# RAYCHEL FERGUSON

## Date of birth: 4th February, 1992

## Report into the nursing care given at Altnagelvin Hospital in June, 2001

**Report prepared by: Sally G. Ramsay**

**Report prepared for: The Inquiry into Hyponatraemia-Related Deaths, Northern Ireland.**

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## Contents

# 1.0 INTRODUCTION

## 1.1 The writer

I am Sally Grace Ramsay. I am registered with the Nursing and Midwifery Council (NMC) as both an adult and a children's nurse. I have managed children's services in both the NHS and independent sectors. My specialist fields are the nursing care of sick children, clinical governance and professional nursing issues. Full details of my qualifications and experience entitling me to give expert opinion are in Appendix 2.0.

## 1.2 Summary of the case

On 7th June, 2001, Raychel Ferguson was admitted to Altnagelvin hospital where she was a diagnosis of acute appendicitis was made. Later that evening she underwent an appendicectomy (appendectomy) under general anaesthesia. After the operation she returned to the ward where an infusion of solution 18 (Dextrose and saline) was started. On several occasions during 9th June, Raychel vomited varying amounts of gastric fluid and in the late afternoon and evening was given intravenous medicines to relieve the vomiting. When she complained of a headache at around 21.15 paracetamol was given.

At approximately 03.00 on 9th June, Raychel's condition deteriorated and she experienced a seizure. Blood tests at this time showed her sodium level was very low. Raychel did not regain consciousness and was transferred to the Paediatric Intensive Care Unit at the Royal Belfast Hospital for Sick Children. When brain stem death was diagnosed, treatment was discontinued.

An inquest found that the cause of Raychel's death was swelling in her brain (cerebral oedema) as the result of a fall in the level of sodium in her blood. The latter had been caused by inadequate electrolyte replacement in the face of severe post-operative vomiting and water retention as the result of inappropriate secretion of anti-diuretic hormone (SIADH).

## 1.3 Summary of my conclusions

The management of Raychel's post-operative nausea and vomiting was inadequate.

There was a failure to inform a doctor when Raychel vomited twice during the morning of 8th June.

There was a lack of clarity regarding which doctor had responsibility for Raychel's care.

Nausea and vomiting were not identified as potential or actual nursing problems.

Some episodes of vomiting, oral intake and urine output were not recorded.

No action was taken in response to Mrs. Ferguson's concerns about Raychel.

### 1.4 Parties involved

- The Inquiry into hyponatraemia-related deaths in Northern Ireland
- Altnagelvin Hospital
- Royal Belfast Hospital for Sick Children
- Mr. & Mrs. Ferguson (Raychel's parents)

## 2.0 THE ISSUES ADDRESSED

I have been asked to assist with the following:

(i) Analysing the documents including the Reports and Statements;
(ii) Understanding the medical processes involved in Raychel's care and subsequent death;
(iii) Identifying areas where other Expert views might be sought;
(iv) Determining what further matters should be addressed in Witness Statements.

## 3.0 MY INVESTIGATION OF THE FACTS

On 7th June, 2001, Raychel was experiencing abdominal pain and appeared unwell. Her mother took her to the Accident and Emergency department at Altnagelvin Hospital.

She was examined by Mr. Makar, Surgical Senior House Office (SHO) who diagnosed acute appendicitis (020-007-012).

In his deposition to the Coroner (098-009a-021b) Mr. Makar stated he had prescribed intravenous Hartman's solution in the A&E department. There is no corresponding prescription. He also recalled that Staff Nurse (S/N) Noble on Ward 6 had asked him to change it to Solution 18 in accordance with the ward protocol. S/N Noble, in her deposition confirmed this.

Although there is no available prescription, Solution 18[1] was started pre-operatively. This is recorded on the Neonatal Care Unit Fluid Balance Chart for IV fluids (020-020-039). Prior to the operation, 60mls was given. Cyclimorph[2] (Valoid) 2mg was given intravenously at 20.20 (020-016-031)

At 22.00 Raychel went to the operating theatre for an appendicectomy (appendectomy). The Surgeon's Report (020-010-018) written by Mr. Makar who performed the procedure shows the appendix was "*mildly congested*". He later described the operation as straightforward (098-009a-021b).

On induction of anaesthesia Raychel was given Fentanyl[3] and Cyclimorph intravenously. At 11.40 she was given Voltarol[4] and Paracetamol suppositories. The wound was infused with Marcain[5]. (020-013-021).

S/N Patterson prepared an Episodic Care Plan (020-027-056). Entries timed at 23.00, list pre-operative nursing actions and give a brief evaluation.

The care plan shows a problem/expected outcome of "*risk of dehydration*" with a goal of "*maintain adequate hydration*", timed at 23.00 on 7th June. Nursing actions include "*check prescribed fluids*" "*set rate as prescribed*" "*inspect infusion rate hourly*" "*encourage oral fluids, record*" (020-027-059). Further entries include "*reduce IV fluids accordingly*", "*keep parents informed*", "*record fluid balance chart daily*" and "*manage IV*

[1] Dextrose 4.3% and saline 0.45%
[2] Relieves pain and nausea
[3] Pain relief
[4] Pain relief
[5] Local anaesthetic to reduce wound pain

*set as per procedure.*" (020-027-060).

There are further entries in the care plan, timed at 23.00 on 7th June for post-surgery risks. Nursing actions include taking vital signs ¼ hourly for 2 hours; ½ hourly for 2 hours; 1 hourly for 2 hours, 2-4 hours until stable. The plan also states "*observe/record urinary output*" (020-027-060).

Raychel returned to the ward after the operation and the first post-operative vital sign observations were recorded at 01.55 on 8th June. The untitled chart (020-015-029) shows recordings of temperature, pulse, blood pressure, respiratory rate and pain score at varying intervals. (01.55, 02.15, 02.35, 03.00, 03.30, 04.00, 05.00, 07.00, 09.00, 13.00). In the "*Comments*" section Raychel is described as "*pink*", "*settled*" and "*pain free throughout the night.*"

An entry by S/N Patterson in the Episodic Care Plan timed at 05.00 on 8th June states "*no complaints of pain since return to ward.*" (020-027-057).

The first post-operative entry on the fluid balance chart (020-020-039), timed at 02.00 indicates Solution No.18 was given at 80mls hourly. The fluid chart has entries in the "*amount*" column of 150mls hourly and in the "*total*" column, hourly volumes of 80mls. By 0800 Raychel had received 580mls of fluid. There are no entries for urine output.

On 8th June in an entry in the medical records (untimed) by Dr. Zafar, Surgical Senior House Office noted "*Apyrexial. Continue observations*". There are no further entries for that day. (020-007-013)

At 10.15 a new intravenous infusion bag of No 18 was commenced. This was prescribed by a paediatric Senior House Officer, Dr. Butler, at the request of S/N Rice.

At 10.25 a "*large vomit*" was recorded on the Feed Chart (020-015-027). There are no corresponding vital sign recordings. Further episodes of vomiting are shown on the Fluid Balance Chart (020-018-037)

08.00 – "*vomit*"
10.00 – "*large vomit*"

13.00 - "*vomited ++* "

15.00 – "*vomited ++*"

21.00 – "*vomited coffee grounds ++*"

22.00 "*vomited small amounts x 3*"

23.00 – "*small coffee ground vomit*"

Raychel passed urine at 10.00 but there are no further recordings of urinary output on the fluid chart.

An entry in the care plan timed at 17.00 on 8th June states "*vomited x3 this am but tolerating small amounts of water this evening*". (020-027-064). There are no entries concerning oral fluid intake on either the fluid balance or feed chart.

The Drug Treatment Sheet (020-017-035) shows on a line numbered "2" that Dr. Devlin prescribed Zofran[6] (ondansetron) 25mg on 8th June.. There is no corresponding entry to confirm the time this was given. In her deposition Sister Miller recalled that it was at approximately 18.00. There are no entries in the nursing care plan to show Zofran was either prescribed or given. In the record for "*as required drugs*" (020-017-036) S/N Noble has noted "*2C, 9.30pm*" for the reference letter/number.

There are varying reports concerning Raychel's condition throughout the day. In her deposition to the Coroner her mother recalled that at 09.00 on 8th June Raychel "*was in bed and colouring and told me that she had been sick*" (098-008-016). As the day progressed "*became sick more often*". She passed urine in the toilet at 10.00 and 12.00. Mrs. Ferguson felt that at 16.00 Raychel looked "*lifeless and weak*" (098-008-019). She did not recall seeing a doctor in relation to the sickness.

In her deposition to the Coroner, Sister Miller stated that Raychel was "*in good form and gave no cause for concern*" (098-017-038).

At 21.25 Mr. Ferguson informed S/N Noble that Raychel had a headache and that although she was asleep she was unsettled. Paracetamol 500mgs was given. At this time S/N Noble described her as "*fully co-operative*" (098-019-046)

[6] For nausea and vomiting

The Drug and Treatment sheet also shows Valoid [7](cyclizine) was prescribed and given by Dr. Curran at 10.15pm.

At 00.35 on 9th June, S/N Bryce and Gilchrist changed Raychel's pyjamas as she had vomited "*a mouthful on it*" (098-023-063). Raychel said "I want to lie down and sleep". At 02.00 she was "*asleep but rouseable*".

The care plan records that at "*around 3am, child was noted to be restless and had been incontinent. She then became stiff*" (020-027-064).

Raychel had experienced a seizure. At this time Dr. Trainor, Paediatric SHO noted she had a petechial[8] rash on her face, neck and upper chest. (098-027-080)

Raychel's condition deteriorated. She was unconscious and required mechanical ventilation. She was transferred to the intensive care unit and later to the PICU at the Royal Belfast Hospital for Sick Children where she subsequently died.

Entries in the care plan timed at 06.00 on 9th June show that Mr. & Mrs. Ferguson were contacted and spoken to by both the paediatric registrar and Dr. McCord, consultant paediatrician.

In his deposition Dr. Johnson said that he contacted the surgeons as "*the surgical team looks after their own patients.*" (098-025-073). Dr. McCord, consultant paediatrician stated "*Neither I nor my staff were consulted regarding the prescription of fluids for Raychel. We would not have expected to be – it was a matter for the surgical team.*" (098-033-102)

## 4.0 MY OPINION

### 4.1 Overview of nursing care following appendicectomy

Wong, 1995 wrote that following a simple appendicectomy "*complications are rare*" and that the post-operative care of the non-perforated appendix is the same as for most

[7] For nausea and vomiting
[8] Small red or purple spots

abdominal operations. It is likely that for this reason few, if any authors, described any post-operative care specific to the child who has undergone a straightforward procedure. Eighty percent of children are discharged within 48 hours (Buick et al, 1987).

In my opinion, the key elements of post-operative care are to ensure recovery from the anaesthetic and surgery; observe and monitor the child for any complications; assess and manage any pain, nausea and vomiting; monitor fluid intake/output; assist with getting out of bed; support the child and family.

McQuaid & Parker (1996) described the key things that parents should be told:

- *That the child may vomit*
- *That it is routine to record observations of pulse and respirations on return to the ward*
- *The child may sleep for the remainder of the day (McQuaid & Parker, 1996)*

From the records I have concluded that Raychel's operation was straightforward. She could, therefore, be expected to drink more during the day; walk a short distance, and possibly eat something light later in the day. I have concluded that she was pain free as a result of a local anaesthetic, infused into the wound site, and did not require any analgesia.

I consider it was initially reasonable for nurses to expect that Raychel would follow the usual post-operative recovery pathway.

**4.2 Post-operative nausea and vomiting (PONV)**

Post-operative nausea and vomiting (PONV) are recognised complications following surgery. "*Many of the common surgical procedures in childhood are associated with a high incidence of PONV. The highest incidence occurs in the 5-12 age group*". (Moules and Ramsay, 1998). Sister Miller indicated that the amount of vomiting Raychel experienced was not unusual (098-017-039). From this I have concluded that the nurses were regularly faced with managing PONV.

PONV is uncomfortable for the child and can be distressing for parents to watch. "*Any*

*nausea and vomiting should be reported immediately so that treatment with an anti-emetic can be implemented*" (Moules & Ramsay, 1998). It is, therefore, surprising that there is no entry in the care plan for PONV as either a potential or actual problem.

It is difficult to determine the frequency with which Raychel vomited as there are differing views between Mrs. Ferguson and the information contained in the records. It is also unclear when the first anti-emetic of ondansetron (Zofran) was given as Dr. Devlin did not record the time and there is no entry in the care plan to indicate it had been prescribed and whether or not it was successful. Sister Miller recalls it was given at 6.30pm on 8th July. Raychel had, therefore, been experiencing untreated discomfort for approximately 10 hours. I have concluded there was a delay in seeking medical advice on managing the PONV.

A naso-gastric tube is indicated where the surgery requires the stomach to be drained of bile and secretions. It is not usual to for a naso-gastric tube to be used following a straightforward appendicectomy. The decision is usually made by the surgeon.

**4.3 Intravenous therapy**

In writing about fluid replacement in the sick child McQuaid et al (1996) described three objectives:

- To meet daily fluid requirements
- To correct dehydration by replacing earlier fluid losses
- To correct for continuing exceptional fluid losses

Several nursing texts from the time describe the formula for calculating normal daily maintenance fluid:

*"Child over 20Kg – 1500mls plus 20mls/kg over 20 Kg"* (Wong. 1995)

Using the above formulas the prescription for Solution 18 at 80mls hourly was excessive even before a post-operative fluid restriction. For Raychel at 25kg maintenance fluids would have been 66mls/hr.
While nurses have a responsibility for checking the accuracy of the medicines they

give, I do not believe it would have been common practice at the time for a nurse to recalculate intravenous therapy. However, I think an experienced nurse should have noticed that the volume was excessive.

I consider a prescription for intravenous therapy should have been written before Raychel returned to the ward. It appears that the prescription used was the one written by Mr. Makar pre-operatively. As a result, this prescription did not take account of any required post-operative fluid restriction.

It is my view that there were no clear lines of responsibility regarding prescriptions for intravenous fluids, with the surgeons and paediatricians both responding to nursing requests. There does not appear to have been a protocol to guide medical staff in their prescribing, particularly post-operatively. Consequently, I believe that no doctor had a continuing overview of Raychel's treatment.

**4.3 Fluid balance chart**

Huband and Trigg (2000) stated "*Urine output may be reduced due to the effects of anaesthetic gases. This can be complicated by the stress response to surgery which increases ADH from the anterior pituitary which in turn acts on renal tubules increasing permeability and reducing/preventing the excretion of urine. The child's urine output must be monitored and the first passage of urine following surgery noted.*"

I note a "*Neo-natal Intensive Care Unit Fluid balance for I.V. Fluids*" charts were used to record fluid balance. This is surprising as Raychel was 10 years old.

The fluid balance chart shows the total amount of intravenous fluid given and it appears Raychel received the same exact amount every hour. In my experience the hourly volumes usually vary as it is unlikely that a nurse can read them at precisely the same time each hour. It is usual practice to record both the hourly amount and the cumulative total. The entries suggest the chart has been completed with expected volumes infused, rather than actual volumes.

In the "*amount*" column there is a repeated figure of "*150*". I have concluded that this was the volume in the chamber of the infusion administration set. Normal practice, in

my view would be to check the level of fluid in the chamber hourly and deduct it from the 150, to give the actual amount infused.

Where an intravenous infusion is needed to maintain hydration "*a fluid balance chart is crucial to monitoring all input and output. Output includes urine, vomit, wound leakage, gastric aspirate*.....(Huband, Trigg, 2000).

Although from 0800 on 8th June, Raychel was taking sips of water, there are no entries for oral intake. Consequently, the amount she took orally was not recorded. The recording of oral intake is, in my opinion, important as when oral intake has increased sufficiently, the intravenous infusion needs to be decreased in order to maintain an appropriate total fluid intake.

Only one incidence of passing urine is recorded on the chart although Raychel used the toilet on several occasions during the day. Post-operatively it is normal to record the first time urine is passed and when an intravenous infusion is in progress it is important to continue these recordings. Although accuracy may be difficult and in straightforward situations, unnecessary, an indication of output can be achieved by asking the child or parent at regular intervals. Where accuracy is needed the child can be asked to place a receptacle in the toilet to facilitate measurement.

Descriptions and volume in relation to vomit are always subjective as there is no effective way to catch and measure sudden vomit. However, I would expect a registered nurse to be aware of the potential consequences of repeated vomiting i.e. dehydration and electrolyte imbalance and to seek advice. "*The nurse should also observe for signs of dehydration*" (Huband and Trigg, 2000).

I believe the failure to note oral intake and urine output were omissions in nursing care. However, Dr. Butler, Dr. Devlin and Dr. Curran all wrote prescriptions and, therefore, had an opportunity to assess Raychel.

### 4.4 Observations

Campbell & Glasper (1995) stated *"The use of fundamental nursing skills, observing and listening, in conjunction with frequent recording of the child's vital signs will enable the nurse to monitor the child's post-operative recovery."*

There was no specific evidence base at the time from which to determine best practice in recording vital signs post-operatively (Aylott, 2006). Whaley & Wong (1995) suggested that the frequency of the recordings of the child's observations should reflect the child's general condition and should be increased or decreased accordingly.

The current guidance from the Royal College of Nursing (2011) states:

*Following a simple procedure – vital signs should be recorded every 30 minutes for two hours, then hourly for two to four hours until the child is fully awake, eating and drinking.*

Raychel's vital signs were recorded on an untitled chart and on a 4 hourly T.P.R. chart. Although the care plan required 15 minute recordings for 2 hour period I consider these was not needed. It is my view that between 1.55 and 09.00 the observations made and recorded were appropriate. Although persistent vomiting was an indicator for increasing the observations made between 09.00 and 21.15, the recordings at 1pm, 5pm, 9pm and 02.00 on 9th June, show little variance.

It is common practice, in my experience, for vital signs to be recorded in graph form in order that trends can be easily observed. The untitled chart used, lists the observations and, in my opinion, makes variations less obvious. However, I believe this practice is used in other hospitals in Ireland.

In my opinion the observations taken and recorded were of an appropriate standard.

### 4.5 The care plan

**Standards for Records and Record-Keeping** were published by the United Kingdom

Central Council for Nursing, Midwifery and Health Visiting, in April 1993[9]. The document described the purpose of nursing records as follows:

- To provide accurate, current, comprehensive and concise information concerning the condition and care of the patient and associated observations;
- To provide a record of any problems that arise and the action taken in response to them
- To provide evidence of care required, intervention by professional practitioners and patient or client responses;
- To include a record of any factors (physical, psychological or social) that appear to affect the patient;
- To record the chronology of events and the reasons for any decisions made;
- To support standard setting, quality assessment and audit
- To provide a baseline record against which improvement or deterioration may be judged.

It is my view that nursing records in 2001 usually included the following elements:

- **An assessment** – recording background information on the child and family
- **A plan of care** – showing problems and potential problems, goals of care and the required nursing interventions.
- **An evaluation** – a record of the outcome of each nursing intervention, and any changes to the child's condition.

Contemporaneous record keeping can be difficult and evaluations were often completed at the end of a shift. After a long span of time it is possible to forget care that had been given and consequently fail to record it.

In my experience, nursing records often had omissions. In 2000 – 2001 allegations concerning shortcomings in nurses' record-keeping were the second most common category of hearing brought before the UKCC[10] (Wood, 2003).

The care plan is computer generated. In order to make regular entries a nurse had to

[9] Former regulatory body for nurses.
[10] United Kingdom Central Council for Nursing, Midwifery and Health Visiting

gain access to a computer. Consequently, entries were made twice daily near the end of a shift. The care plan shows appropriate problems and actions in relation to post-operative care, including observations, intravenous therapy, monitoring fluid intake and output. However, nausea and vomiting are not identified as actual or potential problems. Considering the frequency of PONV in children and the fact that Raychel experienced this, I consider failure to record this, is an omission in care planning.

The entry at 1700 on 8th June identifies that Raychel had vomited three times, but does not indicate any action taken to inform a doctor. The visit by Dr. Curran was not recorded until 8 hours later. The evaluation entries do not give a clear picture of Raychel's condition nor her mother's concerns.

Throughout the care plan Raychel is referred to as "the child". It is unusual in my experience for the child's name not to be used in order to personalise the plan of care.

### 4.6 Level of care

Raychel was cared for by registered nurses. Although S/N Rice was regarded as a junior staff member, the care of a child following appendicectomy is, in my opinion, within the competence of any registered nurse. However, experience may require them to be supported and this was appropriately undertaken by Sister Miller.

I note, however, that Raychel was only seen by Senior House Officers from both the surgical and paediatric services. She was assessed and operated on by Mr. Makar; anaesthetised by Dr. Gund, assessed post-operatively by Dr. Zafar and Drs. Devlin and Butler wrote prescriptions. It also appears that post-operatively no single doctor saw her more than once.

It is not within my area of expertise to comment on whether the level of experience and care was in line with the recommendations of the Paediatric Surgical Services in Northern Ireland working group (1999). However, I believe the nurses were unsure of which doctor to call and who had responsibility for Raychel's care.

### 4.9 Conclusion

I have concluded that:

The management of Raychel's post-operative nausea and vomiting was inadequate.

There was a lack of clarity regarding which doctor had responsibility for Raychel's care.

There were failures in record-keeping in that the care plan did not identify nausea and vomiting as problems or potential problems.

There were failures in record keeping in that some episodes of vomiting; oral intake and urine output were not recorded.

Changes in Raychel's condition as identified by her mother, did not prompt an assessment by a doctor.

## 5.0 SPECIFIC QUESTIONS

I have been asked to respond to some specific questions as detailed below.

a. **The appropriateness of the exchange between Staff Nurse Noble and Mr. Makar during which she apparently persuaded him not to continue to prescribe Hartmann's solution, but to change the prescription to Solution No. 18, and the implications of this interaction.**

It is common practice for nurses to advise doctors on local protocols and practices. Consequently, I consider it was reasonable for S/N Noble to inform Mr. Makar that Dextrose Saline (Solution 18) was normally used. However, I also believe Mr. Makar had a responsibility to ensure both the accuracy of the information and of his prescription. In 2008 the General Medical Council published Good Practice in Prescribing Medicines. This included a section advising:

*"If you prescribe at the recommendation of a nurse who does not have prescribing rights, you must be satisfied that the prescription is appropriate for the patients concerned and that the professional is competent to have recommended the treatment."*

b. **The adequacy of a system which permitted the anaesthetist to leave post-operative fluids to ward protocols with the understanding that nursing staff would seek the input of paediatricians.**

In my experience it is not unusual for infusions to be discontinued before leaving the

recovery room and then reconnected on the ward. This is because the infusion administration sets used in an operating theatre can differ from those on the ward. On arrival in the ward, the infusion needs to be started quickly. For this, a prescription is needed. I believe the anaesthetist would usually write this.

It appears it was custom and practice for nurses on Ward 6 to seek input from a paediatrician and Dr. Johnson and Dr. McCord stated that surgeons were responsible for prescribing for surgical patients. Paediatricians were asked to prescribe intravenous therapy, yet Dr. Devlin the surgical SHO was contacted to prescribe an anti-emetic. I have, therefore, concluded that there was no clear system in place.

**c. The adequacy of the care plan drawn up for Raychel in relation to Raychel's pre and post-operative care, with specific consideration of vomiting and fluid monitoring.**

The care plan was generated from a computer. Computerised care plans make contemporaneous recordings difficult as access to a computer is needed. In my view, the print and format are difficult to read. However, nurses working with these records on a regular basis would probably experience fewer problems.

The care plan appropriately notes the need to observe/record urinary output and lists several key components for maintaining adequate hydration. The care plan does not identify post-operative nausea and vomiting (PONV) as either a potential or actual problem with associated nursing actions. I would expect the possibility of PONV to be included in any post-operative care plan.

I have therefore, concluded that aspects of care were omitted from the care plan.

**d. The appropriate level of observation of Raychel by nursing staff including the planned observations, the type and frequency of observations and the quality of those observations in Ward 6 of the Altnagelvin Hospital on 8th June 2001 and into 9th June 2001.**

See section 4.4 above

**e. The person or persons: (i) who were and (ii) who should have been, responsible within the nursing team for determining the type and frequency**

**of observations undertaken with regard to Raychel. How the observations made by nursing staff were interpreted, and how should they have been interpreted, particularly in the period after Raychel vomited for the second recorded time at or about 10:30 on 8th June 2001.**

In practice, post-operative observations usually follow a standard format. Any registered nurse with responsibility for Raychel's care could determine the type and frequency of observations. The following people could make the decision to change the type and frequency:

Night of 7/8 June - both Staff Nurses Patterson and Noble were on duty and gave care to Raychel.

Day shift 8 June - S/N Rice (McCauley). I understand she was a junior staff nurse and consequently, may have needed to seek support or advice from Sister Miller who was in charge at this time.

Night shift 8/9 June – S/N Noble and S/N Gilchrist both attended Raychel.

The vital sign observations varied very little over the course of the 7/8 June and there is no obvious adverse trend or significant variance. I believe the pulse rate of 101 at 21.15 could reasonably be attributed to Raychel having vomited.

**e. The level of nursing care and monitoring you would have expected Raychel to have received, especially after she vomited for the second recorded time at or about 10:30 on 8th June 2001, and whether the nursing care plan ought to have been reviewed and changed in any way.**

In view of the continuing intravenous therapy and vomiting, observations of pulse, respiratory rate and blood pressure should have been recorded more frequently than 4 hourly. After the second vomit at 10.30 I believe an anti-emetic should have been prescribed and given. Vomiting is unpleasant and can be distressing for the child and parents. To seek an anti-emetic at this time would have ensured a doctor was aware of the vomiting.

The care plan should have been altered to include the problem of vomiting.

**f. Whether the nursing care plan which had been devised for Raychel was adhered to in material respects.**

Two actions documented in the care plan were not implemented:

Observe/record urinary output (020-027-063)
Encourage oral fluids, record (020-027-059)

**g. The specific steps (if any) that the nursing staff ought to have taken when Raychel's vomiting continued into the afternoon of 8th June 2001.**

All episodes of vomiting should have been recorded. Whether Raychel was experiencing nausea should also have been recorded. The vomiting should have prompted the nurse to inform a doctor. This would have given the doctor the opportunity to assess the impact of the vomiting.

**h. The level of understanding that the nurses: (i) had and (ii) should have had, about the severity of Raychel's condition, and in particular whether the amount of vomiting and the duration of vomiting should have been considered by them to have been severe and/or abnormal or whether they were correct to interpret the vomiting as normal during the day after surgery.**

(i) It is my view that even if post operative nausea and vomiting is regarded as common, it still requires intervention in the hope of controlling the symptoms and reducing the child's distress. I do not think the nurses were aware of the inaccuracies in the fluid prescribed or the possible impact of vomiting on hydration or sodium levels.

(ii) In my opinion the nurses should have been aware that vomiting can lead to dehydration and electrolyte imbalance and that fluid lost must be replaced.

**i. Whether and by what time the nurses should have regarded Raychel as being ill, and if they ought to have regarded her as being ill then: (i) the actions they should have taken; (ii) whether they should they have suspected that the cause of her problems related to hyponatraemia**

**and if not whether they should at least have known that there was a serious medical issue which required investigation.**

By 10.30 I think a doctor should have been advised of the vomiting. If the vomiting that occurred in the afternoon had been recorded this may have acted as a further prompt to seek an anti-emetic and give an opportunity for medical assessment. There were no significant changes in vital sign recordings between 9am and 5pm and it likely that Raychel's appearance was unchanged.

(i) Between 21.00 and 23.00 five episodes of vomiting had occurred, despite two doses of anti-emetics. At 21.00 Raychel was complaining of a headache and appeared pale. I believe this was the time at which Raychel's condition should have been causing concern. Two doctors saw Raychel at this time. I believe they had a responsibility to assess Raychel.

(ii) The nursing role does not include medical diagnosis. As noted by the NPSA, prior to 2007, knowledge of hyponatraemia was limited among clinicians. I do not think the nurses should have identified hyponatraemia as the likely problem. However, they should have recognised that persistent vomiting can cause electrolyte imbalance.

**j. The level of understanding that nurses had and should have had regarding the risks to Raychel's health in circumstances where there was sodium loss through continuing vomiting, where she was in receipt of a hypotonic fluid infusion and in a situation when reduced urinary free water excretion was likely.**

As a minimum I would expect a registered nurse to be aware that fluid loss from vomiting, if not replaced intravenously, can result in dehydration and electrolyte imbalance. I consider it is a medical responsibility to determine the fluid to prescribe and to make assessments necessary for a medical diagnosis.

**k. The communication you would have expected the nurses to have engaged in with the medical staff bearing in mind what was known in relation to Raychel's condition during 8th June 2001, and the adequacy of the communication that was actually engaged in, to include**

- **Consideration of how the nurses raised concerns about Raychel's condition or management at the time**

It appears to have been custom and practice for the nurses to seek prescriptions from any available doctor, rather than the doctor with an overview of the patient's care. I think this was not uncommon at the time. It is not within my area of expertise to comment on

whether it is good medical practice for a doctor to prescribe in situations where the patient is not known to him/her.

- **A description of the information that should have been imparted to the medical staff**

I believe the doctor should have been told the frequency and nature of the vomiting and whether Raychel was nauseated. It is not within my area of expertise to comment on the information that the doctor needed I order to either assess Raychel or write a prescription.

- **Whether nursing staff ought to have made any specific request or given any particular prompt to medical staff**

By the evening of 8th June, when vomiting persisted and Raychel complained of a headache, assessment of fluid and electrolyte balance was needed. While in retrospect a prompt was necessary, the doctors caring for Raychel should, in my opinion, have known what actions to take.

- **Whether nursing staff ought to have sought assistance from any particular medical discipline, and the seniority of the medical staff whose input should have been sought**

I have concluded that it was common practice for patients to be cared for by Senior House Officers. It is my opinion that the Senior House Officer was responsible for seeking advice from a more senior doctor.

- **An indication of the time(s) at which communication should have been instigated with medical staff**

At 10.00 when Raychel had her second "*large*" vomit, although Moules and Ramsay (1998) state that "*any nausea or vomiting should be reported immediately so that treatment with an anti-emetic can be implemented.*" Whether Raychel was feeling nauseous after the first vomit is unknown. It was reasonable in my opinion to wait to see if vomiting recurred.

- **The level of responsibility/proactivity expected at the time**

The role of the nurse, in my opinion, is to monitor a patient's progress and to advise medical staff of any changes, or variations from the expected pathway. In practice

many experienced nurses would have helped junior doctors in making decisions on treatments. However, the responsibility for medical management lies with the doctors caring for the child under the direction and supervision of the consultant.

- **The identity of the person(s) who should have made the decision to contact medical staff**

S/N Rice (McCauley) was caring for Raychel during the day shift. As a junior staff nurse she was being supervised by Sister Miller. I think that S/N Rice or Sister Miller should have contacted a doctor. During the evening/night S/N Noble or S/N Gilchrist were the registered nurses on duty.

- **The role of the ward sister**

The role of the ward sister is complex encompassing leadership, management, clinical expertise and practice, education, teaching and patient advocacy (Naish, 2009). A normal day in 2001 would have encompassed many of these aspects of the role. In a day a sister could be involved in: ordering supplies; appraising staff; teaching students; supporting parents; planning duty rotas; attending consultant ward rounds. A recent RCN study found that most ward sisters were rostered to look after their own patients and so could not supervise clinical care or maintain and oversee standards (RCN, 2009).

**l. The quality of the information given to Raychel's family by the nurses during Raychel's hospital stay.**

The brief synopsis of information given to Raychel's family, recorded in the care plan, appears appropriate for a child undergoing an appendicectomy.

**m. The response of the nurses to information given by Raychel's family about Raychel's condition.**

In her deposition Mrs. Ferguson described telling the nurses that Raychel "*did not look too well*" in the morning and that she looked "*lifeless and weak at 4pm*" and that her condition had deteriorated significantly throughout the day.

It is important for nurses to listen to parents. None of Mrs. Ferguson's concerns were

recorded in the care plan. Where a parent appears concerned, discussion with a doctor or the ward sister can often allay those anxieties. In this instance assessment by a doctor at this time, may have established that Raychel was unwell.

**m. The significance of the fact that attempts were not made to contact a member of medical staff, except to prescribe intravenous fluid, until in or about 16:30 on 8th June 2001, and the fact a Junior House Officer (Dr. Devlin, JHO Surgical) did not attend to Raychel until 17:30-18:00.**

Raychel symptoms were not relieved and she continued to vomit.

**n. The steps that ought to have been taken by the nurses after Raychel was seen by Dr. Devlin (at 18:00) and Dr. Curran (at 22:15).**

Nursing care often follows a medical diagnosis. Raychel's diagnosis and medical treatment had not changed and consequently, I do not think there was anything additional that they should have done at the time other than the previously identified omissions i.e. recording the efficacy of the anti-emetic

**o. The adequacy of the management and recording of Raychel's fluids in relation to:**

**a. Fluid intake**

Raychel was given intravenous fluid as prescribed and this is recorded to an appropriate standard. There was a failure to record oral intake.

**b. Fluid output**

There was a failure to record urine output and several episodes of vomiting were also unrecorded.

**c. Monitoring fluid balance.**

Fluid balance was not monitored to an acceptable standard.

**p. The adequacy of the management and recording of Raychel's vomiting.**

It appears Raychel experienced vomiting and in all likelihood nausea for many hours before treatment was prescribed. Consequently, the management of vomiting was inadequate.

There was no plan of care concerning nausea and vomiting. The recordings made on the fluid balance chart are in line with practice at the time. It appears that Raychel vomited more frequently than shown on the chart. Consequently, the records are not of an appropriate standard.

**q. The adequacy of the management and recording of medication administered to Raychel, the reasons for the administration of the medication, and the adequacy of the recording of observations relating to efficacy after medication had been administered.**

The following medicines were given by nurses:

- Diclofenac (used for pain relief) 12.5 mg given on 8th June (time unclear)
- Flagyl (antibiotic) given on 8th June at 12.00, 22.00 and time unclear
- Paracetamol (pain relief) given on 8th June at 9.30pm

These have been recorded to an acceptable standard.

Cyclimorph and Zofran were prescribed and given by doctors. I am, therefore, unable to comment on the reasons for prescribing and giving these medicines.

There entries in the nursing care plan, timed at 0600 on 9th June showing that the Paracetamol and Valoid had been effective. There is no entry concerning the Zofran given by Dr. Devlin. The efficacy of medicines aimed at relieving symptoms would normally be entered in the evaluation section of the care plan. This was an omission in record keeping.

**r. The adequacy of the system that Altnagelvin had in place for the provision of nursing care for post operative children.**

The system for caring for children whose post-operative care was uneventful was adequate. However, there were some potential weaknesses. There was lack of clarity regarding which doctors had responsibility for a particular patient's care. There was lack of clarity regarding the doctor responsible for prescribing post-operative fluids and symptom relieving medicines. There were no protocols to support decision-making with regard to post-operative fluids.

There appears to have been an acceptance that post-operative nausea and vomiting

were normal. While they may be common, in my view, this does not mean that symptoms should not be treated.

The observation chart did not conform to the usual graph style, making it difficult to assess trends and changes.

I believe there was a lack of rigour in monitoring fluid intake and output.

## 6.0 STATEMENT OF COMPLIANCE

I understand my duty to the Court, and have complied with that duty.

## 7.0 STATEMENT OF TRUTH

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

S Ramsay 28/11/11

28 Nov 2011

## APPENDIX 1

## DOCUMENTS I HAVE EXAMINED

**I have received all the documentation concerning Raychel's case. I have examined the following documents:**

(i) *Preliminary Statements provided to the Inquiry by relevant witnesses*

(ii) *Coroner's Papers [File 12] and WHSSC Papers [File 14]*

*Autopsy Materials*

- Autopsy Report [Ref: 012-047-219] or [014-005-006]
- Clinical Summary [Ref: 014-005-012]
- Report of Dr. C. Loughrey (Consultant Chemical Pathologist) [Ref: 012-019-124]

*Depositions to Coroner*

- Mrs. Marie Ferguson (Raychel's mother) [Ref: 012-028-144]
- Dr. Edward Sumner (Consultant in Paediatric Anaesthesia) [012-029-150]
- Dr. John Jenkins (Senior Lecturer in Child Health) [Ref: 012-030-153]
- Dr. Brian Herron (Consultant Neuropathologist) [012-031-157]
- Dr. Peter Crean (Consultant in Paediatric Anaesthesia and Intensive Care) [Ref: 012-032-159]
- Dr. Vijay Kumar Gund (Anaesthetist) [Ref: 012-033-161]
- Dr. Claire Jamison (then SHO Anaesthetist) [Ref: 012-034-164]
- Dr. Bernie Trainor (then Paediatric Second Term SHO) [Ref: 012-035-166]
- Dr. Brian McCord (Consultant Paediatrician) [Ref: 012-036-170]
- Dr. G.A Nesbitt (Consultant Anaesthetist and then Clinical Director of Altnagelvin Hospital) [Ref: 012-037-173]
- Mr. Robert Gilliland (Consultant Surgeon) [Ref: 012-038-176]
- Dr. Raymond Fulton (then Medical Director of Altnagelvin Hospital) [Ref: 012-039-179] and appended documents
- Dr. Jeremy Johnston (then SHO in Paediatric Medicine) [Ref: 012-040-198]
- Sister Millar [Ref: 012-041-202]
- Staff Nurse Michaela Rice [Ref: 012-042-205]
- Staff Nurse Ann Noble [Ref: 012-043-207]
- Staff Nurse Sandra Gilchrist [Ref: 012-044-212]
- Mr. Regai Reda Makar (then Surgical SHO) [Ref: 012-045-216]
- Mr. M.H. Zafar (then Surgical SHO) [Ref: 012-046-218]

*Reports to Coroner*

- Report of Dr. Edward Sumner [Ref: 012-001-002]

*Outcome*

- Verdict on Inquest [Ref: 012-026-139]

*(iii) Altnagelvin Hospital Casenotes [File 20]*

*(iii) Royal Group of Hospitals Casenotes etc. [File 63]*

- Transfer Letter [Ref: 063-005-010] 3 pages
- Fax cover sheet and fluid balance sheet [Ref: 063-008-015] 2 pages
- Clinical Note made by Dr. Dara O'Donoghue (Clinical Fellow - Paediatrics) 9th June 2001 at 13.50 [Ref: 063-009-018] 6 pages
- Diagnosis of brain stem death [Ref: 063-010-024]
- Clinical note made by Dr. McLoughlin (PICU SHO) 10th June 2001 [Ref: 063-012-026]
- PICU record [Ref: 063-015-035] 4 pages
- PICU care plan day 1 [Ref: 063-018-043] 2 pages
- PICU care plan day 2 [Ref: 063-016-039] 2 pages
- Evaluation/progress reports [Ref: 063-017-042] & [Ref: 063-017-041] & [ Ref: 063-021-047] & [Ref: 063-021-048] & [Ref: 063-022-049] 5 pages
- Various record sheets from [Ref: 063-024-052] through to [Ref: 063-027-062] 12 pages

*(iv) PSNI Witness statements [File 95] and [File 98]*

- Mrs. Marie Ferguson (Raychel's mother) four statements commencing [Ref: 095-001-001]
- Mr. Raymond Ferguson (Raychel's father) [Ref: 095-005-015]
- Ms. Elaine Duffy (visitor to the Hospital at the time of Raychel's admission) [Ref: 095-007-022]
- Mr. Stephen Duffy (visitor to the Hospital at the time of Raychel's admission) [Ref: 095-008-025]
- Ms. Margaret Harrison (visitor to the Hospital at the time of Raychel's admission) [Ref: 095-006-020]
- Ms. Teresa McCullagh (visitor to the Hospital at the time of Raychel's admission) [Ref: 095-009-028]
- Dr. GA Nesbitt [Ref: 095-010-30] and attached documentation and in particular notes of a meeting convened by the Chief Executive of the Trust with the Ferguson family [Ref: 095-010-036]
- Dr. Raymond Fulton [Ref: 095-011-047]
- Dr. Aparna Date [095-012-060]
- Dr. Vijay Kumar Gund [ 095-013-063]
- Dr. Mary Butler [094-014-067]
- Dr. Jeremy Johnston [095-015-069]
- Dr. Gareth John Allen [095-016-073]
- Ms. Susan Chapman (Nursing Expert Report) [Ref: 095-019-079]
- Dr. Edward Sumner (transcript of interview with a journalist)

[Ref: 098-087-265]

- Dr Edward Sumner (Expert Reports) [098-081-244] and [Ref: 098-098-373] and [098-101-384]

*(v) Notes from Raychel's Inquest (Author Unknown) [File 64]*

## APPENDIX 2

## BIBLIOGRAPHY

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United Kingdom Central Council for Nursing, Midwifery and Health Visiting (1993) Standards for Records and Record Keeping. NMC.archives

Wong D., Whaley & Wong's (1995) Nursing Care of Infants and Children (5th Ed) Mosby: USA

Wood C. (2003) The importance of good record-keeping for nurses, Nursing Times, 99(2)

## APPENDIX 3

## DETAILS OF MY QUALIFICATIONS AND EXPERIENCE

### PROFESSIONAL QUALIFICATIONS

| | | |
|---|---|---|
| Registered Nurse (Adult) | Nursing and Midwifery Council | 1972 |
| Registered Nurse (Child) | Nursing and Midwifery Council | 1974 |

### CURRENT EMPLOYMENT

**Self-employed Children's Nursing Advisor**
**2003-present**

Work has included:

- Member, National Clinical Advisory Team, Review of Neonatal Services, Norfolk, Suffolk and Cambridgeshire.
- Member, Review Team, Safe and Sustainable Children's Heart Surgery in England
- Preparing standards, competence based education and training frameworks and other documents for the Royal College of Nursing.
- Preparing expert witness reports
- Reviewing nursing services in independent schools
- Nursing and Midwifery Council – Reviewer for nurse education programmes
- Implementing clinical governance in a children's service of an NHS Trust.
- Interim.
- Director of Governance, Royal Orthopaedic Hospital, Birmingham – 2 periods
- Practitioner panellist, Fitness to Practise Investigating Committee, Nursing & Midwifery Council
- Bank staff nurse, NHS Professionals

### CAREER HISTORY

**Portland Hospital for Women and Children** **2002 - 2003**
**2002-03**
Independent hospital providing maternity, neonatal and children's services

**Chief Nursing Officer**

Responsible for:

- Managing nursing and midwifery service.
- Implementing clinical governance strategy
- Clinical risk/complaints management
- Compliance with National Minimum Care Standards
- Nursing/midwifery development, education and training

**Great Ormond Street Hospital for Children NHS Trust** **1994-2002**

Director of Nursing and Family Services
1998-2002

Director of Nursing, Quality and Clinical Support
1994-1998

Responsible for:
- Standards of nursing practice, education, training and research.
- Managing clinical risk, complaints and litigation.
- Managing Professions Allied to Medicine
- Managing family support services

**Hospitals for Sick Children, Special Health Authority.** **1992-1994**

Director of Nursing

**Guy's and Lewisham NHS Trust** **1990-1992**

**1990-1992**

Clinical Services Manager – Paediatric and neonatal services.

**Ealing Hospital** **1988-1990**

Manager, Children's Service

**Guy's Hospital** **1986-1988**

Nurse Manager – paediatric and neonatal intensive care unit

**Various posts at Manager, sister and staff nurse level** **1972-1990**

**Renal nursing course, Guy's Hospital** **1974**

**1974**

## EDUCATION

M.Sc. Nursing, King's College London **1992**
**1992**

B.A. (Hons), Social Science, 2:1, Middlesex Polytechnic **1986**
**1986**

## PROFESSIONAL ACTIVITIES

Member, National Co-ordinating Group on the Provision of Paediatric Intensive Care 1996-1997
United Kingdom Central Council for Nursing, Midwifery and Health Visiting Council Member 1995-2002

Member, Chief Nursing Officer's Task Force on the future nursing workforce in paediatric intensive care, 1997.
Member - the Expert Working Group on Alarms on Clinical Monitors in Response to Recommendation 11 of the Clothier Report: The Allitt Enquiry (1996)
Bond Solon expert witness training in 2002.

## VOLUNTARY ACTIVITIES

| | |
|---|---|
| World Child Cancer - Trustee | 2010 -2011 |
| CLIC Sargent – Children's Cancer Charity – Trustee | 2004-2010 |
| Chronic Granulomatous Disease Research Trust – Nursing Advisor | 2009 - present |

## PUBLICATIONS

Ramsay S. Treading the wards again (2004), Paediatric Nursing 16(3)
Nethercott S. (1999) Child Support. Nursing Standard 13(17)
Nethercott S. (1994) The assessment and management of post-operative pain in children by RSCN's: an exploratory study. Journal of Clinical Nursing 3, 109-114
Nethercott S. (1993) A concept for all the family. Family centred care: A concept analysis. Professional Nurse 8(12), 794-797

**Documents written for the Royal College of Nursing**

- Restrictive physical interventions and therapeutic holding for children and young people. (2010)
- Standards for admission to and discharge from hospital (awaiting publication)
- Mental Health in Children and Young People – A toolkit for general nurses (2009)
- An Education and Training Competence Framework for Intravenous Cannulation in Children and Young People (2005), updated 2009
- An Education and Training Competence Framework for Administering Medicines Intravenously in Children and Young people. (2005), updated 2009
- An Education and Training Competence Framework for Capillary Blood Sampling in Children and Young People. (2005) updated 2009
- Managing fever in infants, children and young people (2008)
- Malnutrition: What nurses working with children need to know and do. (2006)
- Bottle feeding: A guide for nurses (2007)
- Measuring and Recording vital signs in infants, children and young people: an education and training competence framework (2007)
- Standards for assessing, measuring and recording vital signs in infants, children and young people (2007)

- that the child may vomit
- that it is routine to record observations of pulse and respirations frequently on return to the ward
- that the child may well sleep for the remainder of the day.

For day case surgery the discharge will have been discussed with the parents at the outpatient appointment, but it is important to reiterate this information—that the child must be fully awake, have eaten, drunk, passed urine and not be in excessive pain. The parents must be happy to take the child home, have information about analgesia, a number to ring in an emergency, an appointment for when the child will be next seen, an idea about how long the child needs to take off school and information about removal of sutures or dressings. Areas that are lucky enough to have a paediatric community nurse team may have a policy that the nurse will visit all day cases the next day to check that everything is all right.

Discharge planning should start from admission, from both the health professionals' and parents' points of view. Parents should be given as much information, help and practical advice as they need to ensure that the discharge goes smoothly (Norris 1992).

## THE IMPORTANCE OF PLAY

It is said that play is the work of a child (Foster et al 1989); it contributes to and is an expression of development. As children play, social, cognitive, physical and emotional skills are learnt and perfected. Children start to play at a very early age and this continues in various shapes and forms until adulthood. Through the medium of play 'children learn what no-one can teach them' (Goldensen & Hartley 1963; cited by Foster et al 1989, p. 663).

### Uses of play to the hospitalised child

There are many ways in which play is important to children in hospital and useful to the nurses caring for them. As soon as children are put into a strange environment their anxiety levels will rise. A good way of relaxing children is with toys and games, as they are safe things that children consider themselves to be experts with. Vessey & Mahon (1990) talk about two different types of play:

- normative play
- therapeutic play.

**Normative play.** All children use normative play. This is something that is spontaneous and pleasurable, child led and voluntary with no extrinsic goals. This play is very important to hospitalised children and their siblings as it maintains some normality in an otherwise abnormal and strange situation.

**Therapeutic play.** This is different in its design and intent. It is guided by professionals who have goals that the play is going to achieve, the main one being to 'facilitate the emotional and physical well-being of hospitalised children' (Vessey & Mahon 1990, p. 328).

Through both types of play, specialists can tell a lot about how children feel about what is happening to them. Through play, a child may show fear of an upcoming procedure or a sibling may show guilt about hospitalisation, a lack of trust, anger or fear. Vessey & Mahon (1990) talk of three types of therapeutic play:

- emotional outlet play
- instructional play
- physiologically enhancing play.

#### *Emotional outlet play*

Children will turn to play for emotional release when they are unable to cope with the situation that they find themselves in. Emotional outlet play is initiated to facilitate this. Children are encouraged to re-enact events with the ability to be in control of the situation and to resolve the problems they were faced with. This type of play is often used to diagnose child abuse and the use of anatomically correct dolls has made this of greater benefit. It can also be used to help

McQUAID, HUBAND, PARKER 1996

CHILDREN'S NURSING

of fluid deficit

adding up all
's (including for
id loss through

e calculated by
m the daily in-
ceed the output
e area per day
ough respiration
sick children is
; fluid therapy
ith charting of
lentify children
ate amounts of

to describe the
body water, as a
es or insufficient

**Box 13.2 Clinical signs of dehydration in children**

**Weight loss less than 5%**
- Often no clinical signs

**Weight loss between 5 and 10%**
- Loss of skin turgor
- Dry mucous membranes
- Sunken fontanelle in babies
- Sunken eyes
- Lethargy
- Oliguria

**Weight loss greater than 10%**
- Pale clammy skin
- Weak pulse
- Low blood pressure
- Shallow breathing
- Increased core–peripheral temperature gap
- Collapse

*Fluid replacement*

Fluid replacement in the sick child has three parts:

1. to meet daily fluid requirements
2. to correct dehydration by replacing earlier fluid losses
3. to correct for continuing exceptional fluid losses.

The replacement of fluid is accompanied by replacement of electrolytes (especially sodium and potassium), as well as attention to the child's nutritional needs. As a general principle, if a child is well enough to take and absorb fluids given orally (or through a nasogastric tube), this is the best route to administer fluids. Suitable oral fluids must contain physiological amounts of electrolytes; examples are milk, infant formula feeds and oral rehydration fluids (for instance Dioralyte). Water alone should not be given to replace fluid loss or maintain hydration. Examples of fluids for intravenous fluid replacement are given in Box 13.3.

Intravenous fluids are used in severely ill children and in those not able to tolerate or absorb oral fluids. The replacement of fluids in the severely dehydrated child is done at first rapidly in the first minutes to hours, by the intravenous route, and then continues more gradually over the next 1–2 days, as described in Box 13.4. Abnormal signs such as low blood pressure and an increased core–peripheral temperature gap gradually improve as dehydration is corrected.

**Box 13.3 Types of intravenous fluids**

**Crystalloid**
Dextrose 4% + sodium chloride 0.18%
Sodium chloride 0.9% (normal saline)
Sodium chloride 0.45% (half-normal saline)
Dextrose 10%

**Colloid**
Human albumin
Fresh frozen plasma
Artificial plasma expanders (e.g. Haemacell)
Blood

**Parenteral nutrition**

**Box 13.4 Fluid replacement in the severely dehydrated child**

**Initial fluid replacement**
- Intravenous fluid — 20 ml per kg body weight in the first hour
- All or most of this fluid as colloid (plasma or blood)

**Subsequent replacement of fluid deficit**
- Replace half of fluid deficit in first 12 hours:
  - — usually intravenously
  - — most as crystalloid
  - — choice of fluid depends upon type of fluid and electrolyte loss
- Replace remainder of fluid deficit in following 24 hours
  - — intravenously or orally

**Continue maintenance fluids**
- Intravenously or orally
- At the same time as replacing fluid deficit
- Include any continuing losses (e.g. vomiting)

## Causes of abnormal fluid balance

*Pyloric stenosis*

McQUAID, HUSBAND, PARKER 1996
CHILDREN'S NURSING

...emptive analgesia and some sedation:
...e.g., trimeprazine or benzodi-
...or antimuscarinic drugs (e.g.,
...bronchial and salivary secretions
...bradycardia and hypotension as a
...anaesthetic agents. The anaes-
...child's perioperative management
...ive a premedication and what type
...members of health care, children and
...increasingly assertive in expressing
...medical staff. The nurse must act as
...ensure, while ensuring they have suf-
...an informed decision.
...intravenous induction of anaesthesia,
...creams, such as eutectic mixture of
...LA) may significantly reduce the pain

## ...CEDURES

...child to the operating theatre, a
...be completed to ensure the main-
...Case notes, *x-rays* (where appro-
...consent form, an identity bracelet,
...and, in some cases, a preoperative
...roughly checked for any omissions.
...the child removes all jewellery and
...diathermy to cauterize blood vessels
...contact burns on the child if metal
...Equally important, all nail polish and
...d. This ensures that the child can be
...s of hypoxia during surgery, which is
...of the peripheral areas, particularly
...nurse must also check for loose teeth,
...ous if they are inadvertently 'extract-
...ndotracheal tube during intubation.
...urite toy or comforter, this should
...theatre. Care must be taken that it
...await the child's return from surgery.

## THE OPERATING

...he ward to the operating theatre may
...f premedication (if any) the child has
...to the operating theatre department.
...children may prefer to walk to the
...children and those who have received
...dications will require some assistance.
...is probably easier and more reassur-
...o theatre, preferably by their parent.
...used these may be transformed into
...rather than an alien trolley. Making

...ranged. It is unlikely that an adolescent would feel ... travelling to theatre in a 'space rocket' (Harris, 1990).

In some institutions, parents accompanying ... the anaesthetic room remains a contentious issue. ... children's nurses should advocate that any and all ... a fundamental right to have their parent with ... stressful times (Day, 1987). To ensure a positive ... for everyone involved in caring for the child in the ... ic room, it is vital that the parents are given adequate ... ration by the ward and theatre staff to enable them to ... support their child before he or she is anaesthetized (... 1988). Preoperative preparation will also enable the ... know when they should leave the anaesthetic room (... 1990), and will therefore remove one of the main ... excluding parents from anaesthetic procedures.

## CARE OF THE PARENTS DURING ... SURGERY

The parental role enters a state of suspended anima... the child is in theatre. Once the child is anaesthetized, ... parents' physical role stops until the child is returned to ... ward or recovery area (*Muller, Harris and Wattley*, 1... *Sitting patiently by* an empty bed can be an emotionally ... draining experience. If parents decide to wait on the ward ... their child's return, regular progress reports may help them feel ... 'in touch' with their child. This time can also be used to ... encourage parents to use catering and washing facilities ... order to prepare themselves for their child's return to the ward ... (Mitiguy, 1986).

## POSTOPERATIVE CARE

The safety of the child during the postoperative period is of paramount importance. Once in theatre, the child's bed area should be prepared for his or her return. Oxygen and suction equipment should be available and working correctly. An appropriately sized airway should be easily accessible. Specific equipment required for the child's care postoperatively should also be collected, including IV stands, drainage bags and holders, nasogastric tubes, or pulse oximeter monitor.

Following transfer from the theatre or recovery area, the child should be returned to bed as quickly as possible.

## NURSING OBSERVATIONS

Baseline observations of temperature, pulse, respirations and blood pressure give an indication of the stability of the child's immediate postoperative condition. The use of fundamental nursing skills, observing and listening, in conjunction with frequent recording of the child's vital signs, will enable the nurse to monitor the child's postoperative recovery. The frequency of the recording of the child's observations should reflect the child's general condition (Whaley and Wong, 1995)

...shock and haemorrhage. ... ...aemic following surgery ... ...monitoring may be indicated. ... ...chilled during surgery and ... ...core temperature monitorin... ...cy between the core and pe... ...may require gradual warming ... ...extra blankets and for the sm... ...ce this 'gap'.

...ending on the type of sur... ...ics may be prescribed. Initi... ...intravenously and, as the c... ...then be administered orally. ...otic therapy will be influen...

...may also be necessary to give ... ...replace blood lost during th... ...must be alert to the possibilit... ...sion, such as elevation in ... ...ere cases, rigors.

## ...N MANAGEMENT

Pain management is traditionally ... ...analgesia after pain has been ... ...ew of this as the optimum reg... ...anagement is being challenge... ...algesia. As the name suggests, ...e of analgesic drugs *before* th... ...timuli) which thereby reduces th... ...timuli on the individual (Mo... ...esponse to injury is reduced a... ...produced from the damaged tiss... ...of central or regional nerve blo... ...may result in greater stability o... ...the operative procedure, perha... ...cedure is having a lessened effe... The value of pre-emptive analg... and more research is required t... term benefits (McQuay, 1992).

In chronic pain managemen... Organization's *analgesic ladde*... 1990; Watt-Watson and Don... analgesia at an effective dose a... which is appropriate to the leve... up the 'ladder' and receives ... increases, or moves down the ... contrast to chronic pain mana... tive pain management attemp... block or modify the pain patl... different points in the body, ... gesic interventions (Morton, ... analgesic interventions are o... that he or she understands the...

CAMPBELL + GLASPER 1995
Whaley + Wong's Children's Nursing

- Once recovered encourage deep breathing and coughing to remove secretions and expand lungs and assist to the sitting position. Small children will assume the most comfortable position for themselves which often means lying flat. In this instance therapy from the physiotherapist may be required.

## Shock

Shock is defined as circulatory failure which leads to inadequate perfusion of body tissues and organs. It can develop immediately after surgery or slowly becoming evident several hours after surgery. It is important that signs of shock are identified early so that treatment can be implemented. One of the most important observations to make is that of the general appearance of the child. Often a child will 'look bad' before there are any measurable changes in vital signs. A child who is in shock will have pale mucus membranes, mottled cold extremities, irritability then lethargy. Other signs include weak thready rapid pulse (bradycardia is a dangerous sign and should be reported immediately), tachypnoea and temperature instability. Hypotension is a late sign of shock in children. Report any signs of shock promptly. Support a child who is shocked by keeping the surroundings calm, treat pain (which reduces the demand for oxygen), keep the child warm and administer oxygen as needed.

**Types of shock**

- *Hypovolaemic* – 'a compromise in systemic perfusion resulting from inadequate intravascular volume relative to the vascular space'.
- *Cardiogenic* – caused by impaired myocardial function which compromises cardiac output.
- *Septic* – that which occurs 'when an infectious organism triggers a host response which compromises cardiovascular function, systemic perfusion and oxygen delivery and use'.

(Hazinski, 1992).

## Haemorrhage

Haemorrhage following surgery (reactionary) may occur as a result of a slipped ligature or an increase in blood pressure which dislodges a clot that plugged a severed vessel. Haemorrhage may be visible at the wound site or may be internal in which case it can only be recognised by a change in vital signs. These include rapid thready pulse, fall in blood pressure (a late sign in children), rapid respirations, pallor, apprehension, restlessness and weakness. Report any suspicion of haemorrhage promptly. Secondary haemorrhage can occur several days or weeks after surgery and parents should always be warned of this and given information as to what action to take.

## Nausea and vomiting

Post-operative nausea and vomiting (PONV) is an important complication of surgery in children. Many of the common surgical procedures in childhood are associated with a high incidence of PONV (Patel *et al.*, 1995). The highest incidence occurs in the 5–12 age group. Factors affecting the degree of PONV include the type of surgery, history of motion sickness, excessive pre-operative fasting, anaesthetic technique used, too rapid mobilisation after surgery (stimulates the vestibular system which may have been desensitised by opioids – White *et al.*, 1988) and early oral intake after surgery. Nursing actions should therefore be implemented to take account of these factors. Any nausea or vomiting should be reported immediately so that treatment with an anti-emetic can be implemented.

MOULES & RAMSAY 1998

## Urine retention

Urine output may be reduced due to the effects of anaesthetic [illegible]. This can be complicated by the stress response to surgery which increases ADH from the anterior pituitary which in turn acts on renal tubules increasing permeability and reducing/preventing the excretion of water. The child's urine output must be monitored and the first passage of urine following surgery noted. Normal excretion is considered to be 0.5–1.0 ml/kg/hour. Anything less than this should be reported. Anxiety, fear of pain and/or recumbent position can all contribute to urine retention. Therefore actions can be taken to reduce all of these to encourage the child to pass urine. One favourite trick is to take the child to the bathroom and run the tap – try it yourself!

## Wound complications – infection, dehiscence

Surgical wounds in children rarely become infected (Foale, 1994) and are commonly closed using dissolvable sutures. However, it is important to be vigilant for signs of wound infection which include redness, swelling, pain at site and, oozing. Any suspicion of infection should be reported and a wound swab taken. Dressings, where they are used, need to be changed using aseptic technique to avoid introducing infection. When changing dressings the nurse may have to utilise distractive techniques to avoid the child interfering with the procedure. The use of play and music is useful as is the assistance of another person. Where possible encourage children not to explore underneath the dressing. This can be made harder to do if the dressing is taped all round with appropriate tape. A variety of dressings and cleansing agents are available and their use will depend on the type of wound and local policy.

**Stages of wound healing**

- *Inflammatory stage* – initial bleeding when incision made stops after diathermy and during the clotting phase. Vasodilation and oedema result
- *Destructive stage* – polymorphs and macrophages clear dead tissue and debris. The formation of fibroblasts stimulates angiogenesis. This stage can be delayed by vitamin C, iron or oxygen deficiency
- *Proliferative stage* – fibroblasts produce collagen to promote tensile strength of the wound
- *Maturation stage* – wound contracts, collagen fibres reorganised, tensile strength gradually returns

(Galvani, 1997)

### Activity

Critically explore your local policy on wound care and the use of particular types of dressing.

**Wound cleansing agents**

- Tap water (Angeras et al., 1992)
- Saline
- Antiseptics

It is common for many surgical wounds to be left uncovered after the first 48 hours. The use of leeches is becoming more common, particularly in the management of reconstructive surgical wounds and in plastic surgery. Godfrey (1997) suggests that children take to the use of leeches quite readily whilst the parents need a little more persuasion.

Wound breakdown (dehiscence) can occur as a result of infection, excessive coughing and general debilitation. Immediate action should be taken and the wound covered with a sterile pad. Resuturing is usually carried out.

**Cross references**

Caring for children in pain – page 348

Relieving pain – pages 356–359

## Pain

The child should be monitored using an appropriate pain assessment tool and nursing actions implemented accordingly.

## PHYSICAL FORCES INFLUENCING FLUID BALANCE

**rostatic pressure**—The pumping action of the heart creases fluid pressure in the arterial portion of the culatory system, forcing fluid through the capillary lls into the interstitial spaces and from glomerular pillaries into the collecting tubules of the kidneys; it is e pressure created by the weight of fluid.
**otic pressure**—The physical force, or "pull," created a solution of higher concentration across a semiper- eable membrane. Fluid in the solution of lesser con- ntration moves to the solution of greater concentra- n to equalize the concentration on each side of the embrane. Major osmotic forces in body fluids are so- um and intravascular proteins.
**usion**—Random movement of molecules from a re- n of greater concentration to regions of lesser con- ntration. Rate of diffusion is influenced by the size d the distance across which the particle mass must ffuse (small particles move more rapidly than large es), temperature (heat increases the rate of move- nt), and agitation (stirring hastens movement). **Fa- itated diffusion** employs a carrier substance to assist ute movement across a membrane.
**e transport**—A substance is transported by way of a rier substance *against* a pressure gradient, from a re- n of lesser or equal concentration to a region of ual or higher concentration; examples include solutes h as sodium, potassium, and glucose.
**ular transport**—A portion of a membrane engulfs a ge molecule and releases it on the other side of the mbrane. Substances move into cells by ***pinocytosis*** and t of cells by ***exocytosis.***

## INTERNAL CONTROL MECHANISMS INFLUENCING FLUID BALANCE

**Thirst**—The impetus to ingest water is stimulated by an creased solute concentration (osmolality) of extracellular fluid and/or diminished intravascular volume.
**Antidiuretic hormone (ADH)**—Released from the posterior pituitary gland in response to increased osmolality and decreased volume of intravascular fluid; promotes water retention in the renal system by increasing the permeability of renal tubules to water.
**Aldosterone**—Secreted by the adrenal cortex; enhances sodium reabsorption in renal tubules, thus promoting osmotic reabsorption of water.
**Renin-angiotensin system**—Diminished blood flow to the kidneys stimulates renin secretion, which reacts with plasma globulin to generate angiotensin, a powerful soconstrictor. Angiotensin also stimulates the release of aldosterone.

importance of body water to body function is not only to its abundance but also to the fact that medium in which body solutes are dissolved and abolic reactions take place. Since these metabolic es are affected by even small alterations in fluid ition, precise regulation of the volume and compo- f the fluid is essential. In healthy individuals, body emains singularly constant, but marked alterations r its volume or distribution that occur in many states can produce severely damaging physiologic ences.

## R BALANCE

normal conditions, the amount of water ingested pproximates the amount of urine excreted in a 24- riod, and the water in food and from oxidation bal- at lost in feces and through evaporation. In this way, ium is maintained.

### nisms of Fluid Movement

retained in the body in a relatively constant amount h few exceptions, is freely exchangeable between all id compartments. The proximity of the extravascu- partment to the cells allows for continual change in and distribution of fluids, largely determined by sol- specially sodium) and physical forces (see box above, left). Transport mechanisms are the basis of cellular activity within the cells, and since they have limited capacity to store materials, movement in and out of cells must be continuous. Internal control mechanisms are responsible for the regulation and maintenance of fluid balance (see box above).

TABLE 28-1 **Daily Maintenance Fluid Requirements**

| BODY WEIGHT (kg) | AMOUNT OF FLUID PER DAY |
|---|---|
| 1-10 | 100 ml/kg |
| 11-20 | 1000 ml plus 50 ml/kg for each kg over 10 kg |
| >20 | 1500 ml plus 20 ml/kg for each kg over 20 kg |

FIG. 2 centag

approximately
children with fl
ment of these
es of both wat
re. For exampl
expenditure is
and hyperm
as hypothyroid

**Maintaining Water Balance.** Maintenance fluid requirement is the volume of water needed to replace ongoing physiologic fluid loss such as that from insensible water loss (through the skin and respiratory tract), evaporative heat loss, and losses through urine and stool formation. The amount and type of these losses may be altered by pathologic states such as fever (with increased sweating), diabetes insipidus, gastric suction, and sequestration of body fluids into the third space.

Nurses nee quirements requirements: add 12% per rise of g. diarrhea out renal failure insipidus

Basal maintenance calculations for required intravenous fluids are based on the body's requirements for water and electrolytes at a basal metabolic state, at rest; estimated fluid requirements are then increased or decreased from these parameters based on increased or decreased water losses, such as with fever or hyperventilation, body temperature or congestive heart failure. Daily maintenance fluid requirements are outlined in Table [illegible].

requirements: ve heart failure e of inappropriate a cal ventilation atively renal failure intracranial pressure

Maintenance fluids contain both water and electrolytes and can be estimated from the child's age, body weight, degree of activity, and body temperature. *Basal metabolic rate (BMR)* is derived from standard tables and adjusted for the child's activity, temperature, and disease state. For afebrile patients at rest the maintenance [illegible]. Consequently, fema

in Fluid Volume
tage of TBW varie
older children is rela

WONG (1995)

ake some preliminary assessment of the severity of the (see Chapter 26). One of the most reliable estimates degree of change in behavior. A child who stays home school and voluntarily lies down or refuses to play is more likely to have considerable pain than a child is absent from school but plays contentedly at home. younger nonverbal child may assume a rigid, side-lying on with the knees flexed and have decreased range of on of the right hip. For those nurses involved in pri- ambulatory care, the responsibility of recognizing a ble case of appendicitis and prompt medical and/or al referral is particularly important. A detailed history thorough abdominal examination cannot be overem- ed. Palpating the abdomen should be delayed until ther assessments have been made. The child is in- ed to point with one finger to the site of the abdomi- ain. Rebound tenderness may be present but is *not* al- sufficiently reliable test in children. Light palpation satisfactorily elicit pain without causing excessive (see Atraumatic Care box). Other techniques for as- ent of the abdomen are discussed in Chapter 7.

**NURSING ALERT** In any instance in which severe abdominal pain is expected, the nurse must be aware of the danger of administering laxatives or es. Such measures stimulate bowel motility and increase sk of perforation.

## NURSING DIAGNOSES

on a thorough assessment, several nursing diagnoses entified. The more common diagnoses for the child cute appendicitis are included in the Nursing Care on p. 1466. Others may apply in specific situations.

## PLANNING

als for the child with acute appendicitis and the fam- ude the following:

- Child and family will be prepared for surgical intervention.
- Child will receive postoperative care as described for the child undergoing surgery in Chapter 27.
- Child with peritonitis will not experience postoperative com- cations, such as spread of infection.
- Child and family will receive support and education.

## PLEMENTATION

preparation of the child with appendicitis is simi- hat for any child undergoing surgery (see Chapter situations in which medical treatment is required to problems associated with peritonitis, the nurse must te expected procedures and set up equipment as as possible to prevent any delay in preparing the or surgery. Psychologic preparation of the child and is similar to that used in other emergency situations hapter 27).

**operative Care.** Postoperative care for the non- ed appendix is the same as for most abdominal op- . Care of the child with a ruptured appendix and tis involves more complex care. The course of re- considerably longer and may require up to 2 weeks of hospitalization.

The child is maintained on intravenous fluids and antibiotics; is allowed nothing by mouth; and remains on low, intermittent gastric decompression until there is evidence of return of intestinal motility. Listening for bowel sounds and observing for other signs of bowel activity (such as passage of stool) are part of the routine assessment.

A drain is often placed in the wound during surgery, and frequent dressing changes with meticulous skin care are essential to prevent excoriation of the surgery area. If the wound is left open, moist dressings (usually saline-soaked gauze), as well as wound irrigations with antibacterial solution, are used to provide an optimum healing environment.

Pain management is an essential part of the child's care. Not only is the incision painful, but also the repeated dressing changes and irrigations can cause considerable distress. Since pain is continuous during the first few postoperative days, analgesics, especially opioids, are given around the clock. Procedures are performed when the analgesics have exerted their peak effect. (See also Pain Assessment; Pain Management, Chapter 26).

Psychosocial care after surgery is also important. Sudden, acute illnesses cause unique stress, since there is little time for preparation or planning. Parents and older children need an opportunity to express their feelings and concerns regarding the events surrounding the illness and hospitalization. The nurse can provide important education and psychosocial support to promote adequate coping, with alleviation of anxiety for both the child and the family.

## EVALUATION

The effectiveness of nursing interventions is determined by continual reassessment and evaluation of care based on the following observational guidelines:

1. Observe child preoperatively for reaction to the situation and compliance with care.
2. Observe for documentation regarding child's emotional and physical needs, especially assessment of pain and administration of analgesics.
3. Monitor child for evidence of infection.
4. Interview and observe child and family for evidence of their understanding of the condition, [illegible]

### ATRAUMATIC CARE
***Palpating the Abdomen for Abdominal Pain***

Because children associate the stethoscope with "listening," use the bell piece for initial palpation of the abdomen for tenderness. Children usually endure pressure from the stethoscope that they would not tolerate from a probing hand. Follow with manual palpation, using a gentle touch without lifting the hand from the abdomen while observing the child's face for signs of discomfort.

Ask the child to lift the heels and drop them to the floor two or three times, to hop on one foot, or to "puff out" or "pull in" the abdomen to check for tenderness without more painful probing.

of pulse and respirations is more frequent when intravenous opiate analgesia is in progress. One of the side-effects of opiates is respiratory depression, so the rate, depth and quality of respiration is monitored. Reduction in frequency of postoperative observation is based on the nurse's assessment of the child's condition.

Research has shown that the nurse often carries out more frequent observations than the patient's condition dictates, mistakenly believing that the regime had been prescribed by the hospital or by nursing policy (Botti & Hunt 1994).

### *Hydration*

Normally, the reintroduction of oral fluids is left to the discretion of the nurse and is determined by the type of surgery undertaken. However, if the child has had surgery which requires him to have no fluid or dietary intake for a long period of time, e.g. following bowel surgery, his hydration needs will have to be met by intravenous means until he can tolerate fluids orally.

In this instance a fluid balance chart is crucial to monitor all input and output. Output includes urine, vomit, wound leakage, gastric aspirate and stool.

The nurse should also observe for signs of dehydration, e.g. decreased urine output, dark sunken eyes and dry mucous membranes.

Oral fluids should be reintroduced once the child is sufficiently awake. However, in more complex surgery it is common to wait until bowel sounds have returned, and fluids should be commenced as advised by the surgeons. Should it be anticipated that the child is going to be nil orally for some time, e.g. after bowel surgery, the child will have a nasogastric tube for the purpose of draining the stomach of bile and secretions. These losses are replaced millilitre for millilitre with intravenous fluid to prevent the child from becoming dehydrated. Enteral feeding is usually commenced within 24 hours of surgery unless contraindicated. For example, a child having undergone a fundoplication and/or gastrostomy may have to wait 48 hours prior to commencing enteral feeds to allow primary healing. Parenteral nutrition may be administered to children who have been poorly for some time and have no expectation of being able to tolerate diet and fluids normally within a few days. Again, bowel surgery is a good example of this.

**Pain** (see also Pain Management, p. 195)

understanding of numbers, colours and drawings, so a selection of pain assessment tools is helpful in finding the right one to suit the child's level of understanding (Twycross 1995).

Parents play an important role in communication with the child and for those who cannot communicate verbally, pain control is something that should be discussed preoperatively.

As well as pharmacological pain relief, alternative methods include distraction, massage and snoozelen therapy. The latter works with all the senses, using aids such as soft music, optic fibre lights and tactile toys.

Pain is not just a consideration in the immediate postoperative period. The nurse has to prepare the child and family for potentially painful procedures such as removing drains and mobilisation. On these occasions, the play specialist can provide valuable input. It is important where possible to carry out such procedures away from the bedside as the bed should be seen as a safe haven and a place of comfort. Privacy and dignity should be maintained at all times.

#### Method

1. Establish baseline information. Record temperature, pulse, respirations and blood pressure. Vital signs should be monitored and recorded regularly to detect any complications such as haemorrhage or compromise of the airway. They may also indicate that the child is experiencing pain. Assess consciousness level. Report any changes or concerns.
2. Observe the pallor of the skin. If oxygen is to be administered, ensure that the mask is correctly positioned and that the oxygen is delivered at the prescribed rate. Mouth care is essential to ensure patient comfort (see Oral Hygiene, p. 179).
3. Check wound sites and drains. Monitor wound sites at regular intervals for signs of leakage and mark as necessary; change dressings or add additional padding as required. Report any excessive leakage. If drains are in situ, record output regularly and note the characteristics of the fluid. e.g. haemoserous fluid. (*Note:* Aim to observe the wound site at the same time as these observations to reduce disturbance to the child.)
4. Commence fluid balance chart. If an intravenous infusion is in situ, maintain it at the prescribed rate and record the amount infused hourly. Check the [illegible] of extravasation or phlebitis

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PRACTICES IN CHILDREN'S NURSING

## NG CRITICALLY ABOUT . . . *The Drug Combination "DPT"*

combination of meperidine promethazine (Phenergan), romazine (Thorazine), also known as "DPT," "pedi- "lytic cocktail," has been pre- ediatrics for many years. One ind the use of DPT was the be- omethazine and chlorproma- ated or increased the analge- f meperidine. However, it is whether any drug acts as an ıtiator. Rather, most add their ct, such as sedation or anxioly- n of anxiety), to the opioid's fect (McCaffery and Beebe, t, promethazine produces an- Ros, 1987), and chlorproma- es initial antianalgesia fol- ght analgesia (Howland and 1986). These effects alone n irrational choice for prepro- reoperative sedation.

cent reports argue strongly 's continued use. Major criti- f include the following:

excessive central nervous sys- NS) depression; two thirds of tients remained sedated for 7 hours or more (Nahata, nd Krogg, 1985).

he seizure threshold (Snod- d Dodge, 1989).

nazine may potentiate the ac- d increase the toxicity of me- , leading to CNS depression, ory depression, and decreased blood pressure (Nahata, Clotz, and Krogg, 1985).

Promethazine can cause extrapyramidal reactions (spasms of neck, face, tongue, and back; fixed eyeballs).

It is usually administered intramuscularly, causing additional pain, especially from meperidine, which is irritating to the tissues. Because of the potential for respiratory depression, the intravenous route should not be used (Coté, 1994).

To emphasize its risks, the Acute Pain Management Guideline Panel (1992) of the Agency for Health Care Policy and Research (AHCPR) includes the following in its *Clinical Practice Guideline:* "Exercise caution when using the mixture of meperidine (Demerol), promethazine (Phenergan), and chlorpromazine (Thorazine), also known as DPT. DPT—given intramuscularly—has commonly been used for painful procedures. The efficacy of this mixture is poor when compared with alternative approaches, and it has been associated with a high frequency of adverse effects (Nahata, Clotz, and Krogg, 1985). It is not recommended for general use and should be used only in exceptional circumstances."

Although DPT is typically used before a single procedure, some clinicians prescribe DPT for pain relief from repeated treatments, such as burn care. Meperidine is not recommended for chronic dosing because of the accumulation of the metabolite normeperidine, a CNS stimulant that produces anxiety, tremors, myoclonus, and generalized seizures (American Pain Society, 1992).

In patients with normal renal function, normeperidine has a half-life of 15 to 20 hours; this time is extended greatly in patients with impaired renal function, especially those with sickle cell disease. The CNS effects have been observed in young, otherwise healthy patients given sufficiently high doses of meperidine. According to the Acute Pain Management Guideline Panel (1992), "meperidine should be reserved for very brief courses in otherwise healthy patients who have demonstrated an unusual reaction (e.g., local histamine release at the infusion site) or allergic response during treatment with other opioids such as morphine or hydromorphone."

Despite the well-documented risks of DPT and the AHCPR guidelines against its use, you may find some clinicians who are resistant or hard to convince. One reason is that prescribing DPT is an entrenched practice, and many may not be familiar with alternatives (see box on p. 1144). If so, you may refer them to another authority, the 1993 edition of *The Harriet Lane Handbook,* which no longer lists DPT among its suggested drugs for procedural sedation and/or analgesia (Johns Hopkins Hospital, 1993; Wong, 1994).

idelines include provision of emergency h as a positive-pressure oxygen delivery sys- agement and breathing equipment, and an . The patient's level of consciousness and re- eart rate, blood pressure, respiratory rate, uration (via pulse oximetry) must be moni- e procedure by an individual present for this

*itrous oxide* for conscious sedation (defined ation of nitrous oxide—50% or less, with xygen, without any other sedative, opioid, sant drug before or concurrent with the ni- es not require pulse oximetry monitoring, rongly encouraged. The patient is able to communication throughout, and a second e responsibility is to monitor the patient th the procedure. In all cases the patient's he procedure is also documented.

also fear induction of anesthesia by mask. minimize anxiety related to inhalation anesthesia are (1) disguising the unpleasant odor of anesthetic gases by applying a pleasant-smelling substance on the mask; (2) using a transparent plastic mask rather than an opaque black mask and gradually bringing it toward the face; (3) directing a stream of gas toward the child's face from the bare tube until the child becomes drowsy, then using the mask; and (4) allowing the child to sit up rather than lie down for anesthesia induction (Jones, 1985).

### Postoperative Care

After surgical procedures, various physical interventions and observations are required to prevent or minimize possible untoward effects (see Guidelines box, p. 1151, and Nursing Care Plan, pp. 1146-1149). Although most of these interventions are prescribed by physicians, it is the nurse's responsibility to exercise judgment in their implementation. For example, vital signs are taken as frequently as necessary until they are stable. Simply recording temperature, pulse, respiration, and blood pressure without comparing the present readings with previous ones is a useless techni-