Assessing Handovers: The Formula 1 Model
High Reliability Organisations

- Trapping errors
- Identifying problems before they occur
- Extensive reporting systems
- Standards, Procedures & Checklists
- Clear shared goals
“…the transfer from the operating theatre to the intensive care unit is one of the most difficult stages in the care of a child.”

- p. 214, Learning from Bristol (2001)

NOTE
TRANSFER OF:
- safety-critical monitoring & support equipment from theatre to ICU
- patient care, information & plans from operating team to intensive care team
“Of course, there is a process .......but everyone does it differently”
The Old Way

Intensive Care
Bedspace

Monitor

Ventilator

Nurse

Consultant Anaesthetist

ODA
The Old Way

Intensive Care Bedspace

Monitor

Ventilator

Pump

ODA

Consultant Anaesthetist

Nurse

Anaesthetic Registrar

Urine

Drain
The Old Way

Intensive Care
Bedspace

Monitor

Ventilator

Anaesthetic
Registrar

ODA

Pump

Pump

Urine

Drain

Consultant
Anaesthetist

ICU Doc

Nurse

Surgeon
The Old Way
Multiple specialists
Complex tasks
Complex interfaces
Time pressure
Need for accuracy
Lessons from F1 and Aviation

Technology

- Process Organisation
  - Task Allocation
  - Task sequence
  - Discipline and composure

Teamwork

- Leadership
- Involvement
- Briefing

Threat and Error Management

- Checklists
- Predicting and Planning
- Situation Awareness
Process Organisation

Task sequence
- A rhythm and order to events
- Needed clearly defined stages in process

Task allocation
- Team members have defined tasks
- Ventilation: Anaesthetists
  Monitoring: ODA
  Drains: Nurses

Discipline and composure
- Explicit communication strategies to ensure calm and organised atmosphere
- Comms limited during equipment phase
- Order for briefing (Anes; Surg; Discuss; Plan)
- No interruptions
Teamwork

Pit Stop

Leadership
- Who is in charge?

Involvement
- All team members encouraged to speak up

Briefing
- Before every race/flight for shared picture & goals

Handover

Anaesthetist has overall responsibility
- Defined moment for transfer to intensivist

Speaking up explicitly encouraged
- Opportunities built into discussion

Information transfer & discussion phase
- Supported by Thursday / Friday JJC
Threat and Error Management

Checklists
- Established in ‘safe’ cultures

Predicting and Planning
- FMEA to identify weaknesses
- Anticipation and contingency

Situation Awareness (SA)
- See; Understand; Predict
- ‘Overview’ by most able team member

Transfer of ventilation settings
Transfer of information; became the admission note

Formal FMEA identified need for ventilation transfer sheet
Safety checks built into process

Consultants maintain SA by standing back
Safety checks enhance SA
Overview of the New Process

Prior to Transfer

Patient Transfer Sheet obtained from theatre

Bedspace & equipment prepared in CCC
**PATIENT TRANSFER FORM**

**Surgery to Cardiac Critical Care Handover**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PATIENT DETAILS**

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VENTILATOR SETTINGS**

- **a) Mode**
  - (i) Pressure control
  - (ii) Volume control
  - (iii) SIMV

- **b) Rate**

- **c) I-time**

- **d) Tidal Volume or PIP** *(actual, not above PEEP)*

- **e) PEEP**

- **f) \( F_O_2 \)**

**NOTE:** Ventilator to be configured only by CCC Registrar or Advanced Respiratory qualified Nurse

**MONITORING LINES**

<table>
<thead>
<tr>
<th>Number</th>
<th>Location of Central Line (circle)</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Location of Arterial Line (circle)</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VASOACTIVE AGENTS (Tick)**

- Dopamine
- Milrinone
- Adrenaline
- Nitric Oxide

**OTHER**

<table>
<thead>
<tr>
<th>Chest Open</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview of the New Process

Prior to Transfer
- Patient Transfer Sheet obtained from theatre
  - Bedspace & equipment prepared in CCC

Technology Transfer
- Equipment is configured in CCC
  - SAFETY CHECK

Information Handover
- Anaesthetist then Surgeon hand over information using Information Transfer Aide Memoir
  - SAFETY CHECK
### Handover Aid Memoir

#### PATIENT DETAILS
- Name
- Age
- Weight
- Preop Diagnosis & JCC plan
- Preop condition

#### OPERATIVE COURSE
- Anaesthetic problems
- ETT size, Line locations (problems)
- Operation performed
- CPB  CC CA times
- Weaning from CPB & course

#### PRESENT STATUS
- Haemodynamics
- Infusions
- Ventilation
- TOE/Echo
- Bleeding (products given / ordered)
- Antibiotics

#### PLAN
- Anticipated problems / recovery
- Immediate care strategy

---

#### Operating Team

#### Critical Care Team

**Handover Aid Memoir**

**PATIENT DETAILS**
- Name
- Age
- Weight
- Preop Diagnosis & JCC plan
- Preop condition

**OPERATIVE COURSE**
- Anaesthetic problems
- ETT size, Line locations (problems)
- Operation performed
- CPB  CC CA times
- Weaning from CPB & course

**PRESENT STATUS**
- Haemodynamics
- Infusions
- Ventilation
- TOE/Echo
- Bleeding (products given / ordered)
- Antibiotics

**PLAN**
- Anticipated problems / recovery
- Immediate care strategy
Overview of the New Process

Prior to Transfer
- Patient Transfer Sheet obtained from theatre
- Bedspace & equipment prepared in CCC

Technology Transfer
- Equipment is configured in CCC
- SAFETY CHECK

Information Handover
- Anaesthetist then Surgeon hand over information using Information Transfer Aide Memoir
- SAFETY CHECK

Discussion & Plan
- Group discussion
- Anticipation of problems
- Immediate care strategy agreed

Training time = 30 minutes
Resistance to Change

“It’s fine as it is”

“We’ve always done it like this”

“We don’t have time to do it like this”

“It might make things worse”

“But so many other things are wrong”

“Surgery isn’t like motor racing”
Making the Change

- Identify the problem
  - Break it down
  - Generate multiple solutions

- Involve everyone
  - Be visible
  - Obtain support and establish “Champions”
  - Use the most negative people
  - Don’t listen to “No”

- Make the change
  - Gather evidence
  - Plan, Do, Check, Act
The New Way

Monitor
Ventilator
 CCC Reg
Surgeon
Consultant Anaesthetist
Anaesthetic Registrar
Nurse
Urine
ODA
Power
Intensive Care Bedspace
Pump
Pump
CCC Reg
Surgeon
Nurse
Nurse
The New Way

Intensive Care Bedspace

Monitor

Ventilator

Pump

Urine

Drain

Nurse

ODA

Power

Nurse

Anaesthetic Registrar

Consultant Anaesthetist

Surgeon

CCC Reg
Observational Measurement

Leadership & Teamwork
GOOD: Good co-ordination; good communication; mutually supportive; assertive, calm, encouraging leadership.
BAD: Poor co-ordination; poor communication; unsupportive; non-vocal, aggressive, unassertive leadership.

Task Management
GOOD: Plans made prior to actions; good task prioritisation; maintenance of standards; using resources; the right things happening at the right time.
BAD: Actions made without plans; poor co-ordination; poor task prioritisation; poor standards; resources incorrectly or inappropriately used; delays

Workspace and Equipment
GOOD: Appropriate equipment not immediately available; correct operation of equipment; good alarm resolution; functionality and serviceability checked
BAD: Equipment not immediately available; poor operation of equipment; poor or slow alarm resolution; equipment not checked

Situation Awareness
GOOD: Monitors visible; monitoring reliable; monitoring information gathered; pump displays visible; pump information gathered; recognition of patient state; anticipation of patient state
BAD: Monitors not visible; monitoring unreliable; monitoring information not gathered; pump displays not visible; pump information not gathered; poor recognition of patient state; poor anticipation of patient state.
Performance improvements with new handover protocol

Observation of 23 pre- and 27 post- handovers, balanced for operative risk

- **Number of Errors**
  - Before: 7
  - After: 2

- **Information Omissions**
  - Before: 4
  - After: 2

- **Duration (mins)**
  - Before: 14
  - After: 10
## Reduction in Compounding Errors

Errors in **BOTH** Equipment AND Information:

<table>
<thead>
<tr>
<th></th>
<th>BEFORE</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1 in both</td>
<td>39% (9)</td>
<td>11% (3)</td>
</tr>
<tr>
<td>&gt;4 in both</td>
<td>13% (3)</td>
<td>4% (1)</td>
</tr>
<tr>
<td>Correlation</td>
<td>(r=0.513)</td>
<td>(r=0.262)</td>
</tr>
<tr>
<td></td>
<td>(p&lt;0.01)</td>
<td>(p=0.186)</td>
</tr>
</tbody>
</table>
Acceptance of Change

“This is great….

……but we can make it better”

Consultant Anaesthetist, February 2007

Continuous Improvement
High Reliability
Essentials for Sustainability?

- Clinical focus for all interventions
  - To ensure it continues to happen

- Support from senior management
  - To provide prioritisation, motivation & continuity

- Iterative approach
  - Don’t think your first solution will work

- Continuous Quality Improvement
  - Because you can always get better
Selected Publications


Thank you for listening

Ken Catchpole
Nuffield Department of Surgery
The John Radcliffe
Oxford
OX3 9DU
ken.catchpole@nds.ox.ac.uk

http://www.surgery.ox.ac.uk/research/qrstu