

Clinton, I informed Junior Sister Donaghue that I had
been given the vouchers and gave them to Jackie
Clinton when I next saw her.

Anna
E. Wright.

Summary of conversation with Shelia Bennett, Jackie Clinton, 12/01/10

Topics discussed

- General involvement in management of HF
- Specific interactions with HF and her family
- Defining her 'cold'
- Awareness of deterioration of HF

General involvement in management of HF

SB was in charge of the ward during individual shifts when HF was a patient, but was never the nurse assigned specifically to HF. If a patient's parents are unhappy with some aspect of their child's care and are unhappy after talking to the assigned nurse, they can speak to the nurse in charge for the shift. During her time in this role, SB had no concerns referred to her from the parents of HF.

Specific interactions with HF and her family

SB had a specific contact with HF on Monday 9/11/09. She had heard a monitor alarm within the cubicle and went to investigate. At this point HF was not isolated and the cubicle door was open. When the assigned nurse is not immediately available to respond to their patients alarm, another nurse will investigate, which in this incident was SB who responded immediately the alarm was heard. She saw that the IV pump alarm was indicating an occlusion in the line and dealt with this concern. Mum at this point also told her that HF was irritated by her nasal specs. SB removed the specs as HF was in a head-box and they were not necessary.

Defining her 'cold'

SB was in charge of the ward on this Monday and so was involved in the ward round. She was involved in discussion with Zdenka regarding deterioration in HF. Bloods and urine were taken along with a NPA swab to test for swine flu. This swab was taken because HF was noticed not to be improving but no cause was identified. There were no signs of flu, but the swab was taken in order to rule out the possibility of an infection. When swabs are taken, the standard hospital precaution is to place the patient in isolation until a negative result is returned. Following the NPA swab, HF was put in isolation on the Tuesday.

When a child is put into isolation the cubicle door is shut, the notice indicating the need for aprons is put up and restrictions on hand washing before leaving the cubicle are instigated. When the door is shut the pulse oxymeter is placed outside the door so that alarms are audible outside of the room. When HF was put into isolation her mother requested that the monitor remain in the room. No risk was seen in complying with this request as Mum was always in the room and able to alert staff to the alarm. SB was not aware of Mum being required to alert staff during her times on shift. When Mum was away from the bedside ward staff reverted to normal practice of putting the monitor

outside the room. During the Tuesday, Student nurse SM spent most of her day in the cubicle caring for HF.

Awareness of deterioration of HF

When a patient is identified as high dependent the assigned nurse would have no more than 2 patients to care for. HF never fitted the criteria for a high dependency patient based on her PEWS score. Notwithstanding, the Tuesday night before her death, her assigned nurse instigated 2-hourly recording of observations in response to her own diligence and Mum's anxiety. Following an observation at 06:00 on the Weds morning, this nurse noted she was breathing harder. There was no recorded increase in the respiratory rate but the nurse phoned the SHO regardless. The SHO attended before 07:00 and agreed the more laboured breathing but noted that there were no necessary alterations in her treatment. About 30 minutes later Mum came from the cubicle reiterating the difficulty in breathing. The SHO came back and did not identify any further indicators of deterioration but, drawing on her previous days experience with HF, took blood gases. These indicated those problems which led to the escalation of her treatment through that morning.

Surname.....
 First Name.....
 Registration Number.....
 Consultant.....Ward/ Dept.....

In-Patient Continuation Sheet

Please print role and name, write date, time and contact number and sign all entries in black ink

Progress Notes

Sunday 8th
Nov

Hayley was allocated to Emma Shaw as was at that time one of the less dependent patients on the ward and Emma was happy to look after her and the other baby in the same cubicle.

Monday 9th
Nov

I was in charge on this morning. Surgeons had seen Hayleys wound before weekend said for it to be redressed as + when necessary (clozed through the dressing). Dressing was changed on the afternoon and wound cleaned. As I hadn't seen Hayleys wound before I asked grandparents whether it looked any different or better/worse. They said it seemed to look a bit better. Hayley was very sleepy, Doctors were aware observations remained as stable as they had been. Handed over to nightstaff when mum arrived and by this time dressing needed to be doing.

Staff Nurse Lesley Price

The day I looked after Hayley

10 November 2009

- Hayley's mum had not slept all night and looked tired and worried about Hayley
- Hayley looked pale and weak
- Hayley was put in headbox oxygen overnight, feeds were stopped overnight, I.V fluid was given instead due to her not being her normal self
- Hayley's cannula tissue overnight and a new cannula had been inserted.
- I decided to keep a closer eye on Hayley due to her changes in her condition.
- Discussed with mum her concerns and tried to reassure mum that I would keep a close eye on Hayley.
- I commenced two hourly observation on Hayley gave her medication when it was required.
- I looked at Hayley's wound which was purple; I decided it needed to be seen by a surgeon.
- Grandparents were also present with mum when I had a look at Hayley's wound. Granddad believed the wound looked just as bad as the other day.
- Granddad shared his concerns with me that he felt that they had to chase nurses to change Hayley's dressing.
- Granddad also said he asked the nurse who was looking after Hayley the other day if the wound needed to be debrided and was told no.
- I bleeped the on call surgeon who had to debride the wound, I feel the family were glad something had been done, however annoyed that this was not done the other day.
- Hayley's mum shared her concerns and was upset and not happy with the care given while in hospital.
- I recommended mum to speak with the ward manager and also mentioned PALS services that could help her.
- I was asked to take a nose swab and a NPA by the nurse in-charge and to isolate Hayley just in case she had grown an infectious bug.
- This was done as planned, Hayley grandmother asked why isolation was required and I explained that we are testing if Hayley has an infection that needs to be isolated. Therefore if she did have an infection we have prevented this spreading to other patients.
- Hayley mum was really grateful and thanked me for looking after Hayley.
- When I left the shift that night Hayley was stable in headbox oxygen and observation where unchanged from the morning.
- When on my day off, I was shopping and bumped into mum in town who came up to me she was really upset and said she's gone. I could not believe what I heard, I was in shock with the news Hayley's mum told me how she died and I felt so sorry for mum and her family. Hayley's mum thanked me for caring for Hayley.
- Hayley was very much loved and I feel very sad for Hayley's mum and family loss.

Band 5
STAFF ~~Nurse~~ Sanjit (Sharma) (more)

Surname.....

Birmingham Children's Hospital
NHS Foundation Trust

First Name.....

Registration Number.....

Consultant..... Ward/Dept.....

**In-Patient
Continuation Sheet**

Please print role and name, write date, time and contact number and sign all entries in black ink

2/2/10

Progress Notes 7 November 2009

I remember looking after Hayley for one night shift. I met mum for the first time but no other family members. Hayley was in a crib & she was stable in a small amount of nasal spec oxygen, on nasogastric tube feeds and on 4 hourly observation (I think).

At the start of the shift I introduced myself as Hayley's nurse for the night and asked mum about Hayley's usual night routine, whether she sleeps through, & what time she has her feeds. Mum had her own regime. I offered to do Hayley's feeds overnight to allow mum to sleep, she declined, she was happy to do feeds and said that was what she was there for.

I was caring for the baby opposite in the same crib and whilst feeding this baby, myself and Hayley's mum were talking. She was warm, friendly, seemed happy and was talking to me with ease. We were talking about being parents, about her pregnancy and finding out when Hayley was ill. She was telling me about Hayley's development and how poorly she had been. Mum was feeding Hayley through a nasogastric tube and I remember she kept whimpering and mum kept pausing her feed for a short time. Mum thought Hayley was uncomfortable with the volumes of feed that she was meant to have, and it was normal for her to be unsettled during a feed.

Hayley's oxygen saturations were high 90's in a small amount of nasal oxygen, which she had been for some time. That night, her saturations were dropping to about 90% (I think) after resiting her probe and realising

Surname

First Name

Registration Number

Consultant Ward/ Dept.

Birmingham Children's Hospital
NHS Foundation Trust



In-Patient Continuation Sheet

Please print role and name, write date, time and contact number and sign all entries in black ink

Progress Notes

she wasn't going to self resolve I turned the oxygen up a small amount, mum didn't seem concerned nor was I as Hayley looked the same and all her other observations were within normal limits.

For the rest of night mum tended to her basic cares, feeds + nappy cares, I monitored her oxygen saturations continuously and recorded them 4 hourly (I think). There were no further changes in her condition, Hayley was a pale, fragile baby whose was developmentally delayed due to being hospitalised. She wasn't doing / reaching her milestones like other babies of the same age. Hayley's tone was weak and I didn't see her smile at all, however she wasn't acutely ill the night I looked after her, I would say she was stable.

I don't recall speaking to mum in the morning if I did it was only briefly

Stella Duncan

RNCA

Word 11

8 2-2010

On Monday 9th November 2009 in the night shift
I was called into cubicle 1 by staff nurse Hayley Stretton.

Staff Nurse Stretton asked me if I had seen
Hayley Fullerton's wound before, I replied "no but
was aware that Hayley's wound had been seen by
the surgeons".

I then called staff nurse Carly Toole and asked
if she had seen Hayley's wound but she had
not seen it either.

I asked Staff nurse Stretton if she needed any help
to re-dress the wound but she said that she
would be ok

~~the~~ Mrs. Fullerton was ~~the~~ by the cot side

S. Hazlem

Samantha Hazlem Junior sister Wed 11.

PEWS Discussion for Hayley Fullerton

Hayley was identified as having a cardiac arrest which resulted in a 2222 call on the 11/11/2009 at 08:02hrs on Ward 11. The PEWS team routinely identify and review any child who has had a 2222 call or an unplanned PIC admission from the wards to the Paediatric Intensive Care Unit. The review includes the following:

1. Observation and fluid charts – reviewed to decide if the correct observations were completed and the frequency with which they were completed.
2. Nursing notes – did the staff document events adequately, communicate concerns effectively and request assistance in a timely fashion.
3. Medical notes – was this child reviewed in a timely fashion, was effective treatment provided and did medical staff communicate concerns in a timely fashion. For the purpose of this review I did review the medical notes, however I was aware that this child was having a RCA performed therefore have left the medical investigation to the doctors to review in greater depth.

INTERVIEW WITH STAFF NURSE SANJIT MOORE:

I met with staff nurse Sanjit Moore who cared for Hayley Fullerton on the 10/11/2009. Sanjit stated that Hayley appeared relatively stable throughout the day. Hayley was put into isolation in the afternoon, although Sanjit was not entirely sure why she was put into isolation. Sanjit stated that the doctors had come to review Hayley's wound and it look "terrible". She had not ever seen a wound like that in her experience.

INTERVIEW WITH STAFF NURSE JANE TITLEY:

I met with staff nurse Jane Titley on ≈ 10th of December to discuss this case. Jane was indentified as the nurse who had cared for Hayley on the night shift when she has her cardiac arrest.

The following is an account of that discussion:

Jane came on to the night shift and received handover for Hayley. At approximately 02h00 she was advised to restart Hayley's feeds. Jane was slightly surprised that they had decided to re-start the feeds as they had only been off for 24 hours, however when the feeds were started she felt that Hayley tolerated them well and kept an eye out for any signs of increased respiratory distress.

Jane felt that Hayley's observations were quite stable throughout the night, although she did note that Hayley had a slightly elevated respiratory rate overnight. This elevation remained quite constant throughout the night and did not get any worse.

At ≈ 06h55 Jane thought that Hayley had an increased work of breathing and called the SHO to review. As this time the SHO reviewed the patient and decided to decrease the feeds (1/2 feed and ½ enteral).

Shortly afterwards (≈07h30 according to medical notes) Mum called out to Jane and asked her to help. When Jane went in to Hayley she said she was pale with decreased saturations. Jane immediately asked the SHO to review the patient and a blood gas was taken. Jane put 15L of face

mask oxygen on the patient with a reservoir bag and asked for immediate assistance from her colleagues. The staff helped to clear the room.

I believe the blood gas was taken to PIC for processing and the PIC SpR (Richard Neale) came back to review the child in view of the poor results of the blood gas.

Additional question I raised with Jane:

- Hayley was isolated in a cubicle away from the nurses station, based on her condition do you think she should have been closer to the desk? Jane felt that Hayley's condition was stable and she did not need to be closer to the desk. There were several patients on the ward at the same time who were higher dependency therefore given her condition at the time the staff did not feel she needed to be closer to the nurses station.
- Hayley was in isolation in a cubicle away from the nurses desk, should her saturation monitor have been outside the room? Jane said that she has asked Mum if she could put the saturation monitor outside the room, however mum said she was scared she would not hear the monitor go off so she wanted it to remain in the room.

Conclusions as a result of the PEWS review:

1. The Observation and Monitoring Policy recommends that if a child is receiving oxygen then hourly recordings of respiratory rate, effort and pulse oximetry should be completed. It must be acknowledged that this is guidance, and based on Hayley's documented condition it is reasonable that the staff completed observations second hourly in this case overnight on the 10/11/2010 into the 11/11/2010. When Hayley initially went into higher concentrations of oxygen her observations should have been escalated to hourly for a period of time.
2. I was encouraged to see that generally a full set of observations was completed including blood pressure and capillary refill time with most of Hayley's observations.
3. Staff did not document the type of continuous monitoring or alarm limits in accordance with the Observation and Monitoring Policy.
4. Jane called for help immediately when she noticed that Hayley had an increased respiratory effort and the patient was reviewed in a timely fashion. Further review was sought by Jane as Hayley deteriorated and they received medical assistance in a timely fashion.
5. The Ward Manager mentioned that Jane had not necessarily escalated her concerns about Hayley to the nurse in charge, however she did seek and receive the appropriate medical assistance. The ward manager has discussed this with Jane.
6. Jane was quite teary during the interview and other staff appeared to remain quite distressed about this child one month after the event. I discussed this with the ward manager and Justine Kidd the Cardiac Liaison Sister who arranged for a "debrief" session for the staff involved.
7. The PEWS Team classify these events – This event was classified as a Predictable /Category 1 (showed sign for >15 minutes), although these criteria are very tight and it appears that medical assistance was sought in a timely fashion.

Physiotherapy Report – SUI Investigation (09/10:30)

Introduction

An investigation into the management of Hayley Fullerton was requested by the risk management team following generalised concerns regarding her medical treatment, prior to her death on 11th November 2009. A full review of the physiotherapy notes related to the incident has been carried out.

Review of the Physiotherapy notes

The on call physiotherapist was contacted at home at around 7.30am on the morning of 10th November 2009 to review the child. This referral was passed on to the member of staff who was expected on the ward at around 8.30am (a Senior Physiotherapist, with 11 months of acute paediatric experience). A full assessment was documented and appropriate physiotherapy intervention was carried out by 9am on 10th November 2009. Consent for treatment was obtained from Mum. According to the notes, the child tolerated the physiotherapy treatment session well and responded appropriately. The physiotherapist noted that the child continued to show signs of respiratory distress, this was appropriately documented in the medical notes. The physiotherapist involved discussed her findings with a more Senior Physiotherapist who jointly reviewed the child with Mum present in the afternoon. Following physiotherapy intervention, the physiotherapist reported that the child had a clear chest and was settled requiring no further physiotherapy intervention that day, despite recently having her sternal wound inspected. The physiotherapist had planned to review the child on the 11th November 2009 but this did not occur as she died early that morning.

Further information obtained verbally from the Physiotherapists involved

The physiotherapists reported that they had always had a good relationship with parents. Mum was pleased to see the physiotherapist on the morning of the 10th November 2009 and thanked her for her input. The physiotherapist reported that Mum was particularly pleased in the afternoon after the physiotherapy session as the child was so settled and comfortable.

Conclusion

In my opinion, the management of this child by the physiotherapists was appropriate.

Jemma Mears

Acting Principal Physiotherapist

Notes of Discussion with Louisa Snook and Jemma Mears Physiotherapy

Involvement of Physiotherapy prior to 10 November 2009

Louisa explained that she had been the main physiotherapist involved with HF during her time in PICU. Due to the problems with the failed extubations HF was receiving not only 2 sessions of physiotherapy each day but had been added to the acute list of care so was receiving further physiotherapy between 6 – 10 in the evening.

On leaving PICU it was agreed that Physiotherapy should continue and it was Louisa's recollection that she saw HF on Ward 12 for a few days before deciding that physiotherapy involvement should revert to "review on request" as she appeared not to have any secretions and had responded well to physiotherapy. It was agreed that Jemma would get copies of the physiotherapy records at this stage and provide an overview of physiotherapy involvement from PICU to the point when regular physiotherapy stopped.

Involvement of Physiotherapy on 10 November 2009.

The on-call Physiotherapist was bleeped about at around 7.30 in the morning. Jemma had been on-call overnight. This means that the on-call person is at home in bed but accessible for acute problems. (see below). On this occasion Jemma had already set off from home so was on her way to work by train. Jemma explained that she would ensure someone saw HF when she got to work. She was not given the impression that there was any level of urgency. She asked if HF was different from previously and was told no, and she was told that she had slightly increased oxygen but that her gases were OK. When Jemma got to work Louisa arrived and as she had previously given physiotherapy to HF it was agreed she would go.

I asked Louisa to explain her thought process behind the note she wrote in the records "may benefit from CPAP with physio treatment". She explained that in the first instance she wrote in the medical notes rather than the separate physiotherapy records because physiotherapy had been bleeped out of hours and her attendance had been the response. Upon review Louisa felt that HF was working a little harder than normal and despite using percussion to mobilise secretions and nasal suction to remove secretions that she was still suffering with secretions. Louisa therefore felt that she might benefit from the use of CPAP by way of a face mask to add additional pressure to assist with the removal of secretions. This is a physiotherapy modality which is used for a period of 20 mins to relieve secretions while undergoing physiotherapy. Louisa explained that to some extent this was a note for herself, to record her thoughts as to possible future physiotherapy treatment. She does not recall discussing this in any detail with the nursing staff at the time but confirmed that she would be back in the afternoon.

When Louisa returned in the afternoon she came with her senior Physiotherapist in order to decide whether the use of CPAP was appropriate. She recalls that the doctors were looking at HF at the time and the general consensus was that HF had improved from her presentation in the morning, was much more settled and did not have so many secretions. It was therefore agreed that CPAP with the physiotherapy treatment was not needed.

Accessing Physiotherapy out of hours

Jemma explained that out of hours physiotherapy is available via the on-call physiotherapist. Physiotherapists are on-site until 10.00pm. After 10.00pm a physiotherapist is on-call. The physiotherapist is not on site but is at home and about 30/45 mins away from the hospital. There is no physiotherapist as part of the Hospital@Night team

The criteria for accessing the on-call physiotherapist acute deterioration namely;

- Retained secretions
- Deteriorating x-ray
- Deteriorating blood gases
- Poor saturations

In order to access the on-call physiotherapist the call should come from the on-call Registrar ideally, though in certain circumstances they will take a referral from nursing staff or an SHO.

Communication between Medics/Nurses/Physiotherapists.

Jemma explained that Physiotherapy records are currently filed separately within the file at the back, so would not routinely been reviewed by Doctors when they are looking through the medical records unless they actively look at the physiotherapy records. The only time that a physiotherapist would normally write into the medical records is when they are called to review a patient and the physiotherapist wants to indicate that a review has taken place and the outcome of that review.

Generally although the request for a review may come from the Doctors when a physiotherapist arrives on ward they would usually receive an update from the nurses regarding the current issues and after undertaking the therapy the physiotherapist would feedback to the nurses before leaving the ward. Conversations with the doctors would only take place if a doctor happens to be around when the physiotherapist is there, but both Jemma and Louisa said this was unusual.

Perception of Wellbeing

Louisa explained that when HF was on PICU she was aware that she was not well which was why following discharge from PICU it was agreed that HF should continue to receive physiotherapy for a period of time. Louisa explained that she improved whilst on Ward 12 which was why it was agreed that she should stop receiving daily physiotherapy and revert to "review on request". When Louisa saw Hayley on 10 November 2009 she had deteriorated from her previous presentation on Ward 12, although she had improved to some extent by the afternoon of 10 November 2009. The plan had been to see her again on 11 November.

Louisa said she was shocked to hear that HF had died. She had not expected her to die and did not think she was that poorly.

LNG

▲ List

▼ Text FULLERTON/HAYLEY | 06/10/2008 | Female

Logout

Help

Phil Deberham

CHEST | CHEST | 10/11/2009 02:15:20 | 3575643 | Approved

Study Highlights

Reason for Study:

815552

Requesting Physician:

O STUMPER

Phone Number:

Requesting Department:

Technologist: BCHN1/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON/HAYLEY

Study List

Radiology (17)

Study Date | Study Time | Study Description

10/11/2009 | 02:25 | Chest Portable

09/11/2009 | 13:58 | Chest

29/10/2009 | 11:39 | Chest Portable.

26/10/2009 | 09:29 | Chest Portable.

25/10/2009 | 10:13 | Chest Portable.

24/10/2009 | 11:44 | Chest Portable.

23/10/2009 | 16:38 | Chest Portable.

22/10/2009 | 09:50 | Chest Portable.

21/10/2009 | 12:32 | US Chest Port

21/10/2009 | 04:31 | Chest Portable.

20/10/2009 | 11:39 | Chest Portable.

19/10/2009 | 11:49 | Chest Portable.

19/10/2009 | 03:37 | Chest Portable.

18/10/2009 | 18:41 | Abdomen Port

17/10/2009 | 08:00 | Chest Portable.

16/10/2009 | 12:39 | Chest Portable.

14/10/2009 | 14:57 | Chest Portable.

Order Placed on Unknown Date

Study Approved

Report Approved by: Dr Helen Alton (Consultant) 10/11/2009 11:09

History: Increasing oxygen requirement.

Report:

The left pleural effusion and left lower lobe consolidation persist, and are slightly worse than on 09.11.09. The right perihilar consolidation extending into the lower lobe also persists. There is a small right effusion.

▲ List

▼ Text FULLERTON, HAYLEY | 06/10/2008 | Female

Study Highlights

Reason for Study:

813937

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist: BCHNX2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON, HAYLEY

Study List

Radiology (17)

Study Date Study Time Study Description

10/11/2009 02:25 Chest Portable.

09/11/2009 13:58 Chest

29/10/2009 11:39 Chest Portable.

26/10/2009 09:29 Chest Portable.

25/10/2009 10:13 Chest Portable.

24/10/2009 11:44 Chest Portable.

23/10/2009 16:38 Chest Portable.

22/10/2009 09:50 Chest Portable.

21/10/2009 12:32 US Chest Port

21/10/2009 04:31 Chest Portable.

20/10/2009 11:39 Chest Portable.

19/10/2009 11:49 Chest Portable.

19/10/2009 03:37 Chest Portable.

18/10/2009 18:41 Abdomen Port

17/10/2009 08:00 Chest Portable.

16/10/2009 12:39 Chest Portable.

14/10/2009 14:57 Chest Portable.



Logout

Help

Phil Deberham

CHEST | CHEST | 29/10/2009 11:39:46 | 3573404 | Approved

Order Placed on Unknown Date

Study Approved

Report Approved by: Dr Claire Miller (Consultant) 29/10/2009 14:23

History: Requiring increased ventilatory support

Report:

Improved appearances in the right upper lobe. Cardiac contour and central vessel size are unchanged. No significant effusion. NGT tip is only just past the gastroesophageal junction and needs advancing.

Text FULLERTON/HAYLEY | 06/10/2008 | Female

CHEST | CHEST | 25/10/2009 10:13:36 | 3572343 | APPROVED

Study Highlights

Reason for Study:

813222

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist: BCHNX2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON/HAYLEY

Order Placed on Unknown Date

Study Approved

Report Approved by: Dr Karl Johnson (Consultant) 25/10/2009 11:23

History: VED

Report:

There is improved aeration in the right upper lobe.

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable.
09/11/2009	13:58	Chest.
23/10/2009	11:39	Chest Portable.
25/10/2009	09:29	Chest Portable.
25/10/2009	10:13	Chest Portable.
24/10/2009	11:44	Chest Portable.
23/10/2009	16:38	Chest Portable.
22/10/2009	09:50	Chest Portable.
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable.
20/10/2009	11:39	Chest Portable.
19/10/2009	11:49	Chest Portable.
19/10/2009	08:37	Chest Portable.
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable.
16/10/2009	12:39	Chest Portable.
14/10/2009	14:57	Chest Portable.

List

Text FULLERTON, HAYLEY | 06/10/2008 | Female

Study Highlights

Reason for Study:

B13110

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist: BCHNX2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON, HAYLEY

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable.
09/11/2009	13:58	Chest
29/10/2009	11:59	Chest Portable.
25/10/2009	09:29	Chest Portable.
25/10/2009	10:13	Chest Portable.
24/10/2009	11:44	Chest Portable.
25/10/2009	16:38	Chest Portable.
22/10/2009	09:50	Chest Portable.
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable.
20/10/2009	11:39	Chest Portable.
19/10/2009	11:49	Chest Portable.
19/10/2009	03:37	Chest Portable.
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable.
16/10/2009	12:39	Chest Portable.
14/10/2009	14:57	Chest Portable.



Logout

Help

Phil Debenham

CHEST | CHEST | 23/10/2009 16:38:56 | 3572308 | Approved

Order Placed on Unknown Date

Study Approved

Report Approved by Katharine Foster (Consultant) 26/10/2009 11:24



History: Post extubation.

Report:

The perihilar consolidation on the left has improved. The left lung is hyperinflated.

List

Text FULLERTON, HAYLEY | 06/10/2008 | Female

Study Highlights

Reason for Study:

812593

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist:

Institution: BIRMINGHAM CHILDREN'S | DEFAULT

Patient Name: FULLERTON, HAYLEY

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable.
09/11/2009	13:58	Chest
29/10/2009	11:39	Chest Portable.
26/10/2009	09:29	Chest Portable.
25/10/2009	10:13	Chest Portable.
24/10/2009	11:44	Chest Portable.
23/10/2009	16:38	Chest Portable.
22/10/2009	09:50	Chest Portable.
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable.
20/10/2009	11:39	Chest Portable.
19/10/2009	11:49	Chest Portable.
19/10/2009	03:37	Chest Portable.
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable.
16/10/2009	12:39	Chest Portable.
14/10/2009	14:57	Chest Portable.



Logout

Help

Phil Deberham

CHEST | CHEST | 21/10/2009 13:32:46 | 3571437 | APPROVED

Order Placed on Unknown Date

Study Approved

Report Approved by Dr Helen Alton (Consultant) 21/10/2009 13:20



History: Post cardiac surgery. Failed extubation x 2. Normal diaphragmatic movement.

Report:

Hayley was fully ventilated so with the help of an Intensivist, we disconnected the ventilator until she took a gasp. There was normal movement of the diaphragm on both sides

Text FULLERTON, HAYLEY | 06/10/2008 | Female

CHEST | CHEST | 20/10/2009 11:39:53 | 3571117 | Approved

Study Highlights

Reason for Study:

812403

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist: BCHN2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON, HAYLEY

Order Placed on Unknown Date

Study Approved

Report Approved by: Dr Clare Miller (Consultant) 20/10/2009 13:51

History: Ventilator with failed extubation. Post op cardiac patient

Report:

Dextrocardia noted. Support line positions appear satisfactory. There is improved aeration in the right upper lobe. Persistent left perihilar air space opacity. There are small bilateral effusions.

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable.
09/11/2009	13:55	Chest
29/10/2009	11:39	Chest Portable.
26/10/2009	09:29	Chest Portable.
25/10/2009	10:13	Chest Portable.
24/10/2009	11:44	Chest Portable.
23/10/2009	16:38	Chest Portable.
22/10/2009	09:50	Chest Portable.
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable.
20/10/2009	11:39	Chest Portable.
19/10/2009	11:49	Chest Portable.
19/10/2009	03:37	Chest Portable.
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable.
16/10/2009	12:39	Chest Portable.
14/10/2009	14:57	Chest Portable.

List



Logout

Help

Phil DeBorham

Text FULLERTON/HAYLEY | 06/10/2008 | Female

CHEST | CHEST | 19/10/2009 03:37:23 | 3570576 | Approved

Study Highlights

Reason for Study:

812112

Requesting Physician:

BRAWN MR,W

Phone Number:

Requesting Department:

Technologist: BCHNX2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON/HAYLEY

Order Placed on Unknown Date

Study Approved

Report Approved by Dr Karl Johnson (Consultant) 19/10/2009 09:37

History: Reintubation.

Report:

There is extensive bilateral basal consolidation. Bilateral pleural effusions. Cardiac outline lies to the right of the midline. Small right basal pneumothorax. Support lines are satisfactory.

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable.
09/11/2009	13:58	Chest
29/10/2009	11:39	Chest Portable.
26/10/2009	09:29	Chest Portable.
25/10/2009	10:13	Chest Portable.
24/10/2009	11:44	Chest Portable.
23/10/2009	16:38	Chest Portable.
22/10/2009	09:50	Chest Portable.
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable.
20/10/2009	11:39	Chest Portable.
19/10/2009	11:49	Chest Portable.
19/10/2009	03:37	Chest Portable.
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable.
16/10/2009	12:39	Chest Portable.
14/10/2009	14:57	Chest Portable.

List

Text

FULLERTON, HAYLEY | 06/10/2008 | Female

Phil Debarham

Help

Logout

CHEST | CHEST | 17/10/2009 08:00:05 | 3570569 | Approved

Order: Placed on Unknown Date

Study: Approved

Report: Approved by Dr Karl Johnson (Consultant) 19/10/2009 10:25

History: Decrease in size

Report:

Comparison is made with the previous examination. Right pleural effusion has reduced in size. Slightly improved aeration of right base. Increase in size of left pleural effusion.

Reason for Study:

812014

Requesting Physician: BRAUN MR, W

Phone Number:

Requesting Department:

Technologist: BCHN2/BCHUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON, HAYLEY

Study List

Radiology (17)

Study Date Study Time Study Description

10/11/2009 02:25 Chest Portable.

09/11/2009 13:58 Chest

29/10/2009 11:39 Chest Portable.

26/10/2009 09:29 Chest Portable.

25/10/2009 10:13 Chest Portable.

24/10/2009 11:44 Chest Portable.

23/10/2009 16:38 Chest Portable.

22/10/2009 09:50 Chest Portable.

21/10/2009 12:32 US Chest Port

21/10/2009 04:31 Chest Portable.

20/10/2009 11:33 Chest Portable.

19/10/2009 11:49 Chest Portable.

19/10/2009 03:37 Chest Portable.

18/10/2009 18:41 Abdomen Port

17/10/2009 08:00 Chest Portable.

16/10/2009 12:39 Chest Portable.

14/10/2009 14:57 Chest Portable.

List

Text FULLERTON, HAYLEY | 06/10/2008 | Female

CHEST | CHEST | 14/10/2009 14:57:36 | 3553659 | Approved

Logout

Help

Phil Debertem

Study Highlights

Reason for Study:

811521

Requesting Physician: BRAUN MIRAW

Phone Number:

Requesting Department:

Technologist: BQ-INX2/BCUSER1

Institution: Birmingham Childrens Hospital | Radio

Patient Name: FULLERTON, HAYLEY

Study List

Radiology (17)

Study Date	Study Time	Study Description
10/11/2009	02:25	Chest Portable
09/11/2009	13:58	Chest
29/10/2009	11:35	Chest Portable
26/10/2009	09:29	Chest Portable
25/10/2009	10:13	Chest Portable
24/10/2009	11:44	Chest Portable
23/10/2009	16:38	Chest Portable
22/10/2009	09:50	Chest Portable
21/10/2009	12:32	US Chest Port
21/10/2009	04:31	Chest Portable
20/10/2009	11:59	Chest Portable
19/10/2009	11:49	Chest Portable
19/10/2009	03:57	Chest Portable
18/10/2009	18:41	Abdomen Port
17/10/2009	08:00	Chest Portable
15/10/2009	12:39	Chest Portable
14/10/2009	14:57	Chest Portable

Order: Placed on Unknown Date

Study Approved

Report Approved by: Dr Karl Johnson (Consultant) 15/10/2009 09:58

History: Post cardiac surgery

Report:

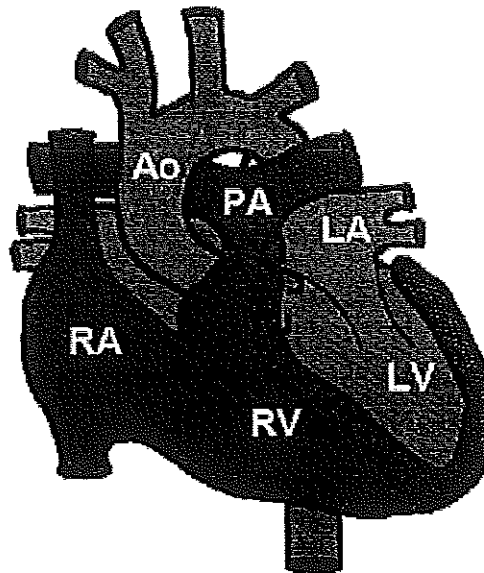
Heart lies on the right. There is consolidation in the right mid zone and left base. No pneumothorax. Small bilateral pleural effusions. Support lines appear satisfactory.

Handout:

The Normal Heart


The normal heart has four chambers - the right and left Atria (RA & LA) and the right and left Ventricles (RV & LV). The atriums collect blood after it returns to the heart via veins. Blood from the circulation round the body ("Main" circulation) returns into the right atrium and from the "Lung" circulation to the left atrium. From the atriums, blood passes to the ventricles, which pump it out, under pressure. The right ventricle pumps into the 'Pulmonary Artery', which carries it to the lung circulation (low pressure) and the left ventricle into the 'Aorta', which is the main artery for the main circulation (high pressure).


Normal Heart and Arteries



LA = Left Atrium
RA = Right Atrium
LV = Left Ventricle
RV = Right Ventricle

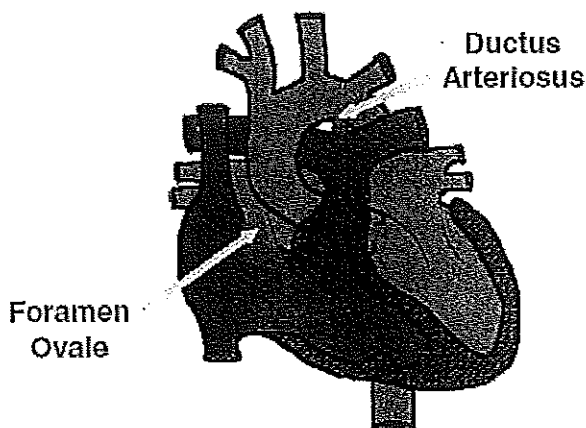
Ao = Aorta
PA = Pulmonary Artery

 Red blood
(high oxygen)

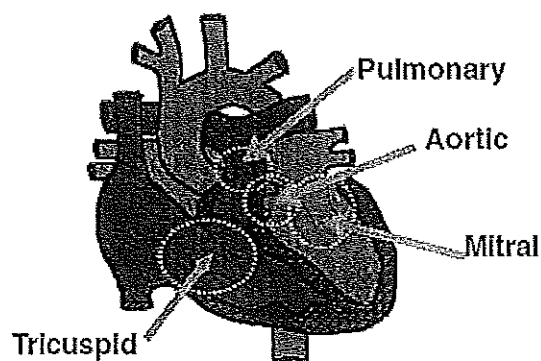
 Blue blood
(low oxygen)

In the newborn infant two communications allow blood to pass between the two circuits. The "Ductus Arteriosus" is still open providing a connection between the aorta and the pulmonary artery. In addition the "Foramen Ovale" allows blood to pass between the left and right atriums (LA & RA). Within a few days the ductus closes off completely. The Foramen Ovale closes gradually over several weeks or months, sometimes remaining open as a tiny slit into adolescence or beyond. The four heart valves control flow of blood through the heart. They work like 'swing doors' allowing blood to flow forwards but not to 'leak' (regurgitate) backwards. The valves are called "Aortic" and Pulmonary" (guarding the outlet from the ventricles to each artery) and "Mitral" and "Tricuspid" (at the junction of the atriums with the ventricles).

Normal Heart in newborn baby



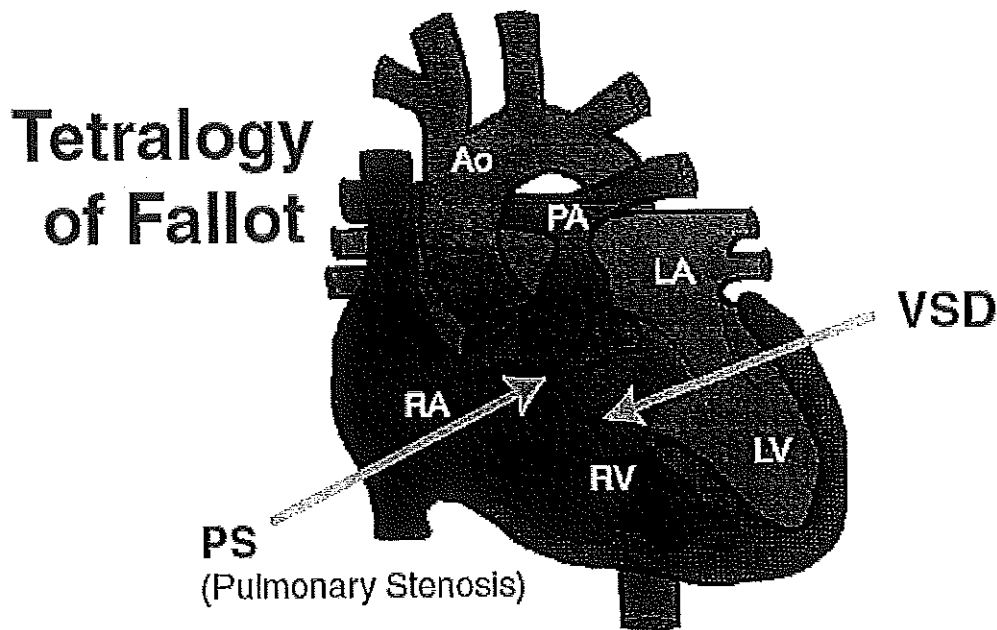
Heart Valves



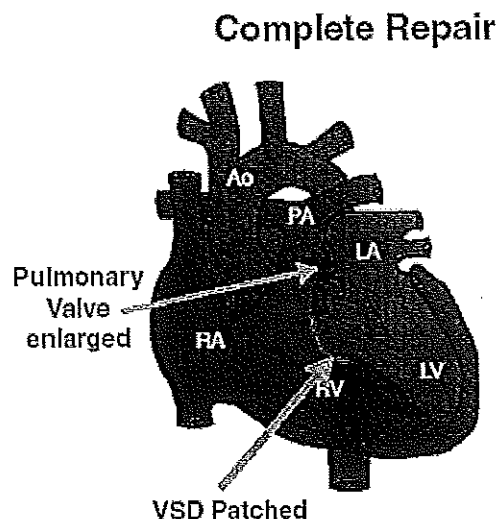
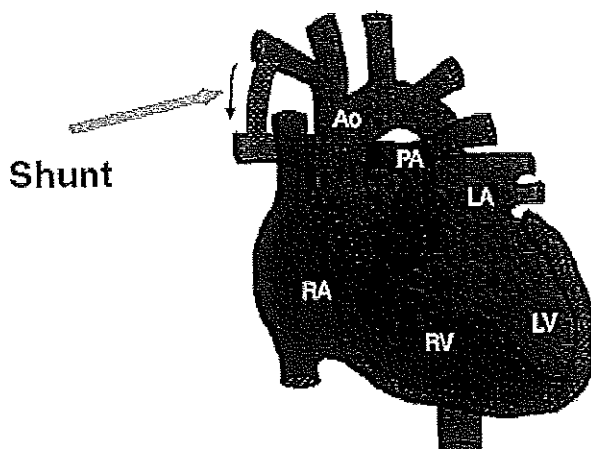
Handout:

Fallot's Tetralogy

The combination of a VSD with Pulmonary Stenosis, with the Aorta "Overriding" (sitting 'astride') the VSD and with Right Ventricle 'Hypertrophy' (thickening of the muscle) is termed "Tetralogy of Fallot". The obstruction to flow into the lungs leads to blood being diverted through the VSD to the aorta. Flow in the lung circulation is reduced and the child appears 'Blue' (Cyanosed). Affected infants are often relatively free of symptoms in the early weeks of life. Cyanosis (Blueness) gradually appears, sometimes with a tendency to intermittent severe exacerbations ("Spells"). A heart murmur is usually heard early in infancy (even before symptoms develop).



Surgery is required during infancy or early childhood. If severe symptoms develop in the first few months the baby may require early surgery (a so-called 'Shunt' operation). This involves insertion of a tiny piece of artificial tube (made from Goretex) between the Aorta, or a branch (usually one of the arm arteries), and one of the branch Pulmonary Arteries (LPA or RPA). Corrective surgery is carried out at around six months.



**BIRMINGHAM WOMEN'S HOSPITAL
PERINATAL PATHOLOGY DEPARTMENT
For HM Coroner (Birmingham and Solihull)**

Post Mortem Number 697/09

Final Report Date: 08/02/2010

Coroner's Ref: 3791/09

Coroner's Officer: Mr J Hoskin

Name: FULLERTON, Haley Elizabeth Sex: Female Age: 13 months Class: Infant

Referring Hospital: Birmingham Children's Hospital Infant's Case No.: L1199628 /

ZP0948884 Consultant Paediatrician: Dr Reinhardt

Date of Birth: 06/10/2008 Date of Death: 11/11/2009 Date of PM: 13/11/2009

PM Performed by: Dr. Tamas Marton At: Birmingham Central Mortuary, at 11.00. Also present Dr Zdenka Reinhardt.

Body weight: 6600. g [$<3^{\text{rd}}$ centile] CH length: 67.0cm [$<3^{\text{rd}}$ centile] CR length: 45.0cm
OFC: 47.0cm [$\sim 50^{\text{th}}$ centile] Foot length: 9.5cm

SUMMARY OF AUTOPSY FINDINGS:

1. A female infant whose measurements are less than expected for her age.
2. No external congenital anomalies.
3. Reconstructed heart, post Modified L Blalock interposition shunt (the left subclavian artery and the left pulmonary artery 2008), and full reconstruction (October 2009: VSD closure, Pulmonary artery reconstruction) for Congenital heart disease (Pulmonary atresia and VSD).
Left superior vena cava with rudimentary right superior vena cava.
4. Cardiomegaly and dextrocardia.
Dilated right ventricle and pulmonary arteries.
Superficial dehiscence of the median sternotomy wound (no bacterial growth of the wound).
Evidence of severe right ventricular failure. Gross hepatomegaly.
Adhesions of the left upper lobe of lung, fibrinous pleuritis of the right lower lobe of lung.
Collapsed lungs.
Purulent bronchitis of the Right lower lobe of the lung.
Pleural effusions (20-25ml) and ascites (~ 100 ml).
Old subdural haemorrhage in the right parietal-occipital region.
5. Other investigations:
 - Microbiology – no significant growth
 - Karyotype – 46,XX

COMMENT:

A non-dysmorphic female infant, whose body measurements were small for her age. The postoperative situation was normal with no apparent complication of the operation. The most significant finding was the severe right ventricular failure, dilated right ventricle and pulmonary vessels and hepatomegaly. (There was no liver damage seen on histology) As there was no

histological sign of pulmonary hypertension, in my view the right ventricular failure must have been acute.

There was no aspiration, no pulmonary embolism and I agree with the clinical diagnosis of collapsed lungs. The Left lower lobe was congested, left upper lobe pale and the right lung atelectatic. There was no pneumonia, but the chronic heart condition resulted in iron laden macrophages in the alveoli.

The significance of the right subdural haemorrhage is not certain, but obviously was not the result of injury (no bruises and no broken bones). The brain did not seem to be damaged (macroscopically or on histology (the brain was not compressed, there was no brain oedema and the old blood clot was thin).

I think that the positive blood culture was the result of contamination of the sample and neither the skin wound nor any other site grew anything significant.

I did not find any further significant abnormalities on histology, and I give the cause of death as it follows:

The pathologist's opinion as for the cause of death:

1A Acute right ventricular failure of the heart.

1B Reconstructed heart, post Modified L Blalock interposition shunt (the left subclavian artery and the left pulmonary artery 2008), and full reconstruction (October 2009: VSD closure, Pulmonary artery reconstruction) for Congenital heart disease (Pulmonary atresia and VSD).

CLINICAL SUMMARY: (from coroner's report/hospital notes/other)

Hayley was born at 37 weeks of gestation weighing 2.1kg with functional pulmonary atresia with VSD. She has previously undergone left modified Blalock Taussig shunt (01.12.08) during this operation the ductus arteriosus was ligated too. The BI shunt was between the left subclavian artery and the left pulmonary artery. Hayley's growth has been slow despite maximising her calorie intake.

16.10.09 baby underwent reconstructive cardiac surgery that consisted of closure of the VSD with a Dacron patch, reconstruction of the pulmonary trunk.

In the PIC Unit Hayley was ventilated post operatively and had 2 failed extubation due to right upper lobe collapse/consolidation. She was successfully extubated on the 23.10.09 and was self ventilating when discharged to the unit on 31.10.09.

Her chest closure was delayed until day 2 post operatively because of hypertension requiring Inotrops.

Hayley completed the course of Meropenem antibiotics for the RUL consolidation. Staphylococcus aureus was cultured from her pacing wires and because of this she was treated with IV antibiotics.

The liver function tests became deranged post operatively but improved without any intervention.

The baby was on ward 11, has been on ward 11 since the 31.10.09. Mother felt that the baby was poorly and tried to ask the staff to move the baby back to the High Dependency Unit, and the baby died on 11.11.09. The cause of death was given as: 1a) Cardio respiratory failure; 1b) Complex pulmonary atresia; 1c) Acute collapse of lungs.

The baby had a sudden deterioration. In the morning 11.11.09 (7.30 respiratory distress), capillary blood gas showed respiratory acidosis.

Intensive Care SpR and the resuscitation team arrived, baby was resuscitated with intubation, cardiac massage and for 20 minutes no significant cardiac output was achieved. There was asystole and the echocardiogram showed ventricular standstill.

Mother was not happy with the care and requested a Coroner's post mortem.

EXTERNAL EXAMINATION:

The body was that of a normally formed, female infant with parameters less than expected for her age of 13 months, otherwise she appears very well nourished and well cared for. There were no injuries. The body was identified by a hospital name tag on the left wrist. The following marks of therapy/resuscitation/PM sampling were noted: needle puncture marks both inguinally, both legs, both tibia, median sternotomy with the lower end wound dehiscence.

The face appeared normal with normally sited ears, patent choanae and normal closure of the lip and palate. The head, back, thorax, abdomen and limbs appeared normally formed. The hands and feet were normally formed with five digits on each extremity and normal palmar creases. The external genitalia were of normal female type and the anus was normal.

SKIN : normal with no marks on injury and no rashes. There were petechiae on the skin of the head. There was a median sternotomy ~12cm long with dehiscence in the lower third (this was cultured).

SUBCUTANEOUS TISSUE: scant.

UMBILICAL CORD: the umbilicus was clean.

POST MORTEM

INTERNAL EXAMINATION:

Cardiovascular system:

PERICARDIUM: open, there were adhesions between the heart and lungs and the layers of the pericardium.

HEART: (93.7 g) was enlarged (body weight/heart weight =71) and was shifted to the right, this mainly was the consequence of the dilated right ventricle. The systemic veins were abnormal, it consisted of a large and dilated left superior vena cava superior that drained into the sinus venosus and a rudimentary right superior vena cava. The pulmonary venous return was normal. The atrio-ventricular and ventriculo-arterial connections were concordant. The right ventricle was dilated and there was a 4mm size Dacron patch on the VSD between the two chambers. The left ventricle was otherwise normal. There was no defect of the atrial or ventricular septum and the ventricular myocardium was normal. The foramen ovale and ductus arteriosus were fully closed. I also identified the clipped BT Dacron shunt.

AORTA AND OTHER VESSELS: the great vessels were fully reconstructed, normally arranged. There was no pulmonary embolus visible.

Respiratory system:

PLEURAL CAVITIES: contained 20-25ml clear fluid each sides. There was old occlusion between the left upper lobe of the lung and the parietal pleura. On the right side over the left lower lobe there was some fibrinous material on the pleura.

DIAPHRAGM: appeared normal.

LUNGS: (L 82.2 g, R 57.5 g) were of normal size but collapsed and showed normal lobation. The parenchyma of the left upper lobe was pale, the left lower lobe congested and the right lung appeared to be atelectatic. The pulmonary vessels were dilated.

LARYNX, TRACHEA AND MAJOR BRONCHI: appeared normally formed there was no sign of aspiration, they were filled with mucus.

Gastrointestinal system:

MOUTH, TONGUE, OESOPHAGUS: appeared normally formed.

PERITONEAL CAVITY: normal, and contained minimal fluid.

STOMACH AND CONTENTS: normal.

INTESTINES: were normally fixed and rotated.

LIVER: (297.0 g) appeared normally formed. It was enlarged with blunt edges, with congested external and cut surface.

GALL BLADDER, PANCREAS: were unremarkable.

Reticuloendothelial system:

SPLEEN: (24.0 g) appeared normal.
 LYMPH NODES: were not enlarged.
 THYMUS: not identified in the post operative situation.

Endocrine system:

THYROID: appeared normal.
 ADRENALS: (4.3 g) were of normal size and appearance.

Genitourinary System:

KIDNEYS: (65.1g combined) were normally sited and of normal size. They showed normal lobulation. No abnormality of the external or cut surfaces was identified and the pelvicalyceal system was not dilated. The cortex appeared to be pale.
 URETERS: there was a single ureter of normal calibre on each side.
 BLADDER: was normal, empty.
 INTERNAL GENITALIA: the ovaries, Fallopian tubes and uterus appeared normal.

Musculoskeletal system:

The muscle bulk appeared normal and no abnormality of the bones and joints was identified.

Skull and central nervous system:

SCALP: appeared normal.
 SKULL: normal cranial bones, anterior fontanelle, dural folds and venous sinuses.
 MENINGES: normal.
 BRAIN: (920.0g) the brain weight and gyral development were consistent with the age. There were two cerebral hemispheres with normal olfactory and optic nerves and corpus callosum. The cerebral ventricles had a normal appearance. The cerebellum, midbrain and brainstem had a normal appearance.
 SPINAL CORD: not examined.
 MIDDLE EARS: not examined

X-ray: not carried out.

Bacteriology: blood, lungs and pleural cavity – no growth from the lung swab, from the wound swab. Coagulase negative Staphylococcus in bacillus species from the blood culture (? post mortem overgrowth).

Virology: not requested.

Cytogenetics: not requested (46,XX, normal female karyotype – from patient's notes)

Biochemistry: no

Frozen tissues: none

Toxicology: no

Organs kept: none

HISTOLOGY:

Kidneys, ovary,
 adrenals, intestine,
 bladder:

Show no specific change

Diaphragm:

Some chronic inflammatory response and fibrin on one side of the

diaphragm.

Heart: Normal histology, some chronic pericarditis with inflammatory cells and fibrin (consequence of the heart operations).

Liver: Normal architecture, congestion is noted.

Lungs: Normally developed. The large vessels are dilated, the small pulmonary vessels are normal, and there is no sign of pulmonary hypertension. There are macrophages seen in all lobes of the lungs, in particular in the lower lobes the alveoli contain iron-laden macrophages in large numbers. In the left lower lobe there is one small focus of acute pneumonia, no sign of bronchitis. In the right lower lobe there is purulen bronchitis visible, there is atelectasia and again no sign of pulmonary hypertension.

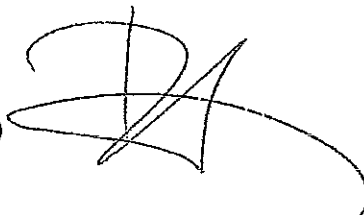
Brain: Normal anatomy, there is no sign of brain damage.

BLOCK KEY:

A1 – left upper lung, A2 – left lower lung, A3 – right upper lung, A4 – right middle lung, A5 – right lower lung, A6 – larynx, A7 – lymph node, A8 – left liver, A9 – right liver, A10 – spleen, pancreas, A11 – left kidney, A12 – right kidney, A13 – ovary, adrenals, A14 – small & large bowel, stomach, A15 – septum, A16 – septum, A17 – left ventricle, A18 – right ventricle, A19 – bladder, A20 – diaphragm; B1 – medulla, B2 – pons, B3 – vermis, B4 – cerebellum, B5 – midbrain, B6 – frontal, B7 – caudate, B8 – parietal, B9 – thalamus, B10 – hippocampus, B11 – occipital.

Dr TG MARTON

Typed on 08.02.2010
AT: 1538



Infection Prevention and Control

Isolation Policy

Version:	4
Ratified by:	Infection Prevention and Control Committee Clinical Risk and Quality Assurance Committee
Date ratified:	April 2009
Name of originator/author:	Judith Room / Jim Gray
Name of responsible committee/individual:	Infection Prevention and Control Committee Clinical Risk and Quality Assurance Committee
Date issued:	April 2009
Review date:	March 2011
Target audience:	All Trust staff

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Appendices

Appendix A	Precautions required for infectious conditions requiring Standard Source Isolation
Appendix B	Infections that require strict source isolation
Appendix C	Permissibility of bedside teaching on patients who are isolated

1 Introduction

Isolation procedures are used either to prevent transmission of pathogenic microorganisms from infected patients to other patients or staff (**source isolation**), or to protect susceptible individuals from exposure to pathogenic microorganisms from their attendants or the environment (**protective isolation**).

Whilst infection may be spread by the airborne route or by direct and indirect contact, the aims of source isolation are the same; namely to confine the infection and prevent transmission. Source isolation can be further categorised as either **standard** or **strict**.

Standard source isolation will normally be sufficient when caring for infectious patients at Birmingham Children's Hospital NHS Foundation Trust (BCHFT). **Strict** source isolation is only required for highly infectious and/or dangerous diseases. Because these infections are unlikely to be encountered at BCHFT there are no isolation facilities suitable for the long-term care of patients suspected or proven to have such infections: patients should be transferred to another hospital as soon as possible.

This policy describes the isolation measures required for common and/or important conditions that may be encountered at BCHFT. The policy however cannot cover all infectious conditions or all clinical eventualities. The Infection Control Team (or the On-Call Consultant Microbiologist) is available to advise in such circumstances.

2 Purpose

The purpose of this policy is to describe the general principles of isolation, and the control measures required for specific infections that are commonly encountered &/or may be important at BCHFT

3. Duties

3.1 Duties within the Organisation

- The Trust Board are responsible for ensuring that appropriate action is taken (as needed) to provide additional isolation rooms. The number of existing side rooms at BCHFT must be maintained.
- All Ward / Department Managers have the responsibility to ensure that this policy is cascaded to staff. They are also responsible for ensuring that staff comply fully with the Isolation policy and related infection control policies at all times.
- The Nurse in Charge is responsible for:
 - informing the Infection Control Team where patients are not able to be isolated according to policy and bed space isolation will be required.
 - undertaking a risk assessment in conjunction with the Infection Control Team in the event of bed space isolation being required.
 - completing an IR1 incident form in the event of bed space isolation being required.

- ensuring that an isolation terminal clean is requested and undertaken (as needed).
- The Head of Nursing is responsible for:
 - ensuring that any completed IR1 incident forms relating to either non-compliance with the Isolation policy or where bed space isolation is required are reported to the Infection Prevention and Control Committee and the Clinical Risk and Quality Assurance Committee.
- The Estates Department are responsible for ensuring that the number of side rooms is not diminished without discussion with the Infection Control Team.
- All individuals have the responsibility to:
 - comply with this policy at all times
 - contact the Infection Control Team if, and when, they need further advice.
 - ensure that they understand the risks associated with non-compliance and report any incidents/risks that occur to the Infection Control Team.
- The Infection Control Team are responsible for:
 - undertaking a risk assessment with the Nurse in Charge in the event of bed space isolation being required.
 - ensuring that the appropriate action is taken to follow up on any incidents reported to them.

3.2 Identification of Stakeholders

Stakeholders are all staff that work at BCHFT.

4 Consultation and Communication with Stakeholders

This policy has been updated and agreed by the multi-disciplinary representatives who attend the Infection Prevention and Control Committee and the Clinical Risk and Quality Assurance Committee.

5 Content

5.1 ISOLATION GENERAL MEASURES

- 5.1.1 There are some general principles of isolation that will apply to all patients regardless of infectious condition. However in addition to the general principles there may be other isolation precautions that are required which will be dependent on the nature of the risks. This will depend on the type of isolation and, in the case of source isolation, on the degree of infectivity of the patient and route(s) of spread of the pathogen.

- 5.1.2 General principles that apply to all patients who are isolated:

- Isolation must be implemented as soon as an infectious condition is suspected or confirmed.
 - The standardised Trust source isolation sign must be displayed prominently on the door of the isolation room (or at the foot of the bed if the patient is being bed space isolated).
 - An isolation sign is not normally required for patients who are infected with blood borne viruses (HIV, hepatitis B, C or D) unless there are exceptional infection risks e.g. patients who are bleeding heavily and causing significant environmental contamination.
 - The Infection Control Team must be contacted where staff are unsure if isolation is required or not.
 - See 5.6 for other infection control principles relating to patients that are being isolated
- 5.1.3 Appendix A lists the infectious conditions that are commonly encountered &/or important at BCHFT and summarises the isolation measures that should be employed (e.g. the need for single room, personal protective equipment needed, doors closed etc.)
- 5.1.4 Where it is a medical decision that the child who needs isolation is too ill to be moved to a single side room, the Infection Control Team or On-Call Medical Microbiologist must be informed.
- 5.1.5 Consideration for single rooms should be given to young children who have an infection and who are mobile due to their inability to maintain good standards of hygiene.
- 5.1.6 Where there are any concerns about cross infection or an outbreak is suspected, the Infection Control Team or On-Call Medical Microbiologist must be informed (See Control of Outbreaks policy).

5.2 STANDARD SOURCE ISOLATION

- 5.2.1 Standard source isolation is the usual type of source isolation that is required at BCHFT.
- 5.2.2 In most instances patients will be source isolated in a single room:
- Where possible the room should have its own handwash basin for the use of the patient, visitors and staff.
 - The door should normally be kept closed (see Appendix A)
 - Where it is deemed that the safety of the child will be compromised with the door being kept closed this should be documented in the patient's notes. In this case it may be acceptable that the smaller single door be kept open. Please discuss with the Infection Control Team (as needed).
 - The air supply should be under negative pressure, or in balance with the air pressure in the main ward.
- Unnecessary furniture and equipment should be removed before admitting the patient.
 - Disposable or dedicated patient equipment should be used (see 5.6.2).

- 5.2.3 In situations where a single room is not available, or where the patient's condition precludes him/her being nursed in a single room, it may be possible to manage the case on the main ward (bed space isolation – see 5.3). This must be done in conjunction with the Infection Control Team.
- 5.2.4 Patients suffering from the same infection can be nursed together (cohort isolation – see 5.4).

5.3 BED SPACE ISOLATION

- 5.3.1 A small number of infections are only transmitted by direct contact. In the event of a single room not being available bed space isolation may be considered for those infections only transmitted by direct contact however this is a last resort in managing patients who require isolation.
- 5.3.2 Where bed space isolation is deemed necessary, the Infection Control Team or On-Call Medical Microbiologist must be contacted so that a risk assessment can be undertaken.
- 5.3.3 The risk assessment must encompass all other patients in the hospital occupying single rooms to ensure that the lowest-risk patient is displaced from a single room. Factors that must be taken into consideration include:
- the likely degree of infectivity
 - the likelihood that patients will be willing or able to cooperate
 - the anticipated length of stay
 - the degree of risk to adjacent patients where bed space isolation is practised
 - the provision of hand hygiene facilities in the vicinity of the bed space-isolated patient
 - the availability of toilet/washing facilities for the bed space-isolated patient
 - protection of the dignity and confidentiality of the bed space-isolated patient
- 5.3.4 In the event of bed space isolation being required, the nurse in charge of the patient must complete an Incident Form. These will in turn be reported, by the Head of Nursing to the Infection Prevention and Control Committee and the Clinical Risk and Quality Assurance Committee, to ensure that the adequacy of isolation facilities in the Trust are kept under constant review.

5.4 COHORT ISOLATION

- 5.4.1 Cohort isolation is the grouping together of patients that are:
- infected or colonised with the same infectious agent or
 - displaying similar signs and symptoms of infection (i.e. respiratory symptoms – see Individual Infectious Disease policy)
- 5.4.2 The purpose of cohort isolation is to confine the care to one area preventing contact with susceptible patients.
- 5.4.3 For effective cohort isolation, bays should have doors that can be closed to provide physical separation from other patients and cohort patients should be cared for by **designated staff**; however this may not always be possible.

- 5.4.4 Cohort isolation can be instigated in the event of an outbreak where the number of cases exceeds side room isolation capacity (see Control of Outbreaks policy).
- 5.4.5 In areas such as critical care, it may be necessary to cohort patients into specific areas of the unit, ensuring that these areas are managed separately from the rest of the unit.

5.5 STRICT SOURCE ISOLATION

- 5.5.1 Infections that require strict source isolation are listed in Appendix B.
- 5.5.2 It is most unlikely that a patient with one of these infections will present to BCHFT. In the event of a patient presenting to BCHFT the Infection Control Team/ On-Call Medical Microbiologist must be informed immediately so that advice on appropriate precautions and actions can be given.
- 5.5.3 In the event of a case occurring, the patient's Clinical Team must make arrangements to transfer the patient to an Infectious Diseases Unit as soon as possible.
- 5.5.4 Whilst the transfer is arranged:
- the patient must be isolated in a single side room
 - the number of persons entering the room must be restricted to a bare minimum and a list of names **MUST** be kept of all persons who enter the side room.
 - ***Staff in contact with the patient must not leave the area until authorised to do so by the Infection Control Team.***

5.6 INFECTION CONTROL PRINCIPLES FOR ISOLATION PATIENTS (Source, Bed space and Cohort Isolation)

5.6.1 *Protective Clothing*

- Protective clothing must be worn as indicated in Appendix A.
- Where aprons are required for source isolation patients, a yellow disposable plastic apron is worn.
 - One exception to the above is where clinical procedures require a white apron to be already worn prior to entry to the room i.e. preparation and administration of IV drugs.
- All protective clothing must be removed and placed in a clinical waste bag before leaving the room.
- Hands should be washed with soap and water immediately after removing protective clothing (preferably whilst still inside the room).

- On leaving the room, hands may be disinfected with the alcohol hand gel however this is usually not required as long as hands have been washed effectively prior to leaving the room.

5.6.2 *Medical equipment*

- Disposable medical equipment is preferred (where available). Where this is not possible equipment should be dedicated to individual patients and used exclusively for that patient. The equipment should remain in the isolation room until no longer needed for the patient.
- In the event of equipment needing to be taken out of the isolation room for use with other patients, it must be thoroughly cleaned (see Cleaning, Disinfection and Decontamination policy).

5.6.3 *Linen*

- In most cases used linen from isolated patients must be managed as Infected Linen (see Handling Used Linen policy).
- The used linen should be placed inside the red alginate bag inside the isolation room. The red alginate bag is then removed from the room and placed inside the red outer bag in the ward sluice. Further advice, if needed, is available from the Infection Control Team.

5.6.4 *Clinical waste*

- Clinical waste is disposed of as normal into approved clinical waste bags (see Waste policy) in the isolation room. Double bagging is not required. All used personal protective equipment (PPE) must be disposed of as clinical waste (see 5.10)

5.6.5 *Disposal of Sharps*

- Used sharps are disposed of directly into sharps containers (see Safe Handling and Disposal of Sharps policy).
- Where needed, sharps containers may be taken into the isolation room for procedures. The outside of the sharps container should be cleaned prior to removing the sharps container from the isolation room.

5.6.6 *Pathological Specimens*

- Pathological specimens from some patients may have to be identified as hazardous (see Collection, Handling & Transport of Specimens policy).

5.6.7 *Crockery and Cutlery*

- No special requirements are required when handling crockery or cutlery used in isolation side rooms. Normal washing in the automated dishwasher is adequate.

5.6.8 *Staff*

- Where a child is being isolated (either source or protective) the number of staff entering the rooms must be kept to a minimum i.e. those actually involved in patient care.
- During ward rounds, only essential staff should enter the cubicle. Teaching of medical students must take place outside the cubicle where possible (see 5.8).

5.6.9 *Visitors*

- Visitors must report to the nurse in charge for advice on appropriate precautions before entering the room (see Prevention of Transmission of Infection to and from Hospital Visitors policy).

5.6.10 *Transport of Patients*

- Isolation patients should only be sent to other Departments when essential.
- The receiving department must be notified in advance (see Infection Control Guidance on the Admission, Movement within the Hospital, Transfer between Hospitals and Discharge of Patients).

5.6.11 *Transfer of Patients to another Hospital*

- Prior to transfer, inform the receiving hospital of the child's need for isolation.
- When booking the ambulance, inform ambulance control that the child is being isolated.
- Advise the ambulance staff when aprons and gloves are needed.
- PPE should be removed after handling the child, prior to leaving the isolation room. Hands must be decontaminated.
- Following the child transfer, the linen on the trolley should be removed and the trolley cleaned and disinfected.

5.7 **PROTECTIVE ISOLATION**

5.7.1 Severely immuno-compromised patients may require strict protective isolation at BCHFT. Positive pressure side rooms are available in areas such as Ward 15 High Dependency Unit.

5.7.2 If patients are admitted to BCHFT who have an increased susceptibility to infection with pathogenic or opportunistic microorganisms but who do not require isolation in a positive pressure side room, the following precautions can reduce the risk of such patients acquiring infection:

- Confinement of the patient in a single room, with the door closed.
- Avoidance of contact with staff or visitors who have, or may be incubating, an infectious condition (including apparently trivial upper respiratory tract infections). See also the Prevention of Transmission of Infection to and from Hospital Visitors policy.

- Thorough washing and drying of hands by **everyone** on entering the room using soap and water.
- Wearing of protective clothing by **everyone** entering the room. A white disposable plastic apron and disposable gloves should be worn.
- Cleaning and disinfection of equipment that is taken into the single room

5.7.3 A Trust Protective Isolation sign should be displayed on the door.

5.7.4 The Infection Control Team can be contacted for further advice as required.

5.8 TEACHING & TRAINING INVOLVING CONTACT WITH PATIENTS WHO ARE ISOLATED

- 5.8.1 It is recognised that students and healthcare professionals in training may need to have some exposure to patients that are isolated in order to provide education on the diagnosis, management and ongoing assessment of such patients. However the training need must be balanced against the risks of exposure of the trainee to the infection and/or of infection spreading to other patients in hospital.
- 5.8.2 As a general rule bedside teaching on isolated patients should be avoided wherever possible, and it is not permitted where patients are in strict source isolation or in protective isolation. The safety of bedside teaching on patients undergoing standard source isolation should be risk assessed according to Appendix C .
- 5.8.3 Students and healthcare professionals in training must comply with the isolation policy. The duration of bedside training should be kept to a minimum, and only persons who need bedside training should enter the single room where a patient is being isolated. The Ward Manager has the right to terminate bedside teaching on isolated patients if he or she believes that the policy is being flouted.

5.9 CLEANING OF ISOLATION ROOMS

- 4.9.1 Strict adherence to the cleaning of isolation rooms is necessary both to ensure that rooms are effectively cleaned, and to ensure the safety of Domestic Staff entering such rooms.
- 5.9.2 Where a patient is being isolated the appropriate isolation sign (source or protective) should be visibly and prominently displayed.
- 5.9.3 This will indicate to the Domestic Services the type of isolation being employed.
- 5.9.4 Patient's diagnosis is **confidential**, and **should not** be disclosed unless knowledge of the identity of the infective agent is necessary for the safety of domestic staff. For example, if the patient being isolated is suspected or proven to have certain infections that are spread by the airborne route (e.g. chickenpox, measles, TB) and only staff who are known to be immune should be allowed contact.
- 5.9.5 Additional daily cleaning of isolation rooms may be required as directed by the Infection Control Team.
- 5.9.6 **Terminal Clean of a Isolation Room / Bed Space**

- The nurse in charge contacts the Domestic Supervisor to inform them that an isolation room requires a terminal clean.
 - Where possible, the Domestic Supervisor should be informed in advance with an anticipated time of discharge so that the terminal clean can be incorporated into work schedules. This is particularly important where the discharge is expected in the afternoon, evenings and weekends.
 - If the room is required urgently for another patient, this should be made clear to the Domestic Supervisor.
- Floors will normally be cleaned using general purpose detergent however in the case of patients who have had *Clostridium difficile* isolated, the floors must be cleaned with Chlorclean. The nurse in charge should inform the domestic supervisor that this is required for those individual cases.
- Where patients have been in protective isolation or isolated as a precaution and they did not develop any evidence of infection (e.g. a chickenpox contact who has not developed disease normal cleaning will usually be sufficient).
- Patient bed spaces in bays will also require a terminal clean when a patient has been moved to a single room for infectious reasons i.e. the patient has been found to have an infectious microorganism such as MRSA, ESBL producing organisms, VRE etc or when the patient has developed diarrhoea.
- Terminal isolation cleans are done using 'Chlorclean' (a combined cleaning and hypochlorite disinfectant product).
 - If Chlorclean is not available, the room must be **cleaned first** with hot water and detergent, **followed** by disinfection with hypochlorite (1,000 ppm available chlorine).
- Where Chlorclean or hypochlorite cannot be used i.e. on delicate items such as electrical equipment 70% alcohol should be used.
 - NB Electrical equipment that has been disinfected with alcohol must be allowed to dry completely before being switched back on.

Procedure

- Nursing staff to remove all patient equipment from the area. All equipment must be cleaned and disinfected prior to removal from the area
- Nursing staff will strip the bed/ cot and clean and disinfect the pillows, mattress and bed/cot base (which is directly underneath the mattress). If 'Chlorclean' is not available the mattress must be cleaned with soap and water PRIOR TO disinfection with 1,000 ppm hypochlorite. The mattress will be left upended to allow the cover to dry thoroughly.
- After 20 minutes contact time, metallic items (made of aluminium and base ferrous metals i.e. iron and steel but not stainless steel) should be rinsed with water to removed residual hypochlorite.

Domestic staff

- Wear a yellow plastic apron and disposable gloves. Yellow cloths and yellow mops (or disposable mop heads) are used for cleaning an isolation room.

- Make up Chlorclean to the correct concentration. It is important to make up the product correctly; one tablet for one litre of COLD water. Cold water must be used.
- Open windows in area.
- Clean and disinfect any remaining equipment prior to removal from the room.
- Remove curtains (as identified for specific infections).
- Clean and disinfect all horizontal surfaces and sanitary fittings.
- After 20 minutes contact time, metallic items (made of aluminium and base ferrous metals i.e. iron and steel but not stainless steel) should be rinsed with water to removed residual hypochlorite.
- Mop floor using general purpose detergent (unless instructed otherwise).
- Send all mop heads for laundering (or dispose of disposable mop heads) after use. Dispose of all cloths.
- Soft furnishings and floor coverings that cannot be washed and disinfected are not recommended. Where such items are noted and unable to be cleaned and disinfected, contact the Infection Control Team for further advice.
- Rehang clean curtains.
- Following cleaning and disinfection, the room should be checked by the Domestic Supervisor.
- The room may be used as soon as it is dry and the smell of hypochlorite has gone.

Note: In the unlikely event that a patient has required strict source isolation, the vacated room should be left untouched until the Infection Control Team has advised on cleaning and disinfection procedures.

5.9.7 Procedure Out of Hours for Terminal Isolation Rooms

- At present there is no out of hours service for the terminal clean of an isolation room out of hours (i.e. after 7pm Monday to Sunday).
- Isolation rooms that have been vacated out of hours are normally left vacant until they can be cleaned by Domestic Services during working hours.
- In the event of an isolation room requiring a terminal clean out of hours i.e. because it is required for another isolation patient, the terminal clean will need to be undertaken by the nursing staff following the procedure outlined above.
- If nursing staff are undertaking a terminal clean they must be aware of the following colour coding for the cleaning equipment:
 - Yellow equipment is used for isolation areas
 - Red equipment for sanitary areas.
- After use, return any used equipment, e.g. mops and buckets, to the domestic store, labelled as *Used to clean isolation room*. These will then be dealt with by Domestic Services during normal hours.
- The room may be used as soon as it is dry and the smell of hypochlorite has gone.

5.9.8 Curtain Changing

- Curtains will need to be changed as part of the isolation terminal clean for certain infectious conditions:
 - Chickenpox
 - *Clostridium difficile*
 - ESBL producing organisms
 - Viral gastroenteritis
 - Influenza
 - Measles
 - MRSA
 - Tuberculosis (including Multi-drug resistant TB)
 - Vancomycin resistant enterococcus
- Curtains should be removed prior to isolation clean being carried out. New curtains should be re-hung after completion of the clean.

5.10. COMMUNICATION

- 5.10.1 Communication is fundamental in ensuring that patients are isolated promptly and appropriately for their infectious condition.
- 5.10.2 All staff are responsible for ensuring that relevant details are recorded in the patient's notes, for ensuring relevant people (both staff and visitors) are aware of the procedures that need to be followed when patients are being isolated and for displaying the appropriate isolation sign.

- 5.10.3 The source and protective isolation signs are available on the Infection Control Website.
- 5.10.4 Information on isolation and the reasons for isolation precautions should be easily accessible to all groups of staff, patients and the public. Disease specific information leaflets are available for Rotavirus, RSV, MRSA, ESBL producing organisms, *Clostridium difficile*, PVL producing organisms. Please speak to the Infection Control Team if information leaflets are not available.
- 5.10.5 Additional information is freely available from the Health Protection Agency website A – Z page accessible at www.hpa.org.uk.
- 5.10.6 There must also be effective communication with community staff as part of the patient's discharge. Discharge letters to General Practitioners and any community care staff must include information about infectious conditions and most recent laboratory results.

6 References

Centre for Disease Control (2007) Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings.

Department of Health (2007) Saving Lives: reducing infection, delivering clean and safe care Isolating patients with healthcare-associated infection. A summary of best practice.

Health Protection Agency www.hpa.org.uk

The Health and Social Care Act (2008) Code of Practice for the NHS on the prevention and control of healthcare associated infections and related guidance.

7 Equality Impact Assessment

Compliance and adherence to infection prevention and control policies is fundamental to providing clean, safe care. This policy is applicable for all clinical staff working at BCHFT.

8 Approval, Dissemination and Implementation

8.1 Approval of document

This policy has been approved and ratified by the Infection Prevention and Control Committee and the Clinical Risk and Quality Assurance Committee.

8.2 Dissemination

This policy will be disseminated through to Heads of Departments and through the Clinical Directorate structure. The policy will be kept in the Infection Control manual on the Trust Intranet.

8.3 Implementation

Implementation and monitoring of this policy will be done by the Heads of Department and relevant Heads of Nursing and Clinical Directors.

9 Monitoring Compliance

9.1 Process for Monitoring Compliance and Effectiveness

Day-to-day monitoring of compliance with this policy will be undertaken by Ward and Department Manager, Matrons and the Infection Control Team. An Incident Report Form will be completed for instances of non-compliance with the policy.

Periodic audits of compliance with this policy (specifically including assessments of the adequacy of isolation facilities) will be undertaken on an annual basis. This will be included in the Annual Infection Control Programme.

9.2 Standards/Key Performance Indicators

It is the responsibility of Heads of Department to ensure that patients with childhood infections are isolated and managed in accordance with this policy. Transmission of preventable health care associated infections to patients or staff should not occur.

10 Associated Documentation

All other infection prevention and control policies that relate either directly or indirectly to this policy (i.e. Hand Hygiene; Waste; Safe Handling and Disposal of Sharps; Cleaning, Disinfection and Decontamination; MRSA; Chickenpox; Tuberculosis; Management of Individual Infectious Diseases; Control of Outbreaks; Infection Control Guidance on the Admission, Movement within the Hospital, Transfer Between Hospitals & Discharge of Patients; Prevention of Transmission of Infection to and from Hospital Visitors; Collection, Handling & Transport of Specimens etc).

Appendix A: Precautions required for infectious conditions requiring STANDARD SOURCE ISOLATION that may be seen at Birmingham Children's Hospital

¹Older children only: where en suite facilities are deemed mandatory a commode is an acceptable alternative ² Curtain Change Required

Infection	Single room required	If yes:		Apron	Gloves	Wearing of masks and eye protection	Isolation Priority (where facilities are limited)
		Door kept closed	En suite sanitary facilities ¹				
Bronchiolitis Where children are confirmed RSV +ve and they need HDU care so unable to move to a single room, care must be taken, where possible, to ensure that other patients do not have underlying cardiac, respiratory or immunodeficiency disease	Mandatory	No	Desirable	All activities that involve direct patient contact			MODERATE Consider cohorting
Chickenpox ² Only staff who have had chicken pox or are immune should care for patients	Mandatory	Mandatory	Mandatory	For all activities that involve patient contact, or handling contaminated equipment			HIGH
<i>Clostridium difficile</i> ²	Mandatory	Mandatory	Mandatory	On entering the room	On entering the room		HIGH
Cytomegalovirus (babies only)	Not usually required	N/A	N/A	For activities that involve contact with urine or respiratory secretions			LOW
Enteric (typhoid/ paratyphoid) fever	Mandatory	No	Designation of a toilet for exclusive use is an alternative to provision of en suite facilities. Access to showers and baths must be considered on a case-by-case basis	All activities that involve direct patient contact, or a risk of exposure to faeces or urine		Masks and eye protection should be worn in accordance with Standard Infection Control Precautions i.e. for activities where contact with blood or other body fluids is probable &/or there is potential for uncontrolled bleeding or spattering	MODERATE
ESBL producing organisms ²	Mandatory - if isolated in past 6 months - any time if patient has diarrhoea	Mandatory	Designation of a toilet and bath/shower room for exclusive use is an alternative to provision of en suite facilities	On entering the room	On entering the room		HIGH
Gastroenteritis, bacterial or protozoan (other than <i>C. difficile</i>)	Desirable	Not usually necessary	Designation of a toilet for exclusive use is an alternative to provision of en suite facilities. Use of communal ward showers is usually acceptable	On entering the room	All activities that involve direct patient contact, or a risk of exposure to faeces		MODERATE
Gastroenteritis, viral ²	Mandatory	Mandatory	Mandatory	On entering the room	On entering the room		HIGH

Infection	Single room required	If yes:			Apron	Gloves	Wearing of masks and eye protection	Isolation Priority (where facilities are limited)
		Door kept closed	En-suite sanitary facilities					
Gonococcal ophthalmia	Desirable for the first 24 hrs antibiotic therapy	Not necessary	N/A		For direct patient contact only			MODERATE
Invasive Group A streptococcus (<i>Streptococcus pyogenes</i>)	Mandatory for the first 48 h antibiotic therapy	Desirable for the first 48 h antibiotic therapy	Mandatory		For direct patient contact and any other activities that involve a risk of exposure to blood or body fluids			HIGH
Hepatitis, blood-borne i.e. B, C	Not required unless uncontrolled bleeding	No	N/A		Only for activities that involve a risk of exposure to blood or body fluids			LOW
Hepatitis, enterically-transmitted	Mandatory	No	Mandatory		All activities that involve direct patient contact, or a risk of exposure to faeces or urine		Masks and eye protection should be worn in accordance with Standard Infection Control Precautions	ASSESS ON A CASE-BY-CASE BASIS
Herpes simplex virus	Desirable	No	N/A		All activities that involve direct patient contact			ASSESS ON A CASE-BY-CASE BASIS
HIV								
As for hepatitis, blood-borne								
Influenza ²	Mandatory	Mandatory	Mandatory		All activities that involve direct patient contact			HIGH
Measles ²	Mandatory	Mandatory	Mandatory		For all activities that involve patient contact, or handling contaminated equipment			HIGH
	Only staff who have had measles or are immune should care for patients							HIGH infected patients
MRSA ²	Desirable	Mandatory	Designation of a toilet and bath/shower room for exclusive use is an alternative to provision of en suite facilities		On entering the room	On entering the room		MODERATE asymptomatic colonisation
PVL producing MSSA or MRSA	Desirable	No	Desirable		On entering the room	On entering the room		HIGH
Rubella (German Measles)	Mandatory	Mandatory	Mandatory		For all activities that involve direct patient contact			HIGH
	Only staff who have had German measles or are immune should care for patients							LOW
Congenital Rubella	Not usually required	N/A	N/A		For activities that involve contact with urine or respiratory secretions			

Infection	Single room required	If yes:		Apron	Gloves	Wearing of masks and eye protection	Isolation Priority (where facilities are limited)
		Door kept closed	En suite sanitary facilities				
Tuberculosis ²	Mandatory for smear-positive pulmonary disease. Desirable for other forms of TB until risk assessment undertaken	Mandatory until ICT advises otherwise	Must be considered on a case-by-case basis		All activities that involve patient contact, or handling potentially contaminated equipment	See Policy for the Prevention & Control of Tuberculosis. FFP3 Masks required for aerosol generating procedures	ASSESS ON A CASE-BY-CASE BASIS
Multi Drug Resistant Tuberculosis ²	Elective patients with suspected or confirmed multi-drug resistant Tuberculosis must not be admitted to BCHFT without prior discussion with the Infection Control Team. In the event of an emergency patient being admitted with suspected or confirmed multi-drug resistant Tuberculosis, the Infection Control Team / On-Call Medical Microbiologist must be informed as soon as possible.						
VRE ²	Mandatory	Mandatory	Designation of a toilet and bath/shower room for exclusive use is an alternative to provision of en suite facilities	On entering the room	On entering the room	Masks and eye protection should be worn in accordance with Standard Infection Control Precautions	HIGH
Other antibiotic-resistant bacteria	ICT will advise						ASSESS CASE-BY-CASE

Appendix B

Infections that require strict source isolation

The following infections required strict source isolation:

- Anthrax
- Diphtheria
- Plague
- Rabies
- SARS
- Viral haemorrhagic fever
- Yellow fever

In the event of new emerging infections arising, additional infections may also be added to the list.

Appendix C Permissibility of bedside teaching on patients who are isolated

Infection	Bedside teaching permissible	Controls
Chickenpox	Permitted	Trainees must be immune to chickenpox
Clostridium difficile	NOT PERMITTED	
Cytomegalovirus	Permitted	Trainees who are or may be pregnant should avoid direct contact with urine or respiratory secretions
Enteric fever	Permitted	Trainees must avoid contact with urine and faeces, including soiled napkins
ESBL-producing bacteria	Permitted	Follow isolation policy
Gastroenteritis, bacterial or protozoal (other than C. difficile)	Permitted	Trainees must avoid contact with urine and faeces, including soiled napkins
Gastroenteritis, viral	NOT PERMITTED	
Gonococcal ophthalmia	No restrictions	Follow isolation policy
Invasive group A streptococcus (Streptococcus pyogenes)	Permitted	Trainees with damaged or broken skin must not enter room
Hepatitis, blood-borne	Permitted	Trainees must be carefully supervised to ensure that they are not exposed to blood or body fluids
Hepatitis, enterically-transmitted	Permitted	Trainees must avoid contact with urine and faeces, including soiled napkins
Herpes simplex virus	Permitted	Follow isolation policy
HIV	Permitted	Trainees must be carefully supervised to ensure that they are not exposed to blood or body fluids
Influenza	NOT PERMITTED	
Measles	Permitted	Trainees must be immune to measles
MRSA	NOT PERMITTED	
PVL-producing MSSA or MRSA	NOT PERMITTED	
RSV	Permitted	Follow isolation policy
Rubella	Permitted	Trainees must be immune to rubella. Trainees who are or may be pregnant must not enter room
Tuberculosis	Permitted in most cases	Infection Control Team will advise on a case by case basis
Multi-drug-resistant tuberculosis	NOT PERMITTED	
VRE	Permitted	Follow isolation policy
Other antibiotic-resistant bacteria	Permitted in most cases	Infection Control Team will advise on a case by case basis

Appendix D Checklist for the Review and Approval of Procedural Document

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

	Title of document being reviewed:	Yes/No/Unsure	Comments
1. Title			
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2. Rationale			
	Are reasons for development of the document stated?	Yes	
3. Development Process			
	Is the method described in brief?	Yes	
	Are people involved in the development identified?	Yes	
	Do you feel a reasonable attempt has been made to ensure relevant expertise has been used?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	
4. Content			
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
	Are the statements clear and unambiguous?	Yes	
5. Evidence Base			
	Is the type of evidence to support the document identified explicitly?	Yes	
	Are key references cited?	Yes	
	Are the references cited in full?	Yes	
	Are supporting documents referenced?	Yes	
6. Approval			
	Does the document identify which committee/group will approve it?	Yes	
	If appropriate have the joint Human Resources/staff side committee (or equivalent) approved the document?		
7. Dissemination and Implementation			
	Is there an outline/plan to identify how this will be done?	Yes	
	Does the plan include the necessary training/support to	Yes	

	Title of document being reviewed:	Yes/No/ Unsure	Comments
	ensure compliance?		
8.	Document Control		
	Does the document identify where it will be held?	Yes	
	Have archiving arrangements for superseded documents been addressed?	Yes	
9.	Process to Monitor Compliance and Effectiveness		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance with the document?	Yes	
10.	Review Date		
	Is the review date identified?	Yes	
	Is the frequency of review identified? If so is it acceptable?	Yes	
11.	Overall Responsibility for the Document		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

Individual Approval			
If you are happy to approve this document, please sign and date.			
Name		Date	
Signature			
Committee Approval			
If the committee is happy to approve this document, please sign and date it and forward copies to the person with responsibility for disseminating and implementing the document and the person who is responsible for maintaining the organisation's database of approved documents.			
Name		Date	
Signature			

SECTION 1:

Department: Infection Prevention and Control		Assessor: Judith Room Lead Infection Control Nurse	
Policy/ Service Title: Isolation Policy		Date of Assessment: 4 th March 2009	
1. Describe the purpose of this policy or function	The purpose of this policy is to describe the general principles of isolation, and the control measures required for specific infections that are commonly encountered &/or may be important at BCHFT		
2. Who is affected by this policy?	All staff working at BCHFT		
3. What are the outcomes or intended outcomes of this policy/ function?	Patients with infections are isolated and managed accordingly so that transmission of preventable health care associated infections to patients or staff does not occur.		
4. What consultation has been undertaken during the development of this policy/function?	Discussed and agreed by the multi disciplinary membership of the Infection Prevention and Control Committee and Clinical Risk and Quality Assurance Committee.		
5. What information or evidence has been used to assess the potential impact across the equality strands?	This policy will not have an impact on the workforce at BCHFT		

IMPACT		
1. What is the impact or likely impact, either positive or negative, of the initiative on individuals, staff, or the public at large?		
All staff are responsible for complying with infection prevention and control policies in order to minimise and prevent cross infection.		
2. Please complete the following list and identify if there is, or likely to be, an impact on a group		
a) Grounds of race, ethnicity, colour, nationality or national origins.	Yes No X	Adverse? Provide further details:
b) Grounds of sexuality or marital status	Yes No X	Adverse?

		Provide further details:
c) Grounds of gender	Yes No X	Adverse? Provide further details:
d) Grounds of religion or belief	Yes No X	Adverse? Provide further details:
e) Grounds of disability	Yes No X	Adverse? Provide further details:
f) Grounds of age	Yes No X	Adverse? Provide further details:

Appendix F – Version Control Sheet

[illegible]

Appendix G – Plan for Dissemination of Procedural Documents

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Title of document:	Isolation Policy		
Date finalised:	April 2009	Dissemination lead: Print name and contact details	Judith Room Lead Infection Control Nurse Ext 9966
Previous document already being used?	Yes		
If yes, in what format and where?	Electronic copy Infection Control manual Trust Intranet		
Proposed action to retrieve out-of-date copies of the document:	Remove out of date electronic copy from the Infection Control manual on the Trust Intranet		
To be disseminated to:	How will it be disseminated, who will do it and when?	Paper or Electronic	Comments
Governance Secretary	Via e mail by the Infection Control Team secretary	Electronic	
Ward/ Department Managers	Via e mail by the Infection Control Team secretary	Electronic	
Heads of Nursing	Via e mail by the Infection Control Team secretary	Electronic	
Directorate Managers	Via e mail by the Infection Control Team secretary	Electronic	

Dissemination Record – to be used once document is approved.

Date put on register / library of procedural documents		Date due to be reviewed	
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Disseminated to: (either directly or via meetings, etc)	Format (i.e. paper or electronic)	Date Disseminated	No. of Copies Sent	Contact Details / Comments

**RISK MANAGEMENT
GOVERNANCE DEPARTMENT
Birmingham Children's Hospital**

Root Cause Analysis Report

Executive Summary

(09/10:28)

Summary of the incident

This patient underwent a cardiac surgical procedure (repair of Fallot's Tetralogy and closure of VSD) on 14th October 2009. Following a prolonged period of time on PICU the patient was transferred to ward 12 on 31st October 2009 and then to ward 11 on 3rd November 2009. The patient suffered from a cardiac arrest on the 11th November 2009 at 0756. Following an attempt at resuscitation the patient was sadly declared dead at 0815. The patient's mother raised concerns that the Trust had failed to recognise and take action when her daughter was deteriorating.

Due to the severity of these concerns the Trust decided to investigate the concerns under the Serious Untoward Incident Investigation process.

Incident details:

<i>Specialties involved:</i>	Cardiac Services, PICU
<i>Incident category:</i>	60; Care monitoring and review - Delay or failure to monitor
<i>Incident grade:</i>	Consequence: 5 x Likelihood: 3 = Incident Score 15
<i>Investigation level:</i>	Serious Untoward Incident using RCA. NPSA Level 2

The incident was investigated by a multi-disciplinary team including representatives from each discipline involved and a chair person from outside those disciplines.

Brief Background:

The patient was born with congenital heart problems which were first palliatively treated in Ireland. The patient was referred to our organisation for further treatment, and successfully underwent an operation. Following a difficult post-operative period on PICU the patient was transferred back to the wards. The patient sadly deteriorated 3 weeks post-operatively and despite attempts to identify and address the cause for the deterioration the patient suffered from a cardiac arrest and sadly passed away.

Overall Impressions

This patient began to objectively clinically deteriorate on the 9th November 2009. Treatment to address this deterioration was started by the clinical team based on their assessment of the patient. This treatment was in line with standard practice.

The cardiology medical team failed to put the clinical deterioration into context of the prior respiratory complications experienced by the patient on PICU.

The patient should have been referred to PICU for review on the 10th November 2009.

Early commencement of pressure support ventilation of this patient could have prevented the patient's death.

Root Cause / Conclusion

The root cause of the incident was a team factor. There was a culture of hierarchy in the teams, which meant that junior staff did not feel comfortable calling PICU for advice unless there was very strong evidence. It was noted that there were sufficient concerns to involve PIC on the 10th November 2009, and that had these concerns been raised to the PIC staff, the outcome may have been altered. The review team did, however, acknowledge that this patient's deterioration was rapid and happened despite treatment being instigated.

Good Practice Noted

- The care that was provided on PICU following the operation on the 14th October 2009.
- The continued regular input of the physiotherapy team on ward 12 until the patient had recovered to a more stable condition.
- The staff nurse's immediate request for review by the medical staff on the morning of the 11th of November 2009, and speed of response by the senior house officer and then by the PIC registrar and the Cardiology Registrar.

Recommendations:***Regarding clinical practice:***

- i. The review team noted the importance of early preliminary discussions with the intensive care team. An open door style policy must be pursued. It was noted that this was an aim of the intensive care team and that their increase in consultant numbers helped this. Although it was also noted that the overall numbers of PIC medical staff had remained the same. The review team did however note that the perception held by junior doctors was that a significant amount of evidence would be needed to justify involving the intensive care team. It is necessary to empower junior medical staff and nursing staff to summon support from the PIC team when they feel that this is justified. This should include the understanding that the criteria for justifying PIC input must be considered in the context of the patient's overall condition, so that staff feel comfortable escalating a patient to PIC whenever they have a concern.
- ii. It is however, recognised that cardiac patients pose an especially high clinical risk. One suggestion that was muted at the RCA was that there should be joint PIC and Cardiology Registrar handovers or ward rounds, potentially after the Cardiac ward round on PICU or at the end of the night shift. The feasibility and benefit of this requires more exploration.
- iii. The review team reinforced the importance of considering the totality of a patient's symptoms and seeking assistance when a concern is identified.
- iv. The review team also considered whether the Trust needed to develop some form of a Rapid Response Team or Medical Emergency Team as an outreach service from PICU. This has worked well in a number of organisations. Some hospitals in the USA have even enabled parents to activate this service, which has been found to be valuable and not severely misused.
- v. The review team also considered whether a referral model such as is used in Child Protection concerns should be used. With child protection concerns, any concern raised by any member of the team must be fully investigated and if

considered not to be valid, then the reasoning for this must be carefully recorded in the patient's health records.

- vi. It was also noted that there is little surgical review in post-operative patients once they have been discharged from PICU, as the patients are then under the care of the cardiologists. The surgeon responsible for this patient was not advised that there were specific concerns with the patient's progression, and current practice does not automatically involve review by the surgical team. This must be addressed.
- vii. The review team also considered that there was inadequate awareness amongst the nursing staff of the requirement to increase the frequency of observations to hourly when a patient was receiving oxygen or when the amount of oxygen required increased. Further training on observation and monitoring is required.
- viii. The review team then agreed that there should be an increase in simulation training, and possibly some training using the STEPS model of communication.

Regarding other practice:

- ix. It was noted that there was no formal debrief for medical staff following the incident and that the debriefing session for nursing staff occurred some time after the incident. This is not an acceptable standard of support for our staff and this should be reviewed and a formalised process developed that is well understood by all staff.

**RISK MANAGEMENT
GOVERNANCE DEPARTMENT
Birmingham Children's Hospital**

Root Cause Analysis Report

Full Report

(Investigation ref: 09/10:28)

1.0 Introduction

This report considers events prior to the patient's death to identify whether there were any reasonable actions that staff could have taken to avert this outcome.

1.1 Terms of reference

- 1.1.1** To investigate the death of the patient identifying contributory and root causes, with specific reference to:
 - 1.1.1.1** Bed space and ward allocation
 - 1.1.1.2** Isolation procedures
 - 1.1.1.3** Clinical monitoring systems
 - 1.1.1.4** The patient's clinical status
- 1.1.2** To review the events and clinical care provided at Birmingham Children's Hospital from 12th October 2009 onward leading up to the patient's death on 11th November 2009.
- 1.1.3** To identify what reasonable actions could have improved the care provided.
- 1.1.4** To establish if any national standards or guidelines are relevant to the incident, and review their implementation.

1.2 The Investigating Team

- 1.2.1** Dr Phil Debenham, Consultant Paediatrician and Hospital at Night Lead (Chair)
- 1.2.2** Dr Adrian Plunkett, Consultant Intensivist
- 1.2.3** Heather Steele, Educational Practitioner, Education and Learning
- 1.2.4** Caron Eyre, Associate Director of Nursing
- 1.2.5** Helen Watson, Head of Nursing for Directorate 3
- 1.2.6** Bryony Winnall, Deputy Associate Service Director for Directorate 3
- 1.2.7** Judy Green, Non-Executive Director
- 1.2.8** Mr William Brawn, Consultant Cardiac Surgeon
- 1.2.9** Mr David Barron, Consultant Cardiac Surgeon and Clinical Lead for Cardiac Services
- 1.2.10** Nina Barbosa, Risk Manager (Facilitator)

1.3. Investigating methodology

The investigation was carried out using principals of root cause analysis by a multidisciplinary team within the terms of reference listed in section 1.1.

The investigating team made reference to the contributory factor checklist to ensure that a range of factors were considered.

The investigation was carried out in accordance with the NPSA's guidance on *level 2* investigations.

1.4. Incident classification

The incident classification is incident type '60; *Care monitoring and review - Delay or failure to monitor*' under the incident domain: '*Safe High Quality and Co-ordinated Care*'. The incident is graded as a SUI and is therefore subject to investigation using RCA. Using the Trust's risk matrix the incident would be graded as consequence 5 x likelihood 3.

2.0 Summary of Incident

This patient underwent a cardiac surgical procedure (repair of Fallot's Tetralogy and closure of Ventricular septal defect (VSD)) on 14th October 2009. Postoperatively the patient remained on the paediatric intensive care unit (PICU) until transfer to ward 12 on 31st October 2009 and subsequently to ward 11 on 3rd November 2009. The patient had a cardiac arrest on the 11th November 2009 at 0756. Despite full resuscitation measures, death was declared at 0815. The patient's carers raised concern that the Trust had failed to recognise clinical deterioration and failed to undertake appropriate clinical management.

3.0 Background to incident

This has been prepared from the clinical record, pathology and radiology databases and additional supporting information listed in section 4.0.

The patient was a female born on the 6th October 2008 with a complex form of Fallot's Tetralogy. This involved pulmonary atresia (PA) with VSD and unusual positioning of the heart with dextroposition. She also had small, narrowed pulmonary arteries and bilateral superior vena cavae that further complicated the condition. She had previously undergone palliative cardiac surgery in Ireland which involved a modified left BT shunt and PDA closure, in December 2008. Following this she was referred to BCH Cardiac Services team by the team in Belfast.

The patient was admitted on the 12th October 2009 to ward 12 for repair of Fallot's Tetralogy and closure of VSD. She was then taken to theatre on the 14th October 2009. The operation successfully corrected the condition. Although the anaesthetic staff noted that the central venous catheter (CVC) cannulation was very difficult in the neck and there was evidence of dilated superficial veins in chest walls. The CVC was placed in the femoral vein. There was also some oozing (bleeding) in theatre immediately post-operatively, but this improved with blood, platelets and cryoprecipitate. The thromboelastogram (TEG) was reportedly normal.

PICU admission

The patient had a prolonged period on PICU, which is not unusual for a patient with this diagnosis. The patient had two failed attempts at weaning off ventilation. Left and right sided lung collapse/ consolidation were identified on serial chest x rays. There were clinical indications of a lower respiratory tract infection (pneumonia). The patient was treated with a range of antibiotics. No causative organism was identified.

The cause of the bilateral lung collapse is unknown. Insertion of an endotracheal tube too deep could cause unilateral lung collapse, but does not cause bilateral lung collapse.

Chest x-ray at 03:37hrs on 19th October 2009 shows a small right basal pneumothorax and has resolved on repeat chest x-ray at 11:49hrs on 19th October 2009. This may be what was referred to as "lung perforation" in the carer's formal complaint. This is unlikely to have resulted from the intubation, due to the rapid resolution without intervention.

In view of the two failed episodes of ventilation weaning, diaphragm paralysis was considered. An ultrasound scan excluded this diagnosis.

Successful ventilation weaning was achieved by using a combination of BIPAP (a form of non-invasive ventilation) and CPAP.

The patient was also noted to have enlarged liver and abnormal liver function tests, secondary to higher pressure in the right side of the heart, which is common in pulmonary atresia. This normalised whilst on PICU.

After the patient was weaned off BIPAP and CPAP she was monitored for a further 36 hours prior to transfer to ward 12.

Transfer to ward 12

The patient was transferred to ward 12 on the 31st October 2009 where she continued to require high dependency care, with a persistent oxygen requirement. She continued to have regular physiotherapy for several days, de-escalated following physiotherapist assessment to "physiotherapy review on request".

The patient was moved to ward 11 on 2nd November 2009 (To allow the admission of another patient requiring a bed on ward 12).

Transfer to ward 11

The patient was transferred to Cubicle 1 on Ward 11 late afternoon of the 3rd November 2009.

The Patient's paediatric early warning scores (PEWS) ranged from 1-5, with frequency of observations ranging from 2-8 hourly from 3rd-9th November 2009.

There was a trend of gradual increasing oxygen requirement since 7th November 2009.

The nursing staff perceived the patient to be one of the more stable on the ward until 10th November 2009.

The medical staff report concern about this patient from 9th November 2009. Chest x-ray was requested on the midday consultant ward round, with a formal radiology report available at 15:00hrs. The cardiology team reviewed the chest x-ray at 18:00hrs noted the deterioration in the lungs and planned to defer physiotherapy until 10th November 2009.

The patient's chest wound continued to be managed in accordance with instructions from the surgical team and a Mepolax dressing was used, which is left in place for 48hours unless there is a lot of oozing.

At 02:00hrs on the 10th November 2009 nursing staff raised concern of clinical deterioration and escalated this to the duty cardiology senior house officer. This doctor reviewed the patient at 02:10hrs and 03:00hrs. Clinical assessment indicated marked respiratory distress. Repeat chest x-ray showed worsening consolidation and capillary blood gas was normal. The doctor telephoned the duty cardiology registrar to share her concerns of the patient's condition and whether a review by the PICU team or antibiotic therapy was appropriate. The cardiology registrar advised not for physiotherapy or PICU review unless further clinical deterioration and to await further discussion with the consultant in the morning.

At approximately 05:00hrs on the 10th November 2009 the duty cardiology registrar reviewed the patient and was of the opinion that whilst she was the sickest patient on the ward, a PICU review was not indicated because the capillary blood gas was normal and the patient's clinical status did not reach this doctors perceived threshold for discussion with PICU.

The on call physiotherapist was contacted at 07:30hrs on the 10th November 2009. She was already on route to work by train. Based on the information provided regarding the patient's clinical status, a decision was taken that on arrival at the hospital she would arrange for a physiotherapy review. On arrival at the hospital, the on call physiotherapist met the physiotherapist whom had the most experience with the patient and a decision was taken for the physiotherapist with the most knowledge of the patient to undertake the assessment. This occurred at 09:40hrs.

At approximately 10:00hrs on the 10th November, the cardiology registrar led ward round acknowledged the overnight clinical deterioration. Infection was considered a possible cause for the deterioration, and investigations to identify an infective source were requested. This included the request for respiratory viral detection (including H1N1 in light of the current pandemic) from nasopharyngeal secretions. It is Trust infection control policy that all patients undergoing testing for H1N1 are isolated until a negative result is received.

The patient remained in the same cubicle but with the door shut to comply with isolation practices.

The patient's mother expressed concerns regarding the isolation procedure to the nurse caring for the patient (Staff Nurse 4), whom relayed these concerns to the ward manager. The mother however did not wish to discuss these concerns with the ward manager at the time.

The night cardiology senior house officer re-instated enteral feeds at 21:00hrs at maternal request. Initially 50% enteral, 50% intravenous with a plan to go to full enteral feeds at 03:00hrs on the 11th November 2009.

The duty cardiology registrar on call for the night of the 10th November 2009 reports reviewing the patient overnight and was of the impression that the clinical status

was stable with an infective aetiology most likely due to the pus in the chest wound and elevated inflammatory markers (Not documented in clinical record).

At 06:55hrs the patient was noted to be working slightly harder to breathe and the patient's nurse (Staff Nurse 1) requested a review by the cardiology senior house officer. The doctor reviewed the patient at 07:10hrs due to worsening respiratory distress. Enteral feeds were reduced to 50% and 50% given intravenously.

At 0730hrs the patient's mother alerted the team that the patient was deteriorating further. The cardiology senior house officer reviewed the patient and took a sample for a blood gas check on PICU. The results were concerning therefore she returned to Ward 11 with the duty cardiology registrar and the PICU registrar. The PICU Registrar recognized the impending signs of respiratory arrest and that the patient would need ventilation and transfer to PICU, so commenced a rapid sequence induction and intubation. The patient had a cardiac arrest at 07:56hrs and the arrest call was put out, while the resuscitation commenced.

Resuscitation

The patient remained on bag ventilation via the ETT and CPR continued throughout this time except for pulse checks and very brief echocardiogram (to exclude pericardial effusion / tamponade). Intravenous access was limited and so intra-osseous (IO) access was obtained twice in the tibia. The first needle only lasted a few seconds and therefore a second IO device was inserted. IO needles often do not last very long in young children but provide quick vascular access in an emergency and a route for resuscitation drugs and fluids. Subsequently an IV cannula was placed in the right femoral vein, through which resuscitation drugs (bicarbonate, adrenaline and calcium) could be administered.

The PICU medical team carrying out the resuscitation noted that the chest was very poorly compliant, requiring very high pressure with the bagging circuit when they were trying to get air into the lungs. This was suggestive of a severe recurrence of lung collapse. It was also noted that the patient's blood gases were not improving despite being ventilated. This indicated that the resuscitation measures were not succeeding and despite air flowing into the patient's lungs; it was not able to cross into the blood.

After 20 minutes, the cardiac rhythm had deteriorated from pulseless electrical activity (PEA) to asystole. This means that the heart went from having an electrical activity but not beating, to having no activity at all. An echocardiogram (ECHO) showed cardiac standstill despite correct resuscitation protocols being followed. The blood gas revealed a severe mixed acidosis and the chest compliance remained very poor. The patient was declared dead at 0815.