


Minimally-Invasive Monitoring Devices: Implications for Improving Donor Management


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Hemodynamic monitoring has traditionally involved the placement of a pulmonary artery catheter

Minimally invasive Cardiac Output Monitoring eliminates the complications of the pulmonary artery catheter


Which includes:
Complications Related to Catheter
Vascular Complications



Arterial Waveform Analysis

Calibrated
LiDCOplus
Lithium Dilution Calibration
PiCCO
Theromodilution Calibration

Uncalibrated
LiDCO Rapid
FloTrac/Vigileo





Arterial Waveform Analysis - from the arterial line via the bedside monitor

Calibrated
LiDCOplus

Pulse Power analysis to derive Stroke Volume
Calibrated with Bolus Dilution of Lithium
Preload indicators


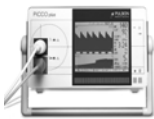
Pulse Pressure Variation
Stroke Volume Variation
Systolic Pressure Variation
Intra Thoracic Blood Volume



Arterial Waveform Analysis - from the arterial line via the bedside monitor

Calibrated
PiCCO

Pulse Contour analysis
Requires a Femoral arterial and CVP
Calibration by Temperature Change sensed in Thermistor-tipped arterial catheter
Preload indicators
Lung Water


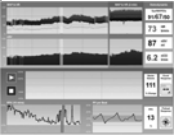


Arterial Waveform Analysis - from the arterial line via the bedside monitor

Uncalibrated - Nomogram scaled
LiDCO Rapid

Pulse Power analysis to derive Stroke Volume
Preload indicators

Pulse Pressure Variation
Stroke Volume Variation



Arterial Waveform Analysis - from the arterial line via the bedside monitor



Uncalibrated FloTrac/Vigileo

Pulse Contour analysis to derive Stroke Volume

Requires FloTrac arterial transducer


Preload indicators

Stroke Volume Variation

Importance of Preload

Preload Indicators	LiDCO plus	Picco	LiDCO Rapid	FloTrac/Vigileo
PPV	√		√	
SVV	√		√	√
SPV	√			
Lung Water		√		




Importance of Preload – patient preload responsive if:

Pulse Pressure Variation - PPV
Greater than 13% (Donors > 15-18%)

Stroke Volume Variation – SVV
Greater than 10%

Systolic Pressure Variation – SPV
Greater than 5 mmHg


MONITOR study will help determine where should be for donor patients



Goal of Donor Management


- Ensure adequate intravascular volume
- Appropriate cardiac output
- Consistent organ perfusion

Perfusion of all organs is important
(not just kidneys)



Flow is the key: CO/CI/SV


- Consistent organ perfusion
- Perfusion of all organs is important
- Competing fluid requirements between the lungs and the kidneys
 - Higher rates of procurement of lungs as associated with less fluid replacement
 - Higher rates of procurement of kidneys may be associated with more fluid replacement



FROM MULTI-SYSTEM ORGAN FAILURE TO MULTI-ORGAN DONOR
UTILIZING MINIMALLY INVASIVE HEMODYNAMIC MONITORING
Michelle Berens, RN, BSN, CPTC – Gift of Hope Organ & Tissue Donor Network

The ability to monitor continuous preload, flow and afterload data using minimally invasive hemodynamic monitoring enables the OPO coordinator to recognize and implement situation-specific interventions that target increasing cardiac output and end-organ perfusion.

LIDCO™ *plus* monitoring can be initiated immediately by the OPO coordinator without the need for specialized catheters or physician support.



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OPO donor management goal of single vasoactive agent at <50% maximum dose was achieved in 12 of 12 (100%) of cases. 10 of 12 (83%) required ≤25% maximum dose of a single vasoactive agent and 4 (33%) required no vasoactive drug support.

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 The Organization for Transplant Professionals

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OPO donor management goal of EF≥50% was achieved in 9 of 12 (75%) of cases. 9 of 12 hearts were placed for transplant, 8 (67%) were ultimately transplanted. (Not all cases had a “Start” echo performed)

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Minimally invasive hemodynamic monitoring helped improve donor outcomes in these twelve challenging cases.

63 organs (5.25 organs transplanted per donor) were transplanted from 12 unstable donors managed using minimally invasive hemodynamic monitoring, including: 8 hearts (67%); 13 lungs (54%); 12 livers (100%); 22 kidneys (92%); 6 pancreas (50%); and 2 small intestine (17%)

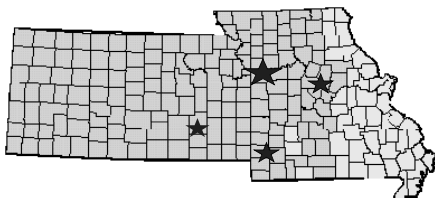
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Use of Flotrac™ to Guide Medical Management of Organ Donors



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The Transplant Institute
Ft. Lauderdale, FL
January 16, 2010

Midwest Transplant Network



- 262 hospitals
- Six transplant centers
- >200 organ donors per year

Where we were...

- Average 2.80 organs tx'd per donor
- 14% lung transplant rate
- 30% heart transplant rate
- Developed Critical Care Task Force
 - 2 Trauma/surgical critical care physicians
 - Pulmonary critical care physician
 - ID/pulmonary critical care physician
 - Pediatric critical care physician
- New Donor Management Goals/Protocols
- More hemodynamic monitoring utilized

Vigileo/Flotrac System

- Flotrac sensor provides the arterial pressure monitor device
- Vigileo monitor continuously computes stroke volume from the pt's arterial pressure reading
- Displays key hemodynamic parameters continuously (q 20 sec)
- Stroke Volume Variation (SVV) has proven to be key in our donor management





Organ Donors **ARE** the Ideal Patient for Flotrac monitoring

- Usually on controlled ventilation
- Stable tidal volumes
- Typically have healthy heart and lungs
- Under resuscitated

Case Illustration

- 59FC
- Involved in MVC 2 weeks prior
- Brief LOC at the scene
- No acute head injury on CT but found two unruptured aneurysms
- Referred for NS consult
- Considered stable and sent home to await NS appointment

Case Illustration, cont.

- Found the next week unresponsive
- CT revealed large ICH
- Not a candidate for surgical intervention
- Admitted to ICU for supportive care
- 18 hours later declared BD
- PMH: HTN on meds for one year
½-1PPD smoker for 39 years
active horse rider/employed on ranch

OPO Management

- Initial picture
 - HR 80s, BP 110/77, no pressors, CVP 12, UO 90
 - CXR clear
 - 7.63, 15, 301, 100%, 5 PEEP
- Flotrac initiated, SVV 19
- Received 3 liters over next 2.5 hours

OPO Management, cont.

- HR 80s, BP 120/80, CVP 15, UO 200
- SVV 16
- 7.35, 29.5, 462
- Received another 3 liters over next 3 hours
- HR 70s, BP 130s, CVP 15, SVV 8
- 7.32, 32.6, 560
- CXR remained clear

Outcome

- Lungs, liver, kidneys all transplanted
- EF 65%, 2 vessel disease on cath
- Pt received 6 liters of fluid over 6-7hrs
- PO2 went from 300 to 560

Results...

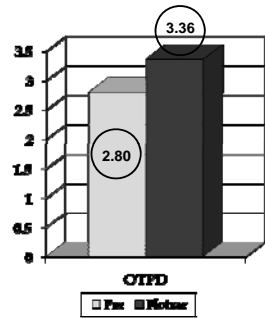
- Began utilizing Flotrac November, 2007
- 311 cases (Nov, 2007 – Dec, 2009)
 - 227 SCD
 - 77 ECD
 - 7 DCD

Organs Transplanted = Lives Saved

3.37 OTPD

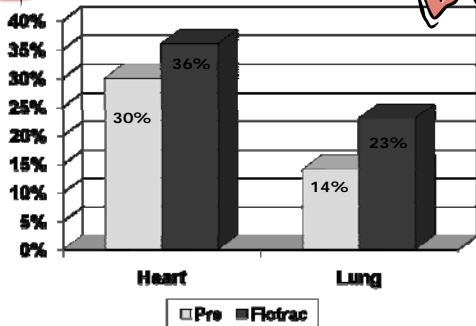
- 110 hearts
- 138 lungs
- 260 livers
- 466 kidneys
- 74 Pancreata
- 3 intestine

1047 Total Organs Transplanted





Thoracic Placement



Conclusions

- Flotrac provides a portable, accurate, reliable solution to obtaining critical hemodynamic monitoring data for BDDs
- Flotrac allows rapid assessment of the donor's hemodynamic/fluid status
- Allows to begin appropriate donor management strategies quickly and change according to the donor's status (ongoing and real time assessment)
