Reconstructing Clinical Events by Interpreting NICU Monitoring Data

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**Report:** "The saturations fall with ETT suction so the FiO2 is increased to 80%".

**Decision support:** "Saturations fall with ETT suction, please increase FiO2"

**Audit:** "Saturations fall with ETT suction" followed by "FiO2 increased to 80%" in 5 minutes.
1. What are the important clinical events?

- Insert Chest Drain
- Desaturation
- Intubate
- Resuscitate
- Blood transfusion
- Stimulation
- CPAP Initiate
- X-ray
- Ultrasound Scan
- Re-site Probes
- Bradycardia
- Adjust Ventilation
- Venepuncture
- Skin care

2. Can they be reconstructed from available data?
The data available

- **Continuous**
  - High temporal accuracy
    - Physiological signals: Automatically collected
  - Low temporal accuracy
    - Laboratory results: Routinely available
    - Medication Actions: Entered by human
  - Moderate temporal accuracy
    - Research annotations: Obtained via research

- **Discrete**
  - Research collected
Related work (medical data analysis)

- Event recognition:
  - Mostly use continuous data only
  - Events targeted: various artefacts, apnea, bradycardia, brain pressures, heart rate, blood pressure, hypoxia, desaturation ...

- Discrete event based reasoning:
  - Mostly for scheduling, therapy planning...

- Event recognition using discrete data?
Proposed approach (target: intubate)

- Morphine
- Incubator open
- Incubator close
- Ventilator setting
- X-ray

Routinely available data:
- Morphine: 10mg, 12:30:00
- FiO2: 80%, 12:45:00

intubation

pre-intubate

intubate

post-intubate

intubation

Heart Rate variation
Working plan

- Acquire data
  - (continuous + discrete)
- Acquire domain knowledge
  - (contextual knowledge)
- Reconstruct selected events
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