICU

continuity of care

The patient can continue to be monitored in a high care area with an arterial line or in any area with the CNAP™.

Hemodynamics and fluid management can continue to be optimised in the post op period.

LiDCO*rapid*^{v2} user display

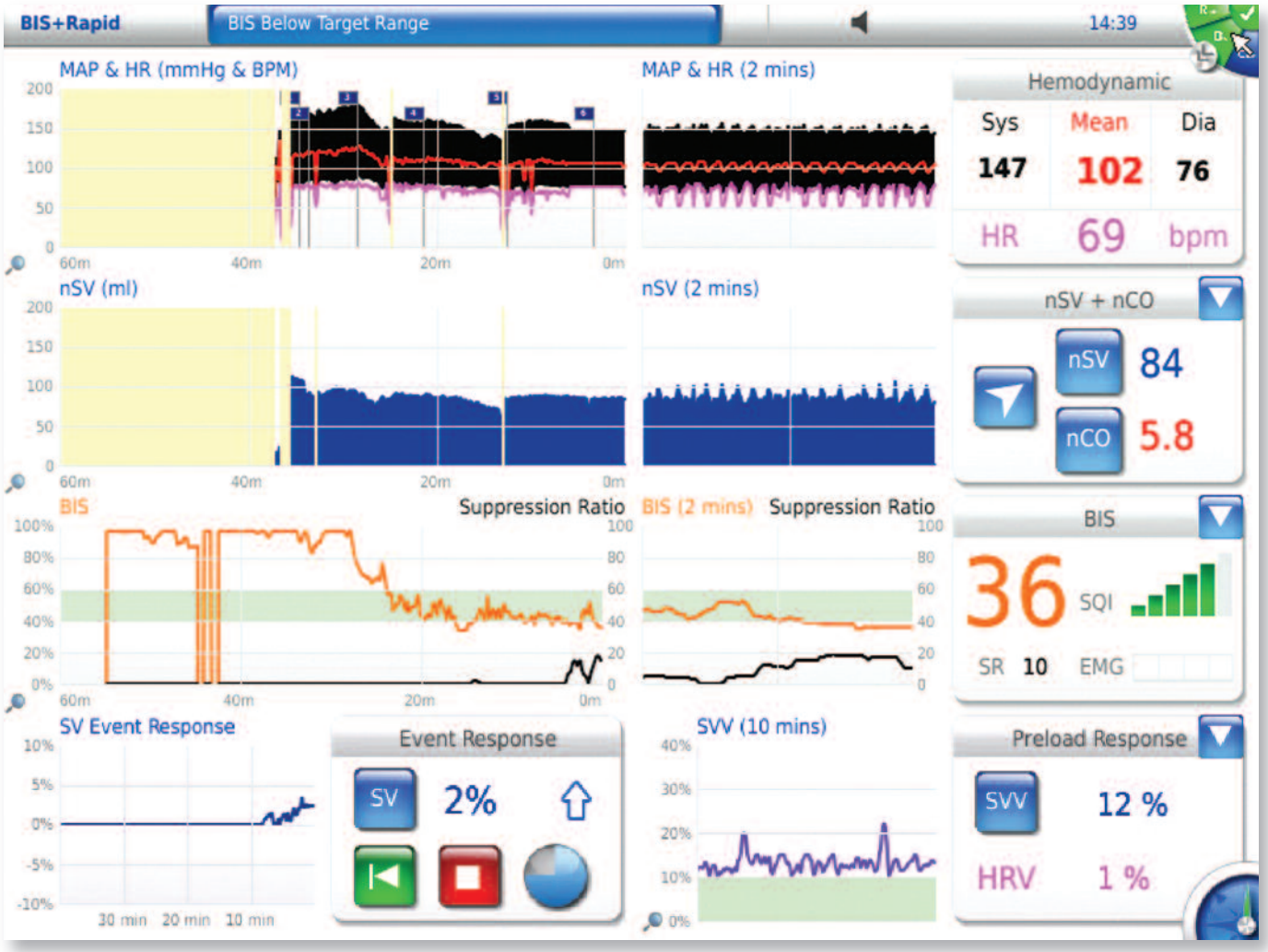
designed for monitoring the high risk surgery patient

long term trend

Hemodynamic and BIS trends from the beginning of a procedure.

short term trend

Hemodynamic and BIS trends for the last 2 minutes, showing the immediate response to an intervention.



event response

The LiDCO*rapid*^{v2} window can show the stroke volume response to a fluid challenge.

preload response

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

LiDCO*rapid*v2 CNAP™ module

provides a non invasive arterial waveform that can be analysed by the PulseCO™ algorithm

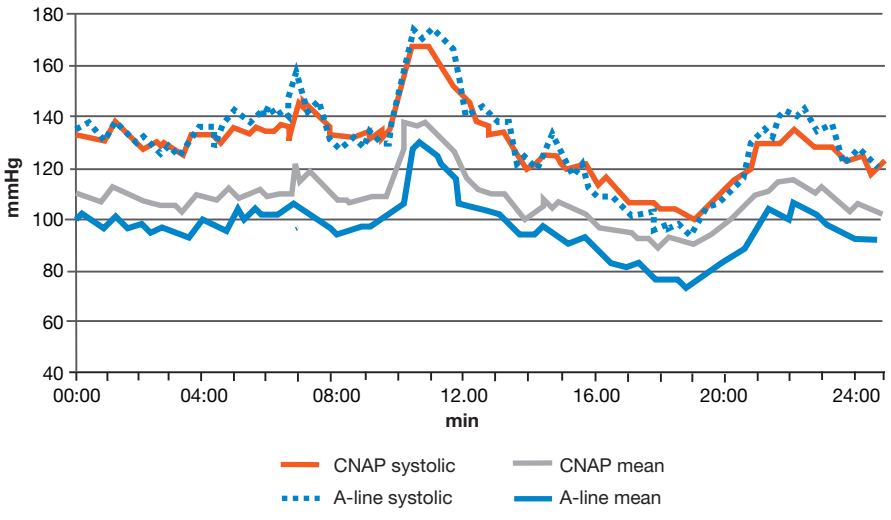
dual finger cuff sensor

Generates a continuous blood pressure waveform for analysis and the monitor display of beat-to-beat pressure and hemodynamic parameters.

calibrated pressure values

Uses an oscillometric arm cuff to provide an absolute measure of brachial blood pressure.

CNAP™ when compared to the arterial line



The LiDCO CNAP™ module provides a continuous non invasive arterial waveform that can be analysed by the PulseCO™ algorithm to derive arterial pressure and the following hemodynamic parameters: HR, SV, SVV%/PPV%, CO & SVR.

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.

summary

non invasive or minimally invasive continuous hemodynamic monitoring from an arterial waveform and level of consciousness

BIS™

- BIS™ technology monitors the state of the brain through acquisition of EEG signals, and may provide insight into the patient-specific effects of anesthesia on the brain. *Gan et al., 1997*
- Prospective, randomized studies have shown reductions in the use of certain primary anesthetic agents when titrated to the BIS™ Index. *Song et al., 1997 & Luginbuhl et al., 2003*
- BIS™ is a consciousness monitoring technology proven in rigorous prospective clinical studies to help clinicians reduce the incidence of awareness in adults. *Myles et al., 2004; Ekman et al., 2004 & Kaplan et al., 2000*

CNAP™

- Provides a continuous non invasive blood pressure measurement with a dual finger cuff scaled to the brachial arterial pressure
- The CNAP™ derived arterial waveform can be used with the PulseCO™ algorithm to monitor fluid responsiveness in surgical patients
- Hemodynamic changes and fluid responsiveness parameters are comparable to those derived from an arterial line

LiDCO*rapid*v2 is easy to set up and use

- Attach the cable from the LiDCO*rapid*v2 to the vital signs monitor
- Insert patient LiDCO*smart* card
- Switch on and select modules (e.g. BIS™, CNAP™) and enter patient details
- If using the CNAP™ attach finger and arm cuffs
- If using the BIS™, attach the BIS™ sensor to the patient's forehead
- Provides early and fast warning of change in a single trend screen
- Measures and displays the stroke volume response to a fluid challenge
- Unique multiparameter user interface

outcome studies

The PulseCO™ algorithm has been used in the following studies

Post operative surgical Goal Directed Therapy:

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

Peri-operative GDT study (intra and post op):

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

Shock patients in an ICU setting:

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

Transplantation organ donor optimization:

Murugan R, Venkataraman R, Wahed A, Elder M, Carter M, Madden N, Kellum J (2009) Preload responsiveness is associated with increased interleukin-6 and lower organ yield from brain-dead donors. Crit Care Med Vol. 37 No. 8, 2387 – 2393

High-risk abdominal & bariatric surgery:

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

Laparoscopic 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

Congestive heart failure patients:

Dizon J, Quinn T, Cabreriza S, Wang D, Spotnitz H, Hickey K, Garan H (2010) Real-time stroke volume measurements for the optimization of biventricular pacing parameters. Europace Sep; 12(9):1270 – 4

Oesophagectomy:

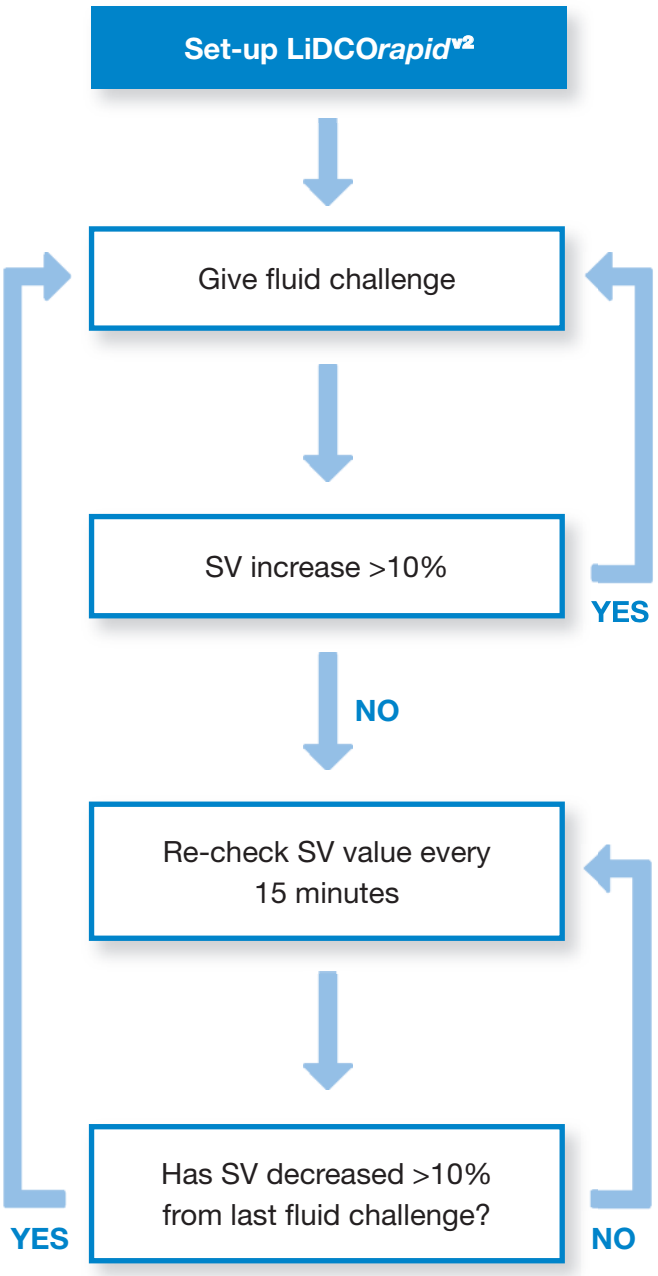
Preston S, Markar S, Baker C, Soon Y, Singh S, Low D (2012) Impact of multidisciplinary standardized clinical pathway on perioperative outcomes in patients with oesophogeal cancer. Br J Surg; DOI: 10.1002/bjs.8974

PulseCO™ validation

pulse power algorithm

- The PulseCO™ algorithm has been unchanged since launch in 2001 and its performance explored in the following patient populations:
  - General surgery patients (Heller et al., 2002)
  - Hyperdynamic liver transplantation patients (Costa et al., 2007)
  - Off-pump cardiac surgery patients (Missant and Wouters, 2007)
  - On-pump cardiac surgery (Wilde et al., 2007, Marquez et al., 2008)
  - Post-operative care (Pittman et al., 2005; Hamilton, 2002)
  - General intensive care patients (Smith et al., 2005)
  - Heart failure patients (Kemps et al., 2009)
  - High risk obstetric patients (Dyer et al., 2011)
- The PulseCO™ algorithm has been proven to accurately track cardiac output after changes in inotropes and administration of vasopressors/ vasodilators that alter systemic vascular resistance

fluid challenge protocol



MAINTAIN:

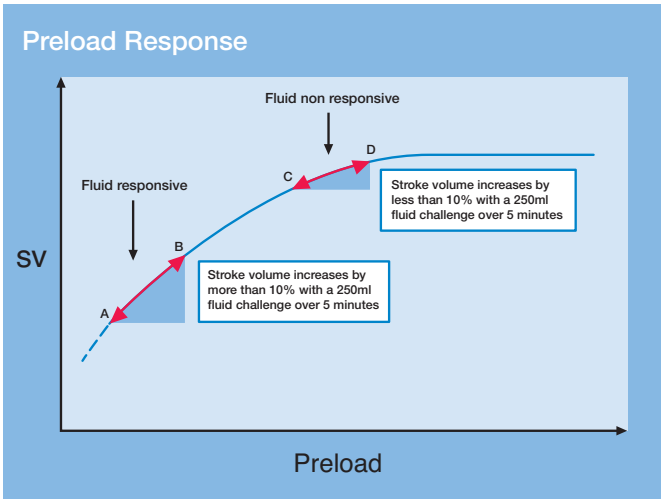
SaO_2 >94%, Hb 8-10 g/dL,
Temp 37ºC, MAP 60-100 mmHg

Warning: The above fluid protocol is a simplified schematic – each institution should only give fluids according to their own internally approved fluid administration protocols.

Adult fluid challenge guidelines:

Administer a 250ml fluid bolus <5 mins intravenously

1. Use wide bore cannula if available
2. Give rapidly with 50ml syringe and 3 – way tap



The use of intraoperative fluid management technologies are recommended from the outset in the following types of cases:

- Major surgery with a 30 day mortality rate of >1%
- Major surgery with an anticipated blood loss of greater than 500ml
- Major intra-abdominal surgery
- Intermediate surgery (30 day mortality >0.5%) in high risk patients (age >80 years, history of LVF, MI, CVA or peripheral arterial disease)
- Unexpected blood loss and/or fluid loss requiring >2 litres of fluid replacement
- Patients with ongoing evidence of hypovolaemia and or tissue hypoperfusion (e.g. persistent lactic acidosis)

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Kemps H, Thijssen E, Schep G, Sleutjes B, De Vries W, Hoogeveen A, Wijn P, Doevendans P. Evaluation of two methods for continuous cardiac output assessment during exercise in chronic heart failure patients. (2008) Journal of Applied Physiology, 105: 1822-1829

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Green D, Paklet L. Latest developments in peri-operative monitoring of the high-risk major surgery patient. (2010) International Journal of Surgery, 8, 90-99

Purushothaman B, O'Brien T, Green D. The hemodynamic effects of anesthetic induction and their correlation with changes in depth of anesthesia. Proceedings of the 2010 Annual Meeting of the ASA

Dyer R, Piercy J, Reed A, Strathie G, Lombard C, Anthony J, James M Comparison between pulse waveform analysis and thermodilution cardiac output determination in patients with severe pre-eclampsia. (2011) British Journal of Anaesthesia 106 (1) 77 – 81

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CNAP™ non invasive blood pressure publications

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