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Northern Ireland Inquiry into Hyponatraemia-Related Deaths

RE: CLAIRE ROBERTS

RESPONSE TO ADDITIONAL QUESTIONS RECEIVED ON 28th MAY 2012

FLUID PRESCRIPTION AND ACTUAL VOLUME OF FLUIDS ADMINISTERED

- Please set out, in simple terms, what volume and type of fluids were:
 - prescribed and
 - administered
- to Claire between her admission on 21st October 1996 and admission to PICU on 23rd October 1996. Unfortunately we have not been furnished with a copy of the PICU fluid balance chart. It might be useful to indicate that 2 IV drips were running on 22nd October 1996, one with Solution 18 and the second with the drugs including midazolam and phenytoin.

Response: From 21.30 on 21/10/96, on admission to the ward, an infusion of 0.18% Saline 4% Dextrose ('solution 18') was prescribed, at an appropriate rate of 64 mls/hour (64 mls/kg/day) (090-038-134). According to the fluid balance charts (090-038-133 and 090-038-135), this amount continued to be administered correctly as her maintenance fluid. In addition, she received 11 mls as part of the Midazolam infusion and 60 mls as part of the Aciclovir infusion. These drugs were probably diluted in 0.9% Saline as this would have been normal practice. Therefore between 21.30 on 21/10/96 and 23.00 on 22/10/96 she apparently received 1479 mls of 0.18% Saline, and 71 mls of 0.9% Saline. This gives a total of 1550 mls of IV fluid over 25 ½ hours. This equates to 61 mls/hr which is close to what was intended, and is an appropriate quantity. It should be noted that IV infusion pumps used at that time were not highly accurate and would often not deliver exactly the volume expected for the flow rate

that had been set, hence the importance of recording the actual volumes delivered on the fluid balance charts.

After 23.00 on 22/10/96, when the low serum sodium was known, the fluid regime was changed. The medical notes record that a decision was made at this time to reduce the rate of infusion to 2/3 of maintenance, i.e. 41 mls/hr. However it appears from the IV fluid prescription chart that 0.18% saline continued to be administered (090-038-136). '64mls/hr' is crossed out and '41 mls/hr' written above it.

Concerning the quantities given, from the fluid balance chart (090-038-135), between 23.00 and 02.00 she received a further 56 mls of 0.18% saline. This is less than the prescribed 41 mls/hr, and it would appear that the maintenance fluid infusion was slowed or stopped in order to compensate, to some extent, for the extra fluids given with the drugs. She received a further 7.5 mls of the Midazolam infusion (supposed to be running at 3 mls/hr) which according to the IV prescription chart was made up with 0.9% Saline. Also recorded at 23.00 is 110 mls given, presumably over 1 hour, as a Phenytoin infusion (IV Phenytoin should always be given as a slow infusion as a rapid infusion can be hazardous), probably made up with 0.9% Saline (although this is not recorded on the IV prescription chart).

This is confusing, because she should have received her loading dose of Phenytoin of 632 mg earlier in the day at around 14.45 (prescription chart 090-026-075). This loading dose would have been given as an infusion and should have been recorded on the Fluid Balance chart, but there is no mention of it until 23.00. Giving the loading dose diluted in 110 mls of fluid would have been appropriate (although more dilute than necessary - 63 mls [10 mg/ml] would have been sufficient dilution). If the infusion noted at 23.00 was for the first maintenance (as opposed to loading) dose, it would have been too early (not due until 02.45), and would have been far too great a quantity of fluid than needed for the much smaller maintenance dose (only 6-12 mls). To add to the confusion, the drug prescription chart (090-026-075) specifies that the maintenance doses should have been given at 08.30 and 20.30, which are routine medicine round times. I conclude therefore that the 110 mls recorded at 23.00 was indeed the loading dose. Therefore either the loading dose was given nearly 9 hours late, or it was recorded in the wrong place on the Fluid Balance chart. Assuming the former, then the total quantity of IV fluids given between 23.00 and 02.00 was 56 + 7.5 + 110 = 173.5 mls; that is 58 mls/hr or 58 mls/kg/24 hours, which is considerably more than intended, and indeed only slightly less than the 61 mls/hr she was receiving initially.

It appears that she had two IV infusions running through different cannulas. This is common practice, and enables the maintenance fluids to run continuously without interruption through one, while drug infusions can be given through the other. The fluid charts show that the maintenance fluids were recorded as running continuously while she received the drugs, so it appears that this system was used in Claire.

- Prof. Young said at the inquest (Ref: 091-010-061) *“I agree that the amount of fluid given between 8pm and 2am was greater than planned. I agree with Dr. Bingham that this did not make any substantial difference to Claire.”* Please comment on these observations and opinions.

Response: I agree with both these statements. The situation often arises in very ill children where a decision is made to restrict fluids, but because of the need to give drugs which have to be made up in dilute solutions, they end up receiving considerably more fluid than was planned. Ideally this should be allowed for prospectively when planning the fluids, but in practice the excess administration is not appreciated until after the totals are summed up on the charts, and further fluid restriction is then instituted. In Claire’s case there was not enough time to do this before her collapse and PICU admission. Between 20.00 and 23.00 she received a total of 275 mls rather than the intended 192 mls (3 hours at 64 mls/hr). Between 23.00 and 02.00 she received 173 mls total rather than the intended 123 mls (3 hours at 41 mls/hr). She therefore received over the 6 hours (20.00 to 02.00) a total of 133 mls more than intended. Although it is difficult to be certain, it seems unlikely that this relatively small excess volume would have contributed significantly to her cerebral oedema. Even if all fluids had been stopped at 23.00 in response to the low sodium level, she would have received only 173 mls less in total from that point on, and again this is unlikely to have been a significant contribution.

I therefore agree with Dr Bingham that this excess volume of fluid probably did not make a substantial difference, and that the process of developing cerebral oedema was probably already underway by the time the hyponatraemia was appreciated at 23.00.

URINE TESTING

- Would you have expected Claire’s urine sodium and osmolality to have been tested between her attendance at the A&E Department on 21st October 1996 and 23rd October 1996, and if so, when. Please explain the reasons for your answer.

Response: No. Urine electrolyte and osmolality measurements are not a routine test, and are normally only done when there is reason to suspect an unusual kidney or pituitary problem (such as SIADH). It is not normally done just in response to vomiting and dehydration, as clinical assessment is considered sufficient. The sodium level of 132 mmol/l would not normally be an indication for this test. It is not part of the investigation of seizures.

On 23/10/96, after Claire’s acute deterioration and the low sodium result was known, it would have been appropriate to request this and the request was made by Dr Stewart (090-022-096).

WARD ROUND

The ward round on 22nd October 1996 was conducted by Dr. Andrew Sands, Registrar, but the note of the ward round appears to have been written by Dr. Roger Stevenson, SHO (Ref: 090-022-052 to 090-022-053).

- In relation to this ward round, it would be helpful if you would explain in your report:
 - What you would have expected to happen during Claire's ward round
 - Whom you would have expected to:
 - conduct
 - attend Claire's ward round.

Response: ward rounds are conducted daily in the mornings on most acute hospital wards. On a children's ward, their purpose is to review each child's progress since the previous day, to allow discussion between members of the nursing and medical team about the child, to examine the child if necessary, to make a plan for ongoing management and, importantly, to communicate this to the accompanying parent. Ward rounds may be preceded by a discussion in an office before proceeding to the bedside. They are usually attended by one or more of the ward doctors and a nurse, who may be the nurse in charge or the child's allocated nurse for the day. There is often a teaching element and students may attend.

- In the absence of the paediatric consultant, who takes responsibility for the ward round and the decisions made on the ward round, particularly in relation to Claire's case?

Response: ward rounds are usually led by the most senior doctor present, who would usually be a consultant or a registrar. It was normal practice in 1996 for a registrar to lead a ward round and make most of the decisions, discussing with a consultant only when needing advice. These days there is normally more consultant involvement. The registrar leading the round would obviously take responsibility for his or her own decisions.

- What documents you would have expected to have been read before or during Claire's ward round and by whom?

Response: the doctor leading the ward round would be expected either to have read the case notes, or to have had their contents relayed to them by a junior doctor. They would be expected to look at the relevant observation charts, prescription charts and fluid balance charts if relevant, although not necessarily study them in detail. They

would not necessarily be expected to look at the nursing record, but the accompanying nurse would be expected to relay any important information.

- Who normally makes a note of the ward round, and the purpose and content of that note?

Response: the most junior doctor on the ward round normally has the task of writing the note. In paediatrics this is usually the SHO. This saves time and frees up the leading doctor to examine the child and speak to the parents. All doctors should have the skills to record the discussion and the decisions made on the round without direct supervision. The doctor who examines the child should relate their findings to the recording doctor. The note should contain a brief description of the child's state at the time (but not necessarily reiterate previous events which should already have been recorded), any relevant observations, the findings on examination, and the management plan: i.e. changes in drugs, fluids, monitoring, requests for investigations or further opinions, and plans for discharge or transfer.

The purpose of the note is to inform any clinician who sees the child what the current situation is, and to form a permanent record of the admission for future reference.

- The adequacy of:
 - the ward round itself
 - the note of the ward round (Ref: 090-022-052 to 090-022-053)

Response: I cannot comment on the adequacy of the ward round itself as none of the participants are able to recall anything about it in their witness statements.

The note is adequate in that it gives a brief background, records the parents' impression of Claire, notes the examination findings, and gives a brief management plan.

- If there had been a request for a repeat blood test of Claire's electrolytes made during the ward round, or later during the day on 22nd October 1996, whether you would have expected this request to have been recorded and, if so, where, and the reasons why.

Response: yes, I would have expected a request from the registrar to repeat any tests to have been recorded by the SHO in the ward round note at the time. This would have been part of the management plan. A note would also serve as a reminder to the SHO to do the blood test after the round.

- Who would have been responsible for following up on obtaining a blood sample from Claire, transporting that sample to the laboratory and checking the serum electrolyte result.

Response: the ward SHO (at that time Dr Stevenson) would have been responsible for taking the blood test (unless there was a phlebotomist or a nurse with phlebotomy skills available, which would have been very unusual in 1996). He would also have been responsible for ensuring that it got to the lab. Although he may have delegated this task according to local practice at the time. He would also have been responsible for chasing up the result by phoning the lab (or consulting a computer record if available at that time). He would be expected to consult a senior if he considered the result to be significantly abnormal.

BLOOD TESTS RESULTS FROM SAMPLE TAKEN ON 21st OCTOBER 1996

It appears that Claire's bloods were likely taken at some time between 22.00 and 22.30 on 21st October 1996. The nursing note on admission records that at 10pm the bloods were taken and IV fluids commenced (Ref: 090-040-140). The fluid chart suggests that IV fluids may have commenced at approximately 22.30 (Ref: 090-038-133). Dr. Steen's statement states that "*Blood was taken at approximately 2230 hours for full blood picture, U&E...*" (Ref: 090-050-154).

Claire's electrolyte and full blood count results were recorded at some time after midnight on 22nd October 1996 by SHO A. Volprech at Ref: 090-022-052. The results include:

- "Na 132 ↓...
- Gluc. 6.6
- WCC 16.5 ↑"

The ward round note on 22nd October 1996 (Ref: 090-022-052 to 090-022-053) records a slightly different WCC result of ↑16.4", rather than the initial result recorded by Dr. Volprech ("WCC 16.5 ↑") and the printed result of 16.52 (Ref: 090-032-108). However, the other 2 recorded results in the ward round note of "Na+ 132... Gluc.6.6" were identical to the results recorded from the sample taken on 21st October 1996.

- State whether you regard the inclusion in the ward round note of the blood results from a sample taken the previous evening as misleading, and explain the reasons why.

Response: No. Recording this may have reflected discussion on the ward round. There was no fixed format for ward round notes, and it would have been normal practice, then as now, for the SHO to write in the notes while the senior doctor examined the patient, and spoke to the nurses and parents. Noting the previous night's blood results would most likely have reflected the fact that the results were acknowledged and discussed on the ward round.

THE CHAIN OF COMMAND

- It would be helpful if you would explain the usual chain of command:
 - In a paediatric medical ward in relation to a patient both between 09.00 and 17.00 and also out of hours

Response: the traditional medical chain of command, at any time, is simply through ascending seniority: SHO refers up to registrar, and registrar refers up to consultant. However in paediatrics the arrangement is often more informal. Most consultants would not object, and indeed would expect, to be consulted directly by an SHO, or a senior nurse in certain circumstances. These might include when the junior staff were seriously concerned that the registrar was acting inappropriately in not calling, or when the registrar was occupied elsewhere and they were seriously concerned about a patient.

- When a specialist consultant attends to examine and advise on a paediatric patient in a medical ward

Response: as discussed in my original and subsequent reports, practice in this area was quite variable at the time, and most hospitals had no formal policy on this. Generally, a request for a specialist opinion would originate from the patient's own consultant, and the specialist would only take over primary responsibility for that patient's care if it was agreed between the two consultants, and the new arrangement would normally be recorded in the case notes.

GCS

- Would you have expected Mr and Mrs Roberts to have been informed by either nurses or clinicians of Claire's GCS and/or the periodic neurological assessments of her, or the relevance thereof, and if so, when, by whom and what information ought to have been given?

Response: I would not expect a parent to have details of the Glasgow Coma Scale explained to them, but I would have expected them to be informed in general terms of a significant neurological deterioration. If the parents were not present, it would not be reasonable to expect nurses to phone them every time observations were done, even if there was a slight deterioration. At night, staff are rightly less inclined to phone parents to avoid disturbing their sleep. During a gradual deterioration it is a matter of judgement when they should be phoned. Often this follows a discussion between nurses and doctors. Usually, only brief information is given over the phone and the parents are encouraged to attend. Either doctor or nurse might make the call. A fuller explanation can then be given face to face. The parents should be told of any change in diagnosis, possible reasons for any deterioration, and the management plan.

In this case, as stated in my original report, in my opinion the parents should have been called between 21.30 and 23.00 on 22/10/96.

CASE NOTE DISCHARGE SUMMARY (Ref: 090-009-011)

Please explain:

- The purpose of this document
- When and by whom is it normally completed
- Which clinicians would normally have input into the contents of this document
- To whom is it normally sent/circulated and where is it retained

Response: the main purpose of the discharge summary is to inform the patient's GP that they have been discharged following an admission. It should contain brief details of presumed diagnosis, significant investigations and procedures undertaken, on-going treatment and follow-up arrangements. It is normally completed by the ward SHO on the day of discharge. Usually only the SHO, nurse and clerical staff have input. If a consultant or registrar wanted to communicate something important to the GP then he or she would dictate a separate letter or make a phone call, rather than use the discharge summary. It is normally sent to the GP and, in children, sometimes to the health visitor and community child health department. A copy is retained in the case notes.

When a patient has died, most consultant paediatricians would either phone the GP directly or request one of their team to do so, so that the GP can console and support the family, and arrange bereavement advice if required. The discharge summary is not a sufficient mode of communication in this circumstance.

- State whether this document ought to have provoked an investigation into Claire's cause of death.

Response: No. The discharge summary does not have this purpose. An investigation would arise from discussion between the relevant clinicians, or the coroner.

- Explain why its content differs from the ICU Discharge Summary at Ref: 090-006-008.

Response: there is no significant difference between the content of these documents. They are simply written in different formats.

- In circumstances where a paediatric patient dies, identify the person who would normally be responsible for sending a formal summary of the child's care in hospital to the General Practitioner and when that formal summary would usually be sent to the General Practitioner.

Response: in paediatrics, the consultant would normally take on this task. However, the formal summary is often delayed for several weeks for two reasons: if there is to be a post-mortem, it may take some time for the full report to become available. Also,

most paediatricians would arrange to meet personally with the parents to discuss the events leading up to the death and the results of any tests. This may be before and/or after any post-mortem. A coroner's investigation might produce further delays. GPs would expect to receive the full picture, and hence it is often considered better to wait. A copy of the summary may be sent to the parents.

- State whether you would have expected a formal summary of Claire's care to have been sent to her General Practitioner and copied to the community paediatric services, and if so, state when you would have expected this to have been sent. Explain the reasons for your answer.

Response: Yes. I would have expected a full summary to have been sent so that the GP had the full details on record, for counselling the parents and to inform them of any issues that might be relevant to others in the family. As above, this might be sent some weeks or months after the death. Community Child Health should be copied in as a formality but they should already have been informed of the death immediately after it happened.

In this case, from the tone of Dr Steen's letter to the GP dated 5/3/97 (090-002-002), it would seem that the GP had already been informed verbally of the circumstances of Claire's death, and the purpose of the letter was simply to pass on the post-mortem results, and the fact that she and Dr Webb had met with them.

Responses completed 12 June 2012



Dr Robert Scott-Jupp

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