The Body, Biomedicine & Society: Reflections on High Tech Medicine

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Steven Wainwright & Clare Williams
King’s College London, University of London
The Body, Biomedicine & Society: Reflections on the Field of High-Tech Medicine

1. Retrospects: The Body, Biomedicine & Society
2. Deteriorating Bodies: Intensive Care
3. Remaking Bodies: Organ Transplantation
4. Regenerating Bodies: Stem Cells
5. Embodied Practices: Biomedical Science in Action
6. Prospects: The Embodiment of Translational Research

Palgrave Health, Technology & Society Book Series
Editors: Andrew Webster & Sally Wyatt
Mapping stem cell innovation in action: an ethnography of the bench-bedside interface

Clare Williams, Steven Wainwright, Alan Cribb
Bobbie Farsides, Nigel Heaton & Mike Michael
Romeo & Juliet: Alina Cojocaru & Johan Kobborg (Royal Ballet)
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‘Theory, it seems, is only skin deep... Social theory has tended to focus on the exteriority of the body, on which culture becomes endlessly inscribed... the biological body remains a silent shadow.’

(Birke, 1999: 2, 26 & 137)
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Cyborg Bodies: Shock, ‘Swan-Ganz’ Catheters & ICU

- Catheter entrance
- Superior vena cava
- Right atrium
- Tricuspid valve
- Inferior vena cava
- Right ventricle
- Pulmonary artery
- Left atrium
- Pulmonary valve
- Aorta
- Left ventricle
Assessment of Oxygen Delivery (DO₂)

Oxygen Delivery
[Cardiac Output (CO) x Arterial Oxygen Content (CaO₂)]

Cardiac Output (CO)
Arterial Oxygen Content (CaO₂)

Stroke Volume
Heart Rate
Hemoglobin
SaO₂ (Arterial Oxygen Saturation)
PaO₂ (Arterial Oxygen Tension)

Preload
Afterload
Contractility

The Significance of Preload: Frank-Starling Curve

Force of Contraction
SV, CO

Fiber Stretch
RA, PAD, PAWP, LA

CO-Set® Room Temperature Injectable

Continuous Cardiac Output
The Swan-Ganz® Continuous Cardiac Output Thermodilution Catheter

Balloon Inflation Volume
- Appropriate inflation volume for 7F to 8F catheters is 1.25 - 1.5 cc.

VIP Port
- 30 cm from tip

Proximal Injectable Port
- Located in RA or SVC
- If incorrectly positioned in introducer sheath, Felix's CO measurement will be erroneously high due to reflux of injectate within introducer
- Transduce Proximal Injectable Lumen - proper waveform is RA

PA Distal Port
- Transduce distal lumen - proper waveform is PA

Thermistor
- 4 cm from tip
- In main body of PA

Thermal Filament
- Extends between RA and RV
- Should be free floating and extend epicardial surface
- Erroneous CO measurements may result if beyond pulmonary valve

Note: Assess patient physiology. Atypical physiology and twist site may require special handling.

System shown with all components connected for room temperature measurement: computer, PAC, injectate set, temperature probe.
PiCCO plus Standalone Monitor

PiCCO ...

...Simple – Safe – Speedy - Specific
Configuration of PICCO

- Central venous line (CV)
- Thermodilution catheter with lumen for arterial pressure measurement
  - Axillary (A)
  - Brachial (B)
  - Femoral (F)
  - Radial (R), long catheter
- Arterial pressure transducer
Decision tree for hemodynamic monitoring**

Cl (l/min/m²)  
<3.0  
>3.0  

GEDI (ml/min)  
<700  
>700  
GEDI (ml/m²)  
<850  
>850  

ELWI (ml/kg)  
<10  
>10  

V+  
V+!  
Cat  

CFI (1/min)  
>4.5  
>5.5  

SVV only applicable in ventilated patients without cardiac arrhythmia

**without guarantee

*not available in USA

V+= volume loading (! = cautiously)  
V-= volume contraction  
Cat = catecholamine / cardiovascular agents
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From Organ Transplants to (Stem) Cell Transplants?

Organs without Bodies (OwB)

Body without Organs (BwO)

Prof Sir Roy Calne, Cambridge
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Stem Cell Therapy: Cell Transplants & Regenerative Medicine

Development:
- Sperm fertilizes an Oocyte to form a Fertilized egg.
- The Fertilized egg undergoes Development, forming a morula.
- The morula further develops into a Blastocyst, a 64 to 200 cell stage with inner cell mass and trophoblasts.

Development of Specialized Cells:
- The inner cell mass can be propagated in culture to form Pluripotent embryonic stem cells.
- These cells can differentiate into various types of cells:
  - Heart muscle cells
  - Liver cells
  - Neurons
  - Blood cells
  - Pancreatic islets cells
  - Intestinal cells

Transplantation:
- Cells can be transplanted into patients with conditions like Diabetes, Alzheimer's, Parkinson's, spinal cord injury, Lou Gehrig's Disease, cancer, cardiovascular disease, rheumatoid arthritis, etc.

Prof Evan Snyder, UCSD
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Alexis Rockman (1993) *Biosphere: Laboratory*
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San Diego Consortium of Regenerative Medicine

Prof Evan Snyder, Burnham/UCSD
Translational Research & the Stem Cell Valley of Death

Stages:
- Basic Research
- Applied Development
- Clinical Therapies

Infrastructure:
- Universities, Research Labs
- Biotech SMEs
- Pharma
- Clinicians

Stakeholders:
- Government / regulatory agencies

Funding:
- Research Councils
- Charities
- Commercial funding (VC, pharma)

Valley of Death

Prof Brian Salter, UEA; Nicola Perrin, UKTI
Implications for Policy include:

1. Understanding Cultures of Translational Research:

Over the coming years we intend to accelerate the rate at which MRC research is translated into new methods of diagnosis and treatment – a process that can take anything from a few years to decades… to bring our knowledge and discoveries into the healthcare system and so to patients. (Colin Blakemore, MRC, 2004: 1)

Problems (Wainwright, Williams et al, 2006)

• Different cultures of medicine and science
• Can hES cells be turned into functioning cells?
Implications for Policy include:

2. Boundary between Research & Treatment:
   • ‘Courage to Fail’, ‘Experiment Perilous’ (Fox, 1972; 1962)
   • Now Global Setting (e.g. Human Embryonic Stem Cells)

If I’m not prepared to do something, someone else will do it. There’s someone right behind me, who’s going to clamber over my back, prepared to do that. There is great pressure on individuals and institutions to ‘push ahead’ (Consultant Surgeon, Ethics Discussion Group 2)
Turner & Landscapes of Loss (Wainwright & Williams, 2005)

The Rise of the Carthaginian Empire (1815)

The Decline of the Carthaginian Empire (1817)

The Bay of Baiae, with Apollo & the Sibyl (1823)

The Fighting ‘Temeraire’ (1839)