Uscom

The measure of life.

A unique non invasive, beat to beat,
real time haemodynamic monitor.

Transform the way you **think** and **practice**

Painting a clear picture – **instantly**

USCOM's unique, non invasive method of haemodynamic monitoring is a completely safe, painless and efficient way of measuring how well the heart is functioning. The USCOM monitor allows doctors and nurses to quickly and accurately assess a patient's haemodynamic status, categorise a problem as either cardiac or vascular abnormality and monitor the patient's response to therapy.

The USCOM monitor uses proven, state-of-the art continuous wave Doppler ultrasound technology with sophisticated, real time signal processing and an intuitive user interface. The USCOM is a novel, non invasive solution for the accurate measurement of cardiac flow.

Equipped with **FlowTracer**
- fully automated flow profile tracing.

- Real time, beat to beat display
- One touch measurement recording
- Advanced trending functionality
- Manual override feature
- Fast patient assessment and treatment
- Storing graphical and numerical data
- SVR capability
- DO_2 and SpO_2 capability with OXYCOM

Reduce risk. **Minimise** cost. **Improve** care.

The Uscom monitor is safe

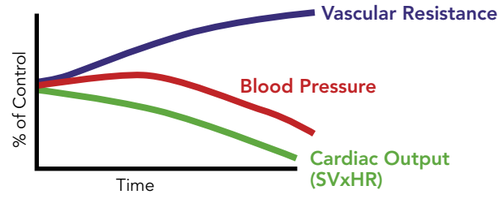
Unlike invasive methods, with the USCOM monitor there is no exposure to blood, and no associated risks of infection or complications. The examination may be performed as often as desired, with no risk to the patient. No sedation is required, making it suitable for all patients, saving on drug use and inherent complications.

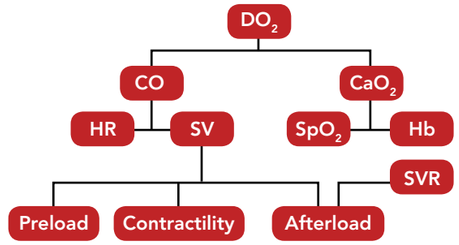
Rapid recognition of haemodynamics could make the difference in an emergency situation

The USCOM monitor provides clinicians and paramedics with vital haemodynamic information, allowing for rapid diagnosis and effective treatment, at the scene and during patient transport. The USCOM monitor can also help to avoid contraindicated therapies, which may put the patient under unnecessary trauma and risk.

Rational approach to **haemodynamic management**

BP = CO x SVR





To maintain a normal Blood Pressure (BP), the autonomic system increases Systemic Vascular Resistance (SVR) in response to a drop in Cardiac Output (CO) and vice versa. While BP stays relatively normal in compensated phase, during decompensation BP drops because SVR is no longer able to manage a failing circulation. Having beat to beat Stroke Volume (SV) allows for earlier detection and rapid intervention.

Circulatory Management = Optimise Stroke Volume

Stroke Volume Resuscitation

Monitoring Stroke Volume (SV) is especially effective in understanding a patient's response to therapy. Optimising fluids can be guided easily and safely. An increase in SV during fluid resuscitation would typically indicate a hypovolaemic state, a decrease in SV a hypervolaemic state and no change a normovolaemic or optimised pre-load. Monitoring SV is equally effective in managing contractility, afterload and oxygen delivery.

OXYCOM

The objective of circulatory therapy is to optimise oxygen delivery to the cells. This can be achieved by increasing SpO_2 or CO. Using pulse oximetry and inputting the haemoglobin (Hb) value, the USCOM monitor calculates DO_2 on a beat to beat basis (requires OXYCOM option).

Applications

- Paediatrics, PICU, NICU
- Emergency medicine – ED and remote (transport, military and field)
- ICU – general, surgical and post cardiac
- Anaesthesia
- Heart failure and Electrophysiology
- Hypertension / Eclampsia
- Dialysis
- Sports medicine
- Veterinary medicine
- Pharmacology and Animal research

Quantitative information to **guide therapy**

CASE STUDY

Response to fluid therapy measured by CVP and USCOM.

DR ROBERT BILKOVSKI
Department of Emergency Medicine, Henry Ford Hospital, Detroit, Michigan, USA

Presentation

82 year old male.
Septic shock with hypotension, tachycardia.
Pneumonia infection.
Blood pressure maintained on vasopressors: norepinephrine (0.5mcg/min) and neosynephrine (200mcg/min)

Observations

Baseline observations
HR = 139bpm, BP = 71/38mmHg (MAP = 45 mmHg) and CVP = 13 mmHg.
Baseline USCOM
HR = 136bpm, SV = 22cm^3, CO = 3.0l/min, CI = 1.6l/min/m^2, SVR = 853.

Intervention

The patient had an infusion of 25gm of albumin over 20 minutes in response to low CO, CI and SV, a high HR, and hypotension.

Post Infusion Observations
HR = 117bpm, BP = 109/56mmHg (MAP = 76mmHg) and CVP = 13mmHg (unchanged).
Post Infusion USCOM
HR = 115bpm, SV = 36cm^3, CO = 4.3l/min, CI = 2.3l/min/m^2, SVR = 1141.

Discussion

CVP directed haemodynamic optimisation goals of >12mmHg were satisfied at rest with CVP of 13mmHg, suggesting no need for fluid infusion. Baseline CO, CI and SV were inadequate as was BP, suggesting the need for fluid. Post fluid CVP was unchanged at 13mmHg, while objective flow measurements from USCOM were significantly increased. SV was increased by 63% and CO by 43%.

Conclusion

USCOM identified significant SV reserve and SV fluid responsiveness not detectable using invasive CVP haemodynamic goals. Appropriate assessment of cardiac output is improved by objective beat to beat understanding of the flow.

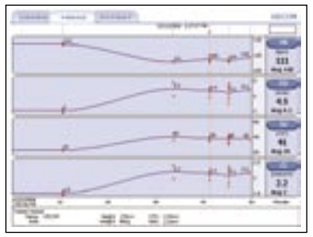


Figure 1
Uscom screen of trend data demonstrating measures from baseline (at left) with decreased HR and increased CO, SV and CI and the post bolus value (on right). This case helps to illustrate that measurement of central venous pressure for the purpose of assessing intravascular volume status has limitations.

Invasive pressure measurements provide crude analogues of circulation. Uscom's real time monitoring of the interplay of SV and HR at rest and during intervention optimizes such observation.

CASE STUDY

Correct treatment of the rapidly recognised high output state achieved a faster patient recovery.

ASSOCIATE PROFESSOR BRENDAN E. SMITH
School of Biomedical Science, Charles Sturt University, Specialist in Anaesthesia and Intensive Care, Bathurst Base Hospital, Bathurst, NSW, Australia.

Presentation

24 year old female 58Kg. Previously fit and well. Only medication is oral contraceptive pill. Brought in by ambulance as "collapse".

Observations

Baseline observations
Patient very confused and little history available. GCS 5-6. BP 73/42, pulse 80, Temp 383. Oxygen sats 92% on 4l/min O_2. Respiratory rate 26/min. Sweaty. Right calf and foot visibly swollen.

Initial diagnosis
Right-sided DVT with pulmonary embolus. CXR - unremarkable. ECG - sinus rhythm. Blood glucose 4.3mMol. Nil else of note.
Baseline USCOM

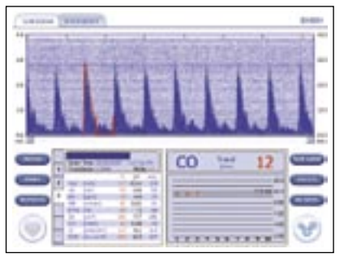


Figure 1
A high CO of 12l/min and a low resistance of 424 d s cm^{-5}

Differential diagnosis
Closer clinical examination revealed 8 x 5cm patch of cellulites on upper inner right thigh with small ischemic areas within. Inguinal lymphadenopathy present on right. Infection confirmed as streptococcus from wound swabs and same organism found in blood culture.

Intervention

The patient was successfully treated with vasopressors.

Discussion

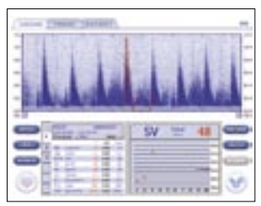
USCOM allowed for rapid differential diagnosis of septicaemia, resulting in choice of the correct treatment and a faster and full recovery of the patient.

CASE STUDY

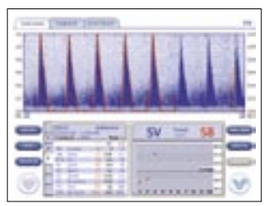
Passive leg raise to confirm whether the patient would be responsive to a fluid challenge or therapy.

Presentation

90 year old female, post Infarct in ICU. Patient seemed a bit low on SV, could be "dry"; not sure whether she was under or overloaded?



USCOM prior to Passive Leg Raise Test SV = 48 cm^3



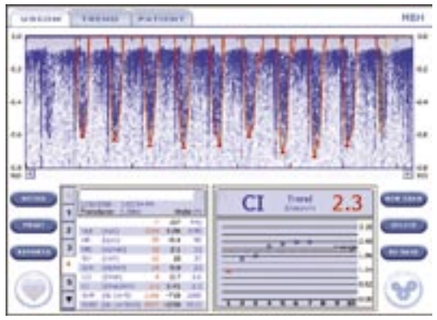
USCOM after Passive Leg Raise Test SV = 58 cm^3

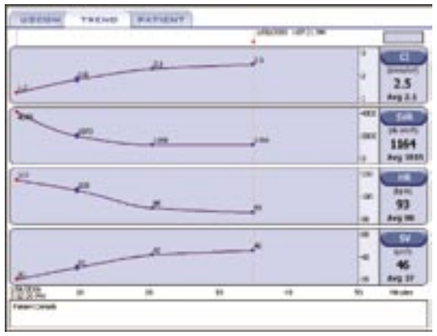
USCOM Features:

- Non invasive, safe and well tolerated
- Real time left and right heart output
- Validated, all ages and all outputs, from neonates to geriatrics
- Compact and easily transportable
- Fast set-up and no calibration needed
- Comprehensive trending feature
- Patient report generation and data export feature
- Intuitive touch screen user interface
- Two-hour battery operation
- 40GB hard disk with large patient archive
- Can be operated by physicians, nurses and paramedics

Simple application of goal directed therapy

- Optimise fluids
- Monitor and titrate drug therapy
- Manage septic shock
- "Smart Resuscitation"





Beat to beat data displayed for all parameters including:

CO (l/min)	Cardiac Output	**DO$_2$** (ml/min)	Oxygen Delivery*
CI (l/min/m^2)	Cardiac Index	**SpO$_2$** (%)	Oxygen Saturation*
SV (cm^3)	Stroke Volume	**SVS** (cm^3)	Stroke Volume Saturation*
SVI (mls/m^2)	Stroke Volume Index	**MD** (m/min)	Minute Distance
SVV (%)	Stroke Volume Variability	**Vpk** (m/s)	Peak Velocity of Flow
HR (bpm)	Heart Rate	**vti** (cm)	Velocity Time Integral
SVR (ds cm^{-5})	Systemic Vascular Resistance	**Pmn:** (mmHg)	Mean Pressure Gradient
SVRI (ds cm^{-5}m^2)	Systemic Vascular Resistance Index	**ET%** (%)	Ejection Time Percentage
CPO (Watts)	Cardiac Power	**FT** (ms)	Flow Time
SW (mJ)	Stroke Work	**FTc** (ms)	Flow Time Corrected

* requires OXYCOM feature

Unique:

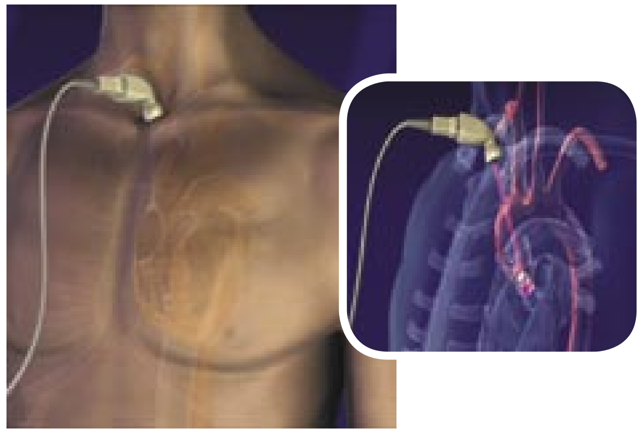
USCOM's non invasive method is unique. Previously, valuable haemodynamic information was only available through invasive means – rarely suitable for children, and decreasingly used in adults. USCOM is validated across a wide range of cardiac outputs in neonates, infants, children and adults.

> “USCOM is the only truly **accurate,** Non invasive system”

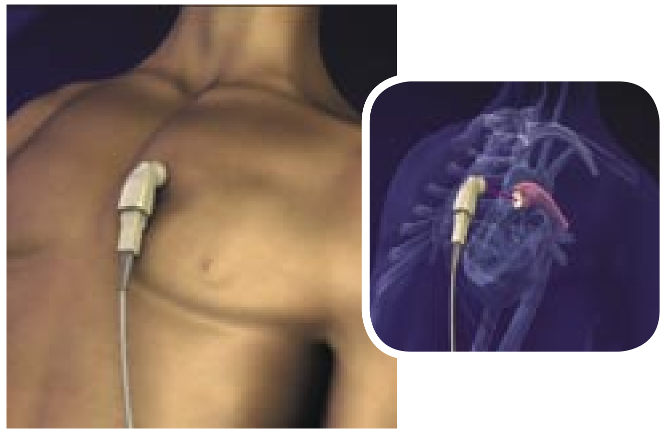
PETER R. LICHTENTHAL, M.D.
Professor and Director of Cardiovascular Anesthesia, University of Arizona College of Medicine

Proven Non Invasive Method

To calculate left cardiac output using the USCOM Ultrasonic haemodynamic monitor, a small, non invasive Doppler probe is placed in the suprasternal notch aiming directly down the longitudinal axis of the ascending aorta and across the aortic valve. Pulmonary or right sided cardiac output is evaluated the same way via the pulmonary valve using the parasternal approach.



Left Approach



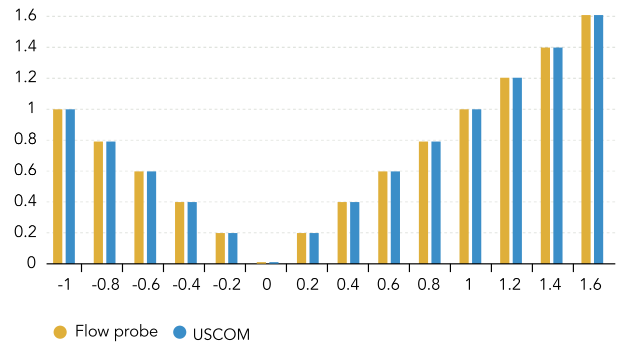
Right Approach

Using USCOM’s beam acoustics technology, the probe emits a broad, continuous wave Doppler ultrasound signal which is used to calculate the ejection velocity of blood as it exits the aortic and pulmonary valve. The real time FlowTracer provides quantitative, beat to beat haemodynamic information.

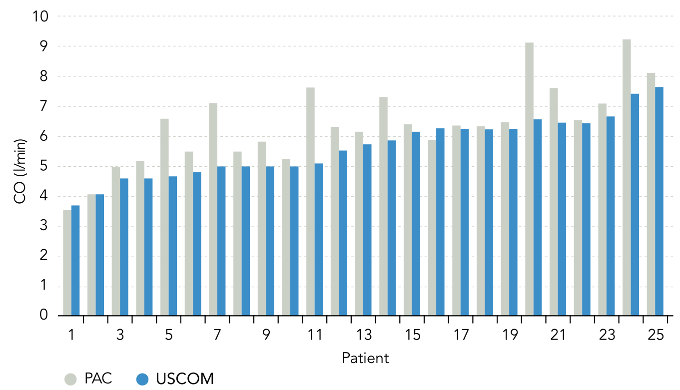
Proven to be accurate

The USCOM monitor has been proven at five stages of validation. Historical evidence shows the accuracy and reliability of continuous wave Doppler. Independent in-vitro testing, animal studies and clinical trials in humans which compared the USCOM to Flow probes, Fick and the clinical “gold standard” Pulmonary Artery Catheter (PAC), clearly demonstrate the accuracy of the USCOM monitor in measuring blood flow. More and more evidence is presented at scientific meetings that confirm its usefulness in clinical practice.

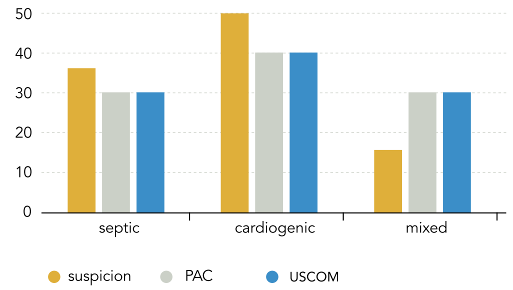
Under precision flow probe testing, the USCOM device exactly agreed with measured flow velocities from -1 to 1.6 metres per second, the accurate range of the simulator.
MecaBio - Ecole Superieure de Mecanique de Marseille.
I.M.T.- Technople de Chateau Gombert, Marseille, France.



“USCOM is a reliable method of measuring CO in critically ill patients. The non invasive USCOM provided adequate data to distinguish different shock types in ICU patients.”
L.E.M. HAAS
Dept of ICU, Geldersee Vallei Hospital, Ede, The Netherlands

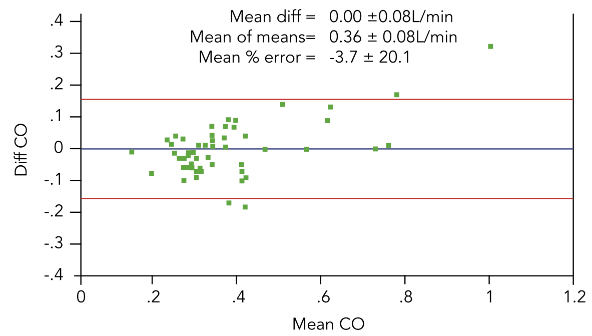


Cardiac Output in individual patients comparing PAC vs.USCOM

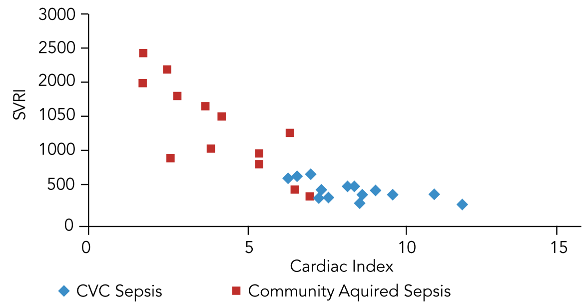


Diagnosis of shock states comparing clinical suspicion with PAC vs. USCOM

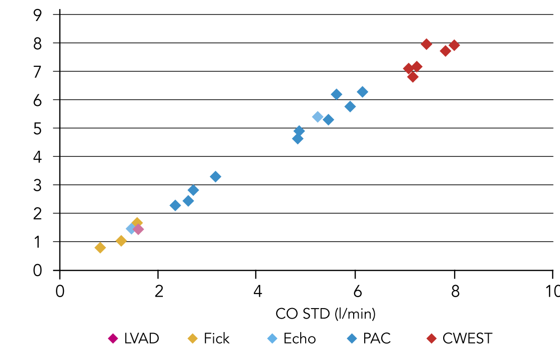
“These results suggest that USCOM is as accurate for measurement of neonatal CO as conventional echo and may be more sensitive for detection of haemodynamic change.”
R. PHILLIPS
University of Queensland, Brisbane, Australia



“The haemodynamic patterns of fluid-resistant septic shock on presentation are distinct depending on etiology. The consistency of this finding suggests that cardiovascular responses to severe sepsis are determined more by the immediate clinical scenario than by genetic.”
DR J. BRIERLEY
PICU, Great Ormond St Hospital, London, UK



“Scatterplot of mean CO values from standard methods against USCOM demonstrating good linear agreement of values with no outstanding disagreement associated with any particular method.”
P. LICHTENTHAL
Anesthesiology, University of Arizona, Tucson, Arizona, USA



Scatterplot of each method against USCOM values

Technical specifications

Model	**USCOM 1A**
Technology	Continuous Wave Doppler
Display	12.1" TFT LCD (800x600)
Interface	Resistive Touch screen
CPU	X86 compatible
Operating System	Windows CE.NET
Storage	More than 500,000 exams
Transducer Frequency	2.2MHz
Transducer Size	12mm diameter
Doppler FlowTracer	Fully automated
Battery	2 hour life with fast-charge
Power Supply	Universal voltage with medical isolation
Dimensions	Height 310mm / Width 350mm / Depth 180mm
Weight	5kg / 11 pounds
Construction	Molded plastic with metal chassis
GUI	Web based protocols
Communications Ports	Serial, USB, Ethernet
User Interface	Multi language

"This machine is **saving** lives"

Associate Professor BRENDAN SMITH
Charles Sturt University of Biomedical Sciences, Bathurst Base Hospital

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