[redacted]

REPORT ON EQUIPMENT USED DURING UNTOWARD INCIDENTS IN THE OPERATING THEATRES, RBHSC

Mr B. McLaughlin, Medical Technical Officer 4 and Mr J. Wilson, Medical Technical Officer 5 examined the anaesthetic, temperature control and monitoring equipment used in the theatre under investigation.

The investigation was carried out between 0900 hours to 1130 hours on Saturday 2 December 1995.

The equipment examined consisted of the following,
Lamtec Anaesthetic Machine, Model 990-905, Serial No. 8704905089
Penlon Nuffield Ventilator, Serial No. 0387-06 fitted with either the NV200 valve, Serial No 33694 or the Paediatric valve, Serial No 432004.

Siemens Patient Monitor, Model 1281, Serial No.
(This monitor is currently out for repair - a new display screen is being fitted and a loan monitor is in use.)
Datex Ultima, Model ULT V-21-01, Serial No 31523.
Hudson Oxygen Analyser.

The Siemens Monitor measures vital signs including ECG, Blood Pressure, Temperature, Heart Rate and Respiration.

The Datex measures End Tidal Carbon Dioxide (ETCO2) and oxygen concentrations (FIO2) in the breathing circuit.

To assist in maintaining the patient's temperature an Aqua-K-Thermia Unit is used. A water blanket in placed below the patient and the circulating water kept at a suitable temperature to maintain body temperature. The patient's temperature in monitored on the Siemens monitor using a reusable general temperature probe.

All service reports pertaining to the equipment were examined and no indication of malfunction found in the documentation. The parts replaced are standard under preventative maintenance and functional checks. The service reports for the period under investigation are Ulster Anaesthetics Job No.DD833 and DD834 (Nuffield) and Anaesthetic Services 7524,7232, and 6992 (Lamtec).

A copy of the service report for the Siemens monitor is expected this week but verbal indications are that nothing untoward was discovered during its overhaul.

[redacted]

The Datex monitor is not on service contract but the calibration was checked and found to be satisfactory.

The Aqua-K-Thermia Unit is not on contract and as it is over 10 tens old does require regular maintenance and must be considered for replacement. It was difficult to assess its performance over a short period, but at the time of the investigation it appeared to work satisfactorily.

All monitor alarms worked and gave no cause for concern.

The Lamtec and Nuffield were set-up and connected to the test lung fitted with a Wright's Respirator and a Hudson Oxygen Analyser. Once a steady state was achieved the patient circuit was disconnected and the low pressure alarm became active within 20 seconds (as specification).

The steady state was again achieved and the oxygen pipeline supply disconnected causing the Alarm Whistle to be activated (as specification).

The standby oxygen cylinder fitted to the Lamtec was opened and the oxygen supply restored (as specification).

All cylinders were removed from the Lamtec, one nitrous oxide (N2O), two medical air, one Carbon Dioxide (CO2), one oxygen (O2). The Pin Index System was checked for security. Five pins were discovered to be loose and could be removed. One on N2O, both on the CO2 and both on the O2. This effectively removes an essential safety feature from the machine and allowed the investigators to fit the CO2 cylinder in the O2 yoke and supply CO2 via the O2 flowmeter.

At this stage the O2 supply was still from the hospital pipeline system, that the valve system on the Lamtec should maintain. Instead the supply from the cylinder replaced the pipeline O2 supply and the percentage oxygen in the breathing circuit fell from 50% to 11%. All anaesthetic machine and ventilator alarms were bypassed. The Datex monitor did function correctly and the high CO2 and low O2 alarms were activated.

It must be clearly stated that this could only be achieved by gross misconduct and failure to use the monitoring equipment.

The pins were re-inserted and the Lamtec put back to a safe working condition and again checked by a second person to ensure

[redacted]

correctness of gas delivery. The purity of oxygen was checked and also found to be satisfactory.

Examination of theatre practice would indicate that the cylinders are checked daily by the medical technical officer (MTO) on duty and the cylinders are only changed by the MTO. The Lamtec log book was examined and found to be signed daily prior to the commencement of the days list by the MTO after all safety and function checks were carried out satisfactorily. The Anaesthetist using the machine is also expected to sign the log before commencing the list but this does not happen on most occasions. A reason for this omission should be requested.

The anaesthetic machine is approximately 10 years old and has been regularly serviced by Anaesthetic Services. The last visit was on 12 September 1995. It is difficult to believe that 5 pins have come loose in 3 yokes in such a short time. This must be considered as a major omission on the part of the service company and requires investigation.

It is also essential that all cylinder yokes are replaced or repaired as a matter of urgency. A check of all pin index equipment within the Trust should be carried out forthwith to ensure the safety of such systems. This will include oxygen cylinders in use at ward level.

Finally it must be emphasised that the protocols and monitoring procedures set up within the RBHSC's Theatres, for more than 2 years, would have discovered if a reversal of cylinders had occurred. If these procedures had been ignored the following actions had to occur;

1. MTO did not check the anaesthetic machine

2. Anaesthetist did not check the anaesthetic machine.

3. The fresh gas supply was not checked.

4. The Datex monitor was not used.

5. Poor tissue oxygenation was ignored by the Surgeon.

6. The pulse oximeter was not used.

[redacted]

The procedure for constructing arterial lines was examined and found to be satisfactory and in accordance with other areas within the Trust.

In conclusion the equipment was found to be in satisfactory condition. The current practices covering anaesthetic and monitoring equipment are safe and satisfactory.

[redacted]