A Private Hospital /

ENT Surgeon, Dr D /

Anaesthetist, Dr E /

Nurses, Mr F / Ms G / Ms H / Ms I /

Ms J / Ms K / Mrs M

A Report by the

Health and Disability Commissioner

(Case 00HDC00231)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Parties involved

Mr A	Complainant / Consumer's father
Mrs B	Complainant / Consumer's mother
Miss C	Consumer
Dr D	Provider / Ear, Nose and Throat Surgeon
Dr E	Provider / Anaesthetist
Mr F	Provider / Registered Comprehensive Nurse
Ms G	Provider / Registered Comprehensive Nurse
Ms H	Provider / Registered Nurse
Ms I	Provider / Registered Comprehensive Nurse
Ms J	Provider / Registered Nurse
Ms K	Provider / Registered Nurse
Mrs M	Provider / Registered Comprehensive Nurse
Mr O	Provider / General Manager of a private hospital
Ms P	Director of Nursing of the private hospital

Expert advice was obtained from an independent nurse, Ms Glennis Birks, and an independent anaesthetist, Dr Ian Campbell.

Complaint

On 5 January 2000 the Commissioner received a complaint from Mr A and Mrs B about the treatment their daughter, Miss C, received at a private hospital. The complaint is that:

- *On 18 October 1999 Miss C had her adenoids and tonsils removed by Dr D at the private hospital. The anaesthetist was Dr E. An IV dextrose saline drip was commenced which was prescribed to be administered at a rate of 80mls per hour.*
- *The private hospital staff failed to administer or monitor Miss C's IV drip properly. When Miss C vomited and 'fitted' medical staff misdiagnosed her symptoms as an allergic reaction to Stemetil. As a result, on 18 October 1999 Miss C was transferred to a public hospital, where she was diagnosed as having hyponatraemia and cerebral oedema.*

An investigation was commenced on 3 May 2000.

Information reviewed

- Relevant medical records from the private hospital
- Relevant medical records from the public hospital
- Relevant protocols from the private hospital

Information gathered during investigation

Adenotonsillectomy
On 18 October 1999, at about 9.30am, nine-year-old Miss C had her adenoids and tonsils removed by ear, nose and throat surgeon Dr D, at the private hospital. The anaesthetist was Dr E. Dr E and Dr D are private specialists and are not employed by the private hospital.

Insertion of IV line
Miss C's weight on admission to the private hospital was 26kg. Prior to Miss C's operation, she was given 26mls of oral Phenergan as a pre-medication, and an intravenous ("IV") dextrose saline drip was set up in theatre. The anaesthetic nurse involved in setting up the drip was Mr F. Mr F had been registered as a comprehensive nurse for four years, commencing work at the private hospital in late May 1999, and working full-time in the operating theatre.

Mr F described the process involved in setting up the IV drip. He first obtained a bag of the appropriate IV fluid, which in Miss C's case was dextrose saline. Each bag of dextrose saline contained 1000mls of fluid. He checked the expiry date and warmed the fluid, assembled the IV therapy line in readiness for Miss C's operation, and then assisted Dr E with Miss C's intubation. Immediately following Miss C's intubation Mr F assisted Dr E to place and secure the IV line into her arm. The IV was assembled with a continuous flow set.

A continuous flow set is regulated by means of an adjustable clamp. Staff can adjust the clamp to ensure the set delivers at the rate prescribed by the anaesthetist. IV delivery can also be controlled by infusion pumps and burettes. Burettes (eg, Buretrol) are filled with the amount of fluid to be given each hour and set at the appropriate prescribed drip rate. Staff fill the burette on an hourly basis. This decreases the likelihood of administering too much fluid. Infusion pumps are mechanical devices programmed to deliver a pre-set amount of fluid over a certain time period.

Mr F explained that it is normal practice for the anaesthetic nurse to assemble the IV line with a continuous flow set, unless otherwise ordered by the anaesthetist or if the child is an infant. This is because sometimes, in the theatre setting, the IV infusion is used as a means of administering fluids or medications at a rapid rate. The anaesthetist makes decisions concerning the IV delivery rate. This rate can be variable, and is related to the patient's needs while undergoing the operation. As the anaesthetist is present there is often no

written prescription for the administration of IV fluids. During the course of the operation the anaesthetist completes the prescription.

The private hospital's IV policy in place at the time specified that "children <10 years to have a Burette or Floguard". Mr F stated that the IV therapy policy is flexibly applied in theatre because of the nature of operating theatres and the changes that may be necessary during an operation. There is no provision in the private hospital's IV policy specifying that IV infusions may be set up differently in the theatre setting.

Mr F informed me:

> "We keep a preference sheet for each anaesthetist who practices at [the private hospital]. This is a reference to help each nurse anticipate the preferences each anaesthetist has. It covers many aspects of their practice and includes IV therapy. It is important to note that the patient's physiological wellbeing underpins the anaesthetist's and my own actions throughout the operation. Following the IV line being secured, I have the responsibility for documenting the time the IV infusion began, what the IV fluid was, the batch number, and the volume of fluid in the bag etc. When the operation was finished I assisted [Dr E] in the extubation of [Miss C]. The circulating nurse then helped [Dr E] transfer [Miss C] to the recovery room."

Dr E's preference sheet recorded that he required a Buretrol in children under three years of age.

Miss C's adenotonsillectomy was straightforward and proceeded uneventfully. Dr E prescribed that her IV drip be set at a delivery rate of 80mls per hour before she was transferred to the recovery room.

After Dr E had completed his operating list that morning he left to provide anaesthetic services at another hospital.

Recovery room

Miss C was transferred to the recovery room, with the IV infusion of dextrose saline in progress, at about 10.10am. Miss C was administered 5.0mg pethidine (an analgesic) at 10.45am and 10.50am.

The fluid balance chart records that at 10.30am 1000mls of dextrose saline was supplied and set up. The signature of the 'person putting up the IV fluids' was Mr F's, and it is signed as checked by Dr E. This would indicate that the fluid was administered before Miss C was transferred to the recovery room, whilst still in the care of Dr E and Mr F. This is supported by the evidence of Ms G, who stated that on transfer to the recovery room, Miss C "had an intravenous infusion of Dextrose Saline running at 80 mls/hr which was in progress on her arrival from theatre".

There were two nurses on duty in the recovery room that morning, Ms G and Ms H. Ms G had been a registered comprehensive nurse since September 1997. Ms H had been a registered nurse since January 1976.

During her time in recovery Miss C was monitored and given pain relief until her transfer to a ward. Ms G said Miss C's IV drip ran at the prescribed rate of 80mls per hour during her time in recovery. Ms G said the drip rate was regulated manually by recovery staff and maintained at the prescribed rate. Both Ms G and Ms H shared responsibility for Miss C's care during her time in recovery apart from relieving each other for morning tea, at which time the remaining staff member had sole responsibility for Miss C's care.

Ms H informed me that her role in Miss C's care was minimal. She assisted with the immediate preliminary procedures, which all patients receive in recovery. She stated, "I also recall checking the intravenous line, and I did alter the rate of flow, in that, I reduced it, to accommodate the requirements [80mls / hour] as charted by [Dr E]. A short time after this, I was required to receive another patient from the operating theatre, and my involvement with [Miss C] became virtually nil."

Miss C was transferred to the ward at about 11.15am. Ms G said Miss C was comfortable and settled when she handed her over to the ward nurse, Ms I.

Ward: morning shift

Ms I is a registered comprehensive nurse who has practised intermittently for the past 15 years. She had worked at the private hospital for the past six years. Ms I was assigned to care for Miss C on the ward for the remainder of the morning shift.

When Ms I took over Miss C's care from Ms G, she noticed that Miss C's IV drip was running through a continuous flow set and noted that the prescribed rate was 80mls per hour. Ms I did not check the drop rate as she assumed it to have been set in recovery.

Ms I could not recall exactly how much IV fluid had been administered on Miss C's arrival in the ward but she noted the bag was "near full". Ms I estimated that about 200mls had already been administered. Ms I's impression that the bag was "near full" indicates that Miss C was, most likely, administered the appropriate amount of fluid, in line with Dr E's prescription, during the hour she spent in the recovery room.

Ms I commenced half to one hourly pulse recordings and gave Miss C some iced water to sip. Ms I said Miss C's recordings were stable but after about an hour or so she began vomiting, which was not unusual for children after an operation involving a general anaesthetic.

After Miss C had vomited three to four times, Ms I noted a few specks of fresh blood in the vomit and became concerned about the possibility of a post-operative bleed. Ms I asked the acting charge nurse, Ms J, to come to Miss C's room and check the vomit.

After examining Miss C's vomit, Ms I and Ms J agreed that there was not enough evidence to indicate bleeding, as there was insufficient blood, a very mucousy expectorate and Miss C's pulse was not elevated. Ms I recorded in the clinical notes that Miss C vomited "+++ six times" and that the vomit initially contained fresh blood and then was mostly dark brown. No time was recorded for these observations. At approximately 12 noon Ms I rang Dr E to get medication to stop Miss C's vomiting. Dr E verbally prescribed an anti-emetic,

10mgs IV Phenergan. The notes record that 10mgs IV Phenergan was given to Miss C at 1.00pm by Ms I. Ms I advised me that she administered the Phenergan by slow injection into a port in the IV line. She advised me that this was in accordance with *Notes on Injectable Drugs* (New Zealand HealthCare Pharmacists' Association, 4th ed), and that administration via a burette was not required.

Ms I said Miss C's observations remained stable, although her pulse was slightly elevated. She attributed this to Miss C's profuse vomiting. Miss C continued to vomit several times after the administration of Phenergan.

Ms J, a registered nurse since January 1969, informed me she played no part in the set-up or administration of Miss C's IV fluids. Ms J said her role as acting charge nurse involved allocating staff to patients, assisting staff as required and being available in an advisory / consultation role, along with other duties. Ms J stated:

> "In regard to the person responsible for IV services – each registered nurse is responsible for managing the infusion of patients in their care. There is a policy formulated by the QA system at [the private hospital]. Nurses undergo IV training and designation on employment."

During the nurses' meal break Ms J recorded Miss C's pulse rate, and noted that Miss C was settled.

Further IV fluids administered

Ms I said that around 1.00pm, she noticed that Miss C's IV bag was empty. However, Miss C's vomiting had not eased at all and she was not tolerating any fluids orally. For this reason Ms I commenced a further 1000ml bag of dextrose saline. I have been advised that the standard practice at the private hospital is that after the first litre of IV fluid is administered, the drip is luered (IV disconnected but cannula left in situ). However, if the patient is vomiting, IV therapy is often continued.

At 1.00pm when Ms I commenced a further bag of fluid, Miss C had received 1 litre of dextrose saline in two and a half hours (between 10.30am and 1.00pm) which is equivalent to 400ml per hour. The prescribed rate was 80ml per hour. If the fluid had been administered as prescribed, by 1.00pm Miss C would have received only 200ml.

Ms I stated:

> "Because I was focused on her persistent vomiting and getting it under control and supporting her mother and grandmother, along with my other commitments in the ward at the time, I omitted to record the commencement of the second litre of fluid on her fluid balance chart."

At 3.00pm Dr D called in to check on Miss C. Dr D said when he saw her at this time she had a moderate degree of post-operative vomiting, which was not unusual in children following a tonsillectomy under general anaesthetic. As a result Dr D prescribed Stemetil 6.25mgs IM (intramuscular) to be administered immediately to try to settle her vomiting.

Ms I administered 6.25mgs IM Stemetil, together with Pamol elixir for pain and discomfort, prior to going off duty at approximately 3.30pm.

In response to my provisional opinion, Ms I advised me:

> "I have always prided myself on delivering a high standard of care, and I am at loss to explain how this incident occurred. I accept that I hadn't checked the flow rate on her return to the ward and that I neglected to record the second bag of fluid on her fluid balance chart. I can only surmise that the patient demands and the workload incurred that day, led to this unfortunate accident."

Afternoon shift

On 18 October 1999, Ms K was on the afternoon shift from 2.45pm until 11.15pm. Ms K, a registered nurse since 1983, had worked part-time at the private hospital for about seven years.

At handover she was told of Miss C's continual vomiting and that Stemetil had been given at about 3.00pm. On completion of the handover report Ms K did her patient round. Her attention was focused on another patient in the High Dependency Unit ("HDU") who was unwell. On her way to HDU the bell rang from Miss C's room and she answered it. Mrs B handed her a towel as Miss C had just vomited again. Ms K cleaned up the vomit and discussed with Mrs B the possibility that Miss C might need to stay overnight, and returned to care for an unwell patient in HDU.

On returning to the ward at about 5.00pm Ms K heard a three-bell emergency alarm sounding from Miss C's room and went to investigate. Ms K found Miss C had been fitting and went to obtain the emergency trolley. An enrolled nurse was sent to get help from the theatre anaesthetist and the theatre manager.

Dr L (anaesthetist) and the theatre manager attended and Miss C was stabilised. Dr L diagnosed a possible dystonic (fitting involving muscle spasms) reaction to the Stemetil given earlier that afternoon. Ms K rang Dr D at 5.15pm and he came immediately to the hospital. Dr D said Dr L was still in the hospital at the time, and they both felt that Miss C's fits could be a reaction to the Stemetil. Dr L prescribed an antidote, Cogentin. The drug administration chart records that Dr L administered 0.4mg Cogentin at 5.35pm. As Miss C could possibly require a further dose of Cogentin, Dr L left a syringe of Cogentin for this purpose. The drug administration record notes that 0.4mg IV Cogentin was given to Miss C at 5.35pm.

Ms K rang Dr E to inform him of what had occurred. She then contacted the nurse on call, Ms J, at home and asked her to find a nurse to 'special' (one-to-one constant care) Miss C. Ms J arranged for a comprehensive nurse, Mrs M, to come in and special Miss C.

Third litre of IV fluid commenced

Ms K reassured Mr and Mrs B, who were "obviously distressed". At this stage (about 5.45pm), as Miss C had not been eating or drinking and was still vomiting, Ms K set up a

third 1000ml bag of dextrose saline, discarding approximately 300mls of fluid from the previous bag.

Between 1pm and 5.45pm Miss C received a further 700mls of dextrose saline. If the dextrose saline had been administered at the correct rate of 80mls/hr she would have received only 380mls over this period.

Ms K said that it was not obvious to her that this was the third bag of fluid to be put up as there was no record on the fluid balance chart that a second bag of dextrose saline had been commenced at 1.00pm. Ms K informed me that, in her haste, she failed to record on the fluid balance chart that she had commenced a further bag of dextrose saline and she regrets this immensely. When she changed the IV bag, Ms K visibly monitored the IV drip rate and believed it was running at around 80mls per hour. She did not notice that there was no burette or Floguard pump in place.

Special nursing care
Between 5.45pm and 6.00pm Mrs M arrived to special Miss C. Mrs M was registered as a comprehensive nurse on 13 August 1999, less than two months before she cared for Miss C. Prior to this she had been an enrolled nurse since 29 July 1982. When Mrs M arrived she found Ms K and enrolled nurse Ms N in attendance in Miss C's room. Mrs M received a verbal handover from Ms K.

Mrs M said:

> "On entering the room I noted a child with an IV infusion which was running quite fast, the IV drip did not have a burette or infusion pump in situ. I recall that approximately 500mls of the IV solution had been infused. I also noted this child, [Miss C], was being administered oxygen via nasal prongs. I was informed that [Miss C] had just vomited and that IV Cogentin had been administered. I noted [Miss C's] feet and toes were in a dystonic position and also her neck was hyper-extended (I recognised this to be consistent with a side effect suffered when a reaction to Stemetil has occurred). [Miss C's] complete medical records were not in the room at the time of the handover. [Miss C] was very restless and needed her bed linen changed as she had just fitted and been incontinent of urine, this I proceeded to do with RN [Ms K]. [Miss C's] mother, father and grandmother were present and all needed reassuring. I recall I slowed the IV drip rate down after changing [Miss C]."

Mrs M further informed me that:

> "In summary of this most unfortunate incident I recall thinking that [Miss C] had been assessed and seen by many nurses and medical personnel prior to my involvement with her care. Having viewed her presenting symptoms on my arrival (which were conducent with the diagnosis made) I did not question the amount of fluid or rate of IV she had received on my arrival as sometimes the IV fluid therapy can be altered according to the situation, particularly in an emergency situation. I requested and arranged a mechanical means of regulating the IV drip soon after assessing the situation upon my arrival."

Mrs M asked a nearby registered nurse for a Floguard infusion pump to regulate the IV rate. Mrs M could not recall who this was. She recalled that this did not arrive. Mrs M felt she could not leave the room to get one herself because of Miss C's condition, so made a further request to another nurse, who took about a half an hour to get one. In the meantime Dr E rang and spoke directly with Mrs M. Mrs M could not recall the time Dr E rang. There was no record in the nursing notes of this call. In her report to Mr O, General Manager of the private hospital, Ms P, Director of Nursing, reported that this call was sometime between 6.05pm and 6.20pm.

Mrs M told Dr E that Miss C seemed settled at that time and there was less hyperextension of her neck. Dr E told her he would have his tea and then come over to the hospital.

At about 6.25pm Miss C convulsed again and Mrs M rang the emergency bell to get assistance. Ms K attended and helped Mrs M. Ms K administered the extra dose of Cogentin left earlier by Dr L. The drug administration chart records that 0.4mg of Cogentin was given intravenously to Miss C at 6.29pm. Ms K advised me that she administered the Cogentin as a stat (immediate) dose into the side arm of the drip, as earlier instructed by Dr L. Ms K contacted Dr E immediately and informed him of the event. There is no record in the notes of this call or when it was made. The nursing observation chart records Miss C's condition at 7.30pm as "settled".

Just after 7.30pm Mrs M rang the three-bell emergency signal from Miss C's room and Ms K attended to see Miss C having a further fit. Mrs M contacted Dr E again (the call is not recorded in the notes). Dr E ordered a further smaller dose of Cogentin to control Miss C's fitting.

The drug administration chart records that 0.1mg of Cogentin was given intravenously at 7.30pm. Shortly after this Miss C fitted again and Mrs M rang three bells again. Another registered nurse, Ms Q, was seconded from recovery to the ward to assist Mrs M. Ms K and Ms N also attended to provide assistance to Mrs M. A further dose of Cogentin was administered. The drug administration chart records that Ms Q administered 0.1mg of Cogentin intravenously at 8.10pm.

Ms Q rang Dr E and indicated that he needed to attend the hospital urgently (this call is not recorded in the notes). Dr E told her he was already on his way. Dr E arrived at approximately 8.30pm.

Mrs M could not recall the actual time she rang Dr E but thought it was about 8.00pm. During the telephone call Dr E ordered a Cogentin infusion to be set up. Ms K began to set this up with a burette and a Floguard pump. Ms K discarded the previous IV dextrose saline bag and estimated there to be about 300mls of fluid remaining in the discarded bag.

If this is correct, Miss C received 700mls of intravenous dextrose saline between 5.45pm and 8.00pm. If Miss C had been administered dextrose saline at the prescribed rate, she would have received only 180mls in this period.

Miss C fitted again and Mrs M said she asked Dr E to stay and witness the type of convulsions Miss C was having. Mrs M said that each time Miss C convulsed she was incontinent of urine. Mrs M said her time was taken up with repeatedly changing the bed linen and attempting to pacify Miss C's mother and perform observations and complete recordings.

Dr E stated that he saw Miss C at about 8.30pm and she appeared to be unconscious and in a post-ictal state (pertaining to a stroke or an epileptic seizure). While he was examining her she had a clonic seizure which looked to be epileptiform (resembling epilepsy). Dr E administered Valium 4.0mg IV and decided to transfer Miss C to the Intensive Care Unit at the public hospital. The drug administration chart records that 4.0mg of Valium was given at 8.45pm.

Dr E stated:

> "I gave her 1mg Valium and arranged for her transfer to the [public hospital's] Intensive Care Unit where she was transferred forthwith. I had no further part in her treatment although I did stay in communication with the Intensive Care Unit and saw the girl in Intensive Care Unit the next day. She made a fairly uneventful recovery as far as I am aware".

(Although Dr E stated 1.0mg of Valium in his response to me, the drug administration chart records that 4.0mg of Valium was administered at 8.45pm.)

Miss C was transferred by ambulance at approximately 9.30pm. Mrs M said she assisted with the administration process of transferring Miss C to the public hospital.

Fluid balance chart

When Mrs M was putting Miss C's medical records together to fax to the public hospital, she noted from the Intravenous Fluid Check Form that four 1000ml bags of IV fluid had been commenced for Miss C during the course of the day. She noted that the fluid balance sheet had not been completed since the recording of the first litre commenced in theatre. She updated the fluid balance sheet in retrospect, but did not record that she had done so.

The fluid balance chart, written in retrospect by Mrs M, recorded that the first 1000mls of fluid was set up in theatre at 10.30am. This was changed at 1.00pm when a second 1000ml bag of dextrose saline was commenced. At 6.00pm the fluid balance chart recorded that a third 1000ml bag of dextrose saline was commenced. At 9.30pm the chart recorded another 1000mls of dextrose saline was set up and 80mls was administered (at 80mls/hour) prior to Miss C's transfer to the public hospital. There were no running totals of the amount of fluid given at each time.

Mrs M advised me that when she was putting Miss C's medical records together to fax to the public hospital, she noted the amount of IV fluid that had been transfused into Miss C, which by her calculation in retrospect was 3080ml. However, it was not until some 30 minutes to an hour after faxing the records through, when she was assembling Miss C's papers in her private hospital file, that she realised that Miss C had "received a lot of fluid"

from the time she was in theatre until her transfer. She advised that she did not tell anyone because she thought staff at the public hospital would have "arrived at their own diagnoses", given that some time had passed since Miss C had been transferred, and that her medical records had been sent.

In response to my provisional opinion, Mrs M stated:

> "I have relived this incident since it happened and reflected on my practice. I deeply regret the anxiety and distress that [Miss C's] family experienced. I believe I acted safely using both my professional skills and knowledge to care for [Miss C] to the best of my ability."

The public hospital
It appears that by the time Miss C was transferred to the public hospital's ICU at 9.30pm on 18 October 1999 she had received at least 2500mls of IV fluid since her IV drip was commenced in theatre about 9.30am that morning.

On admission to the public hospital Miss C had a Glasgow Coma Score ("GCS") of 4 out of 15, clonic seizures and marked papilloedema (swelling of the first part of the optic nerve). The GCS is a numerical measure used to estimate a patient's level of consciousness. The higher the GCS score the greater the level of consciousness, with an upper level of 15. A score of 7 or less indicates a coma.

Dr E's referral note recorded:

> "She has had a Ts + As operation today with vomiting post op. 10mg Phenergan at 1pm was unsuccessful and 6.25mg of Stemetil at 3pm gave rise to a 'dystonic' reaction treated with Cogentin 0.4mg with some alleviation of symptoms but further episodes later. I first saw her at 2030 hours when she was unconscious and responding only to painful stimuli. She developed further clonic spasm with compromised airway 5 minutes later – which settled with 4mg of Valium."

Miss C was admitted to ICU where she was ventilated overnight and stabilised. On admission she was oedematous with marked papilloedema. Bloods taken showed severe hyponatraemia (low sodium levels). The plan was to sedate her, ventilate her, restrict her intravenous fluids, and review her blood electrolytes. On 19 October 1999, paediatrician Dr R noted the following after his ward round: "Post op hyponatraemia. 3.0 litres of solution given over nine hours." Dr R recorded that he discussed with Miss C's family "current problems and therapies described. Aetiology [causal event] not discussed." A CT scan of Miss C's head done later that day revealed no cerebral oedema.

Miss C was transferred to the ward on 20 October and was well enough to be discharged on 21 October 1999. Miss C had some residual ataxia (unsteady gait) on discharge.

Mr and Mrs B informed me that Miss C is healthy now but has put on a very large amount of weight and they are concerned about the long-term consequences for her.

Independent advice to Commissioner

Anaesthetic advice
An independent anaesthetist, Dr Ian Campbell, provided the following expert advice:

"Having read thoroughly all the documents before me concerning the above complaint, I feel that I can answer the questions you have posed. I will take each one in the order you have set them out.

1. The anaesthetist is responsible for prescribing the flow rate of a drip set up in theatre.

2. The drip in theatre was regulated by means of a variable aperture clamp. The drip rate is regulated by knowing that the drip set allows 20 drops/ml, and the clamp pressure is adjusted to the rate prescribed by the anaesthetist in the theatre. This method is the norm in both adult patients and also in older children. This also was in accordance with [Dr E's] preference sheet, as it states he requires a 'Buretrol' set only in children under age 3 years, in order to regulate the flow more accurately for the smaller volumes required for these children, when used in the operating theatre. This practice is acceptable because both the anaesthetist and his assistant are closely, and constantly observing the flow rate as part of their in theatre monitoring of the patient. Once a patient leaves the theatre, and no longer has 'one on one' care, to ensure correct flow rates of the prescribed fluid, it is easier, safer and more accurate to change to other measures to regulate the flow.

3. There are 3 main broad methods for regulating flows of drips:
   a. The standard drip set with adjustable clamp.
   b. A 'Buretrol' set allowing a maximum volume to be delivered and no more than that, then the chamber has to be refilled thus allowing regular checking of the delivered totals and ensuring the rate of flow, over a defined time, is accurate.
   c. A mechanical device programmed to deliver a preset amount of fluid at a defined rate over a certain time period.

4. Close monitoring of the flow rate is a crucial part of total patient care. The frequency of checking of the flow rate should be in accordance with the prescribed rate ie if the rate prescribed is 80mls/hour then each hour the drip should be checked to determine that the prescribed rate has been delivered appropriately. The nurse responsible for the care of the patient has checking the drip rate and volume delivered, as part of her duties when caring for his/her patient. In this case the flow rate prescribed and the fluid volume delivered were not in accordance.

5. At 13:00 and 17:00 when a new bag of fluid was started, the nurse changing the bags of fluid should indeed have made a mental note of both the volume delivered and the time over which such volume had been delivered, to ensure that they matched the fluid prescription, as set down by the anaesthetist on the fluid chart.

6. [Dr E] prescribed IV Phenergan over the phone as an anti-emetic for the patient, because it has anti-emetic properties and he was continuing the same drug that he had given in theatre, knowing that she had had no problems with it earlier.

7. Stemetil is a standard anti-emetic which can produce dystonic reactions as a side effect. These take the form of involuntary muscle spasms and often strange upward rolling of the eyes. In the circumstances, this diagnosis would have to be high on the differential list, since the patient had just received the drug and this reaction has a quick and easy solution. In addition this was the major information given to those attending the emergency bell call so their efforts were directed towards a drug effect.

8. Cogentin is a specific antidote to dystonic reactions to Stemetil, and was correctly administered when the diagnosis of a dystonic reaction was entertained.

9. Certainly when [Dr E] was contacted, at 17:15, there should have been a brief review of all aspects of her management, including vital signs, temperature, nausea/vomiting, drugs thus far, and her fluid balance. When a phone contact is made often only information pertaining to the immediate problem is discussed, and in this situation the pressing problem was the presumed reaction to Stemetil.

10. Taking point 9 above into account, [Dr E's] decision to prescribe more Cogentin, was in accordance with standard practice as the dystonic reactions may require repeated doses to stop the reactions.

11. The Valium IV was administered to stop the child fitting. This was the correct choice of drug in view of the clinical diagnosis Dr E made when he saw the child's fitting in front of him. He realised immediately he saw the fits that this was more than a dystonic reaction and required Valium to terminate the fit and then arrange her transfer to the ICU.

12. [Dr E's] standard of care in this case is acceptable, given the circumstances. I shall explain further. He prescribed his usual post op regime for the child with regard to fluid administration and analgesia, then left the care of the child with the ward nurses, and presumabl[y] went to another hospital to give anaesthetics for another list. He was contacted by phone and responded appropriately for the request for an anti-emetic when the nursing staff reported ongoing vomiting. His response to give a further dose of Cogentin was the correct response to a diagnosis made by other medical practitioners. He was not able to examine the patient until he had finished his other operating list, but when he did it was clear that the original diagnosis was in doubt and his course of action from then on was in accordance with good professional practice.

    The difficulty arises with reported information by the phone, unless a systematic and complete approach is made when the nursing staff report information over the phone, important extra information can be missed. It is always easier to review all the information on the charts and by looking at the patient, obviously, if you attend

in person. In this instance he was unable to attend in person, which by the way is often the case, when anaesthetists work in different locations, and had to rely on reports, concerning the most pressing issue at the time of each phone call. A longer detailed review is often more difficult to perform, as when the anaesthetist is phoned, he is often in another operating theatre looking after another patient and therefore has a double responsibility and requires therefore to make quick calls so as not to be too distracted from the job in hand.

13. The cause of the patient's symptoms initially was of the common problem of postoperative nausea and vomiting. However on review of the details of the fluid administered, she received over the first 2½ hours, 1000mls of fluid instead of the prescribed 200mls at the rate of 80mls/hr. This fluid continued to be administered at the increased volume (almost 3000mls was given to the child instead of the 800mls prescribed over a 10 hour period), thus giving rise to fluid and water overload leading to hyponatraemia. Hyponatraemia is a blood diagnosis when the serum sodium falls below a lab-defined value; the clinical picture is of drowsiness, general swelling including the brain, leading to abnormal movements and ultimately convulsions. The commonest cause is, as in this instance: – fluid overload, in the form of dextrose solutions, ie the dextrose saline that was given here.

14. The IV policy which the hospital had in place at the time of this case, was in accordance with good clinical practice, in that it requires that all patients under 50kg must have a Buretrol or Floguard infusion pump to regulate accurately the amount of fluid given. Even when the older policy read children < 10 years also required the Buretrol or Floguard, it was in accordance with good clinical practice.

    It is unfortunate but clear that because the IV policy was not followed, this child received much more that the prescribed fluid regime, she became fluid overloaded and thus hyponatraemic.

    In each of the 5 hospitals that I regularly work in **all** patients returning to the wards with IV fluid running have either a Buretrol or Floguard pump in place to accurately regulate their fluid administration."

Nursing advice
An independent nurse, Ms Glennis Birks, provided the following expert advice:

"**Responsibility for setting up and regulating flowrate of drip**

- The drip was set up in theatre by the anaesthetist [Dr E] with the assistance of RN [Mr F]. The drip set up was a continu–flow system and [Dr E] was responsible for the flowrate whilst [Miss C] was in theatre. [Dr E] was also responsible for ordering the amount of intravenous fluid [Miss C] was to receive following the operation. He ordered 80mls per hour to be given to [Miss C] and whoever took over her care following the surgery was responsible for checking that the correct amount was delivered per hour. Flowrates on a continuous flow system are calculated as drops per minute and the nurses taking over the care of [Miss C] were

responsible for counting the drip rate on a regular basis and changing it to the required rate so that the correct amount of fluid was delivered to [Miss C].

- [Miss C] was received in Recovery by [Ms G] who states in her letter to the Commissioner that she monitored [Miss C] and manually adjusted the drip rate to ensure it was running at the prescribed rate. As [Mr O's] letter to the Commissioner states that the ward nurse who received [Miss C] from Recovery estimated that approximately 200mls had been administered in theatre and recovery, it is my opinion that [Ms G] monitored [Miss C] and the drip in a manner that met professional standards of practice. It is often necessary during an operation to administer fluid at flexible rates to maintain blood pressure and to administer drugs and as only 200mls had been used it would seem that for the hour [Miss C] was in recovery she was administered the appropriate amount of fluid.

- [Miss C] was returned to the ward at 11.30am approximately and responsibility for her care was taken by Ms I who notes in her letter to the Commissioner that she did not check the drop rate as '… I assumed it to have been set in recovery …'. Managing intravenous infusions (drips/drops) at the prescribed rate is a nursing responsibility and because many factors can affect the flow rate, the drip does not necessarily continue to run at the rate originally set. The nurse must therefore monitor drips frequently (15-30 minute intervals) to ensure that the fluid is running at the intended rate (Brunner and Suddarth). In my opinion [Ms I] did not exercise reasonable skill or care in the monitoring and regulation of [Miss C's] drip and therefore did not meet NZ Nursing Council standards in relation to performing [Miss C's] care in a way that was safe (NZ Nursing Council, 1999, 4.5, 4.6, 4.7, 4.8).

- When the afternoon shift commenced at 1445 hrs, [Ms K] assumed responsibility for [Miss C's] care. [Ms K] notes in her letter to the Commissioner that she commenced the third litre of fluid at 1745 hrs. This meant that [Miss C] had received 2 litres of fluid over seven and a half hours approximately when [Dr E] had instructed the nurses that [Miss C] was to receive 80mls of fluid an hour. [Ms K] notes, '… that it was not obvious to me that this was the third bag of fluid … I also failed to chart it on the fluid balance chart'. It is my opinion therefore that [Ms K] did not exercise reasonable skill or care in the monitoring and regulation of [Miss C's] drip and therefore did not meet Nursing Council's standards of ensuring effective and safe nursing care for [Miss C] (NZ Nursing Council, 1999, 4.5, 4.6, 4.7, 4.8).

- [Mrs M] took over [Miss C's] care at 1745-1800hrs and provided one on one nursing care. She noted that the drip was going fast so turned it down and requested an infusion pump. There was a delay in receiving this and by 2030hrs when the Cogentin infusion was ordered [Miss C] had received another 700mls (approximately) of fluid over 2hrs and 45 minutes. This means that over that time, [Miss C's] drip was running at approximately 250mls per hour. It is my opinion therefore that [Mrs M] did not exercise reasonable skill or care in monitoring and regulating [Miss C's] drip and therefore did not meet Nursing Council's standards of

ensuring effective and safe nursing care for [Miss C] (NZ Nursing Council, 1999, 4.5, 4.6, 4.7, 4.8).

Regulation of Drips

- Drips work by gravity flow and the rate of flow may be regulated by clamps on the tubing which are tightened or loosened to adjust the flow rate or by infusion pumps which are designed to provide constant but adjustable flow of solutions given intravenously. Pumps usually work by applying intermittent pressure on the drip tubing and provide more accurate administration of fluids and medications than is possible with gravity flow set-ups. The use of calibrated burettes can help ensure that the prescribed hourly amount of fluid is administered. Burettes are filled with the amount of fluid to be given each hour and set at the appropriate drip rate. This requires the nurse to fill the burette on an hourly basis and therefore decreases the likelihood of administering too much fluid. [Miss C's] drip was a continuous gravity flow with an adjustable clamp on the tubing. Because of the difficulty of maintaining the flow at a constant rate with this type of set-up, it is my opinion that [Miss C] needed either a burette or pump or both. I note on Page 2, no 2 of the [private hospital's] Intravenous Policy in operation at the time of [Miss C's] surgery, that 'children < 10 years to have Burette or Floguard'. It is my opinion therefore that the nurses caring for [Miss C] did not meet professional standards of practice. This particularly applies to the ward staff who cared for [Miss C] as she was restless and vomiting and this increases the likelihood of the drip rate varying. According to NZ Nursing Council (1999, 6.6) nurses are required to administer interventions, treatments and medications within legislation, codes, … and according to authorised prescription, established policy and guidelines.

Importance of Flow Rates

- Flow rates determine the amount of fluid delivered to the patient and it is therefore a critical component of patient safety that the flow rate is accurate. Flow rates are calculated in drops per minute and the nurse who is caring for the patient is responsible for ensuring the accuracy of the flow rate. With the continuous flow set-up of [Miss C's] drip it would be possible for an entire litre of fluid to run through very rapidly so it was extremely important that her drip was monitored at 15-30 minute intervals and that the inline burette or infusion pump was used to decrease the likelihood of administering too much fluid. The use of burettes and infusion pumps is not a guarantee of safety and when these are used they also require monitoring on an hourly basis at least (Brunner & Suddarth, 2000; Ashwill & Drosk, 1997). Factors such as movement, position of the limbs and of the patient can all affect the flow rate of a drip and as [Miss C] was fitting in the evening this could affect the flow rate also. It is my opinion that the nurses should have been checking the flow rate on a regular and frequent basis as described above and should have also checked and reset the flow rate at the times the bags of fluid were changed.

Overall Nursing Care provided to [Miss C]

- From the [private hospital's] medical records and from letters to the Commissioner from [Ms I] and [Ms K] it would appear that both [Ms I], [Ms K] and [Mrs M] provided appropriate care to [Miss C] in relation to her physiological recordings, in noting her ongoing vomiting and consulting with medical staff about alleviating this. When [Miss C] started fitting she was treated appropriately, in consultation with medical staff. Extra staff were made available to provide one-to-one care for [Miss C].

- As noted above, it is my opinion that the nursing staff did not monitor or regulate [Miss C's] drip adequately with the result that she was given 2700 – 3000mls of fluid over nine hours approximately which resulted in her developing hyponatraemia and cerebral oedema.

- [Ms I] notes in her letter to the Commissioner that she did not record the commencement of the second litre of fluid at 1300 hours on [Miss C's] fluid balance sheet. [Ms K] also notes in her letter to the Commissioner, that she failed to note on the fluid balance chart that she had commenced another litre of fluid at 1745 hours. [Mrs M] commented to [Dr E], that the drip had been going fast so she had slowed it down. As the fluid balance chart had not been completed accurately and there is no record of the nurses being aware of the total amount of fluid [Miss C] had received, it would appear that [Dr E] was not given accurate information about the total amount of fluid [Miss C] had received. In my opinion this does not meet professional standards of documenting appropriate nursing information and communicating this to other team members (NZ Nursing Council, 1999, 9.6).

[The private hospital's] Intravenous (IV) Policy

- The [private hospital's] IV Policy that was in use at the time of [Miss C's] surgery clearly states in section two that all ward patients are to have a burette on line if being given additives. Over the course of the day, whilst in the ward, [Miss C] had several additives to her drip, including Phenergan and Cogentin and no burette was put in place. The policy also states that children under 10 years of age are to have a burette or Floguard in place. It is my opinion that if the nurses had adhered to this policy then it is unlikely that [Miss C] would have received too much fluid and developed hyponatraemia and cerebral oedema.

- I note that the policy has been updated to state that all patients under 50kgs must have a Buretrol or Floguard Infusion pump. Whilst this has strengthened the requirement for using a Buretrol or an infusion pump, it is my opinion that the policy in place at the time of [Miss C's] surgery was detailed enough to ensure the safe administration of intravenous fluids and medication to a child in a ward.

Summary

- In my opinion, [Ms I], [Ms K] and [Mrs M] did not meet NZ Nursing Council Competencies for Entry to the Register of Nurses (1999: 4.5, 4.6, 4.7, 4.8), because they did not adequately monitor or regulate [Miss C's] drip and as a result she received 2,700 – 3000mls of fluid over nine hours instead of the prescribed 720mls for that time period.

- In my opinion, [Ms I], [Ms K], and [Mrs M] did not meet NZ Nursing Council Competencies for Entry to the Register of Nurses (1999: 6.6) as they did not adhere to [the private hospital's] Intravenous Policy. It is my opinion that had this policy been adhered to, the risk of [Miss C] receiving too much fluid would have been minimised.

- In my opinion, [Ms I], [Ms K], and [Mrs M] did not meet NZ Nursing Council Competencies for Entry to the Register of Nurses (1999: 9.6) as they did not document accurate information about the amount of fluid [Miss C] had received and there is no evidence that they communicated this information to medical staff treating [Miss C].

- In my opinion [the private hospital's] Intravenous Policy at the time of [Miss C's] surgery was appropriate and provided adequate safeguards for the administration of intravenous fluids to children in the wards, if nursing staff adhered to it."

Further advice provided

Additional nursing advice
At the time she provided the above advice, my nurse advisor, Ms Glennis Birks, did not have Mrs M' response to the complaint. After reviewing Mrs M's response, my advisor provided the following additional advice:

> "I have considered [Mrs M's] response and note that she had been an Enrolled Nurse and undertaken a programme to attain comprehensive nurse registration. She states that she registered in June 1999 and this incident occurred in October 1999. I am unsure whether she sat NZ Nursing Council Examinations in March 1999 or November 1998. Regardless, if she claims registration in June 1999, as per your facsimile, then she needs to meet standards for beginning practitioners as per my previous opinion. If she was still an Enrolled Nurse at the time she took responsibility for [Miss C's] care then the hospital had a responsibility to provide her with supervision. Enrolled Nurses have to work under the supervision of Registered Nurses as per the Nurses Act. If [Mrs M] was a newly Registered Nurse, then it is my opinion that [the private hospital] should not have put a new graduate nurse in the position of 'specialling' a child as critically ill as [Miss C] was when she took over her care. Newly registered nurses need to be in

'intern roles' for their first year of practice (see NZ Nursing Council Review of Nursing Education, 2001)."

My nurse advisor was also asked to comment on whether the recovery ward could be properly regarded as a theatre setting. My advisor advised that it was, as in the recovery ward one-on-one nursing care is provided and medical staff are present, whereas in the ward setting there is not a one-on-one patient to nurse ratio. Ms Birks advised me that on transfer from recovery to the ward the onus is on the ward nurse receiving the patient into the ward to check the fluid balance chart as part of her duties. The fluid balance chart records exactly when the bag was put up and the nurse should check that the drip was running at the prescribed rate. It was a nursing duty to check that the drip is regulated in accordance with the private hospital's protocol.

My advisor commented that it was a nursing duty to check that the drip was regulated in accordance with the private hospital's protocol. In this case there was a clear policy requiring all ward patients under ten years of age to have a Buretrol. She commented that this is a requirement that a nurse would expect and that the private hospital had a right to expect that a nurse would know this and would follow the protocol.

My advisor explained that on acceptance of Miss C into the ward, the nurse should have checked that they had the correct IV set-up and that the drip was running at the prescribed rate. Ms Birks considered that the private hospital's IV Policy was adequate, but in Miss C's case the nurses involved did not follow it.

Code of Health and Disability Services Consumers' Rights

The following Rights in the Code of Health and Disability Services Consumers' Rights are applicable to this complaint:

RIGHT 4
Right to Services of an Appropriate Standard

1) *Every consumer has the right to have services provided with reasonable care and skill.*
2) *Every consumer has the right to have services provided that comply with legal, professional, ethical, and other relevant standards.*

Other Relevant Standards

Nursing Council of New Zealand: Guidelines for Competence-Based Practising Certificates for Registered Nurses, (June 1999)

"4.0 Management of Nursing Care

The applicant manages nursing care in a manner that is responsive to the client's needs, and which is supported by nursing knowledge.

Generic Performance Criteria

The applicant:

…

4.6 Obtains, documents and communicates relevant client information.

…

4.6 Uses professional judgement, including assessment skills, to assess the client's health status and to administer prescribed medication and/or to consult with the prescribing practitioner and/or refer client to other health professionals.

4.6 Prioritises nursing actions to ensure effective and safe nursing care.

4.7 Performs all nursing interventions safely recognising contextual factors, while demonstrating effective time management skills.

4.8 Administers and monitors the effect of prescribed interventions, treatments and medications within a framework of current nursing knowledge and knowledge of pharmacology, physiology, pathophysiology, pharmacodynamics and pharmacokinetics.

…

6.0 Legal Responsibility

The applicant practises nursing in accord with relevant legislation and upholds client rights derived from that legislation.

…

6.6 Administers interventions, treatments and medications within legislation, codes, scope of practice and according to authorised prescription, established policy and guidelines.

…

9.0 Interprofessional Health Care

The applicant promotes a nursing perspective within the interprofessional activities of the health team.

Generic Performance Criteria

The applicant:

…

9.6 Documents appropriate nursing information and communicates this to the other team members."

The private hospital's IV Policy

Mr O sent me a copy of the private hospital's IV Policy in place at the time of Miss C's operation. The relevant part of that policy regarding IV therapy and IV additives is as follows:

"…

It is the policy of [the private hospital] that the registered nurse under the direction of the medical officer adheres to the procedures set out below to ensure safe administration of intravenous therapy. …

2. ASSEMBLING IV LINE FOR USE

- All ward patients must have a Burette on line if being given additives.
- Children < 10 years to have Burette or Floguard
- Close off clamps on giving set
- Invert bag
- Hang on IV pole
- Open Burette clamp and fill to desired level
- Pinch drip container to half fill with fluid
- Open giving set clamp
- Hold tubing over receptacle and allow 5-10mls fluid to be expelled
- Close drip regulator
- Insertion of IV cannula
- Shave injection site as needed
- Swab site
- Cannula inserted by doctor (L.A. available on trolley)
- Secure infusion site with tape / IV op site
- Bloods may be taken for laboratory testing if required at this time
- Giving set is connected to cannula
- Infusion commenced at required flow rate
- Splint and bandage if needed

Notes:
1. Never leave rate control fully open unless instructed by doctor in which case closely observe patient
2. Record fluid type rate and commencement time on fluid balance & IV check forms
3. IV site to be examined for signs of inflammation, 8 hourly

4. INTRODUCTION OF IV ADDITIVES.

To be checked by 2 R/Ns, 1R/N and 1E/N or 1 R/N and Dr

a) The nurse responsible for patient must make herself aware of:
- All the pharmacological interactions of drugs in solution
- All potential sources of contamination
- Correct flow rates
- Potential complications and treatment of same
- Recommended mode of delivery as outlined in IV drugs book

b) If it is the patient's first dose of antibiotic (Check OT record) it must be given by a doctor who must remain on the premises long enough to resuscitate patient in event of an anaphylactic reaction
c) Check correct drug and dose against yellow medication chart and prepare solution. Use interlink vial access cannula when able
d) Identify patient by checking name, number and drug against yellow medication chart
e) Check IV site, clean rubber bung using 'Steret' then start introducing the drug. If into Burette attach additive sticker to Burette, open airway and close top clamp change settings on Floguard to accommodate altered VTBI. Note: If into bag, attach additive sticker to bag, gently swirl bag to mix. If into side arm of drip, have fluid running briskly to dilute drug and run through 10mls after dose to flush line.
f) On completion of administering IV drugs
- Check flow rate and remove additive label
- Record the drug given on medication chart

…"

Changes made since this incident
Since the incident with Miss C, the private hospital has reviewed its IV Policy and made a number of changes. Ms P, Director of Nursing at the private hospital, advised me:

"**2.0 ASSEMBLING IV LINE FOR USE**

The words 'Children < 10years to have Burette or Floguard' was deleted. This was replaced with the wording 'All patients under 50kg' to have a Buretrol or Floguard Infusion Pump."

Further changes were made in 1999. Of relevance was the underlining for emphasis of the following instruction:

"**2.0 ASSEMBLING IV LINE FOR USE**

- All ward patients must have a Buretrol on line if being given additives."

Opinion: No breach – Dr D

Right 4(1)

In my opinion Dr D did not breach the Code of Health and Disability Services Consumers' Rights.

IV drip
On 18 October 1999, ear, nose and throat surgeon Dr D performed a routine adenotonsillectomy on nine-year-old Miss C. Just before her operation Miss C was put on an intravenous drip of dextrose saline and given oral Phenergan as a pre-med. Dr D played no part in the setting up or regulation of the IV dextrose saline drip, and is not responsible for the error that occurred.

Diagnosis of dystonic reaction to Stemetil
Dr D checked on Miss C about 3.00pm. Despite the Phenergan that had been administered at midday, Miss C's vomiting had failed to settle. Dr D prescribed another anti-emetic, Stemetil. My anaesthetist advisor informed me that Stemetil is a standard anti-emetic to settle vomiting in a child after surgery. It is uncertain exactly when Miss C had the Stemetil as the notes record 3.00pm but Ms I said that she administered the Stemetil about 3.30pm just prior to going off duty.

Dr D was contacted again when Miss C fitted. It is unclear precisely when Miss C had her first fit but Ms K, the afternoon nurse, heard the three-bell emergency alarm on her return from the high dependency unit at about 5.00pm.

When Dr D arrived in the ward at about 5.15pm, an anaesthetist, Dr L, was attending Miss C. Dr L had diagnosed that Miss C was having a dystonic reaction to Stemetil. Dr D agreed with this diagnosis and Miss C was given an antidote, Cogentin.

My anaesthetist advisor informed me that Stemetil can produce dystonic reactions as a side effect. These reactions take the form of involuntary muscle spasms and often strange upward rolling of the eyes. In the circumstances, a dystonic reaction to Stemetil would have to be high on the differential diagnostic list, since Miss C had just received the drug. I am advised that Cogentin was an appropriate and specific antidote for dystonic reactions to Stemetil, and was correctly prescribed in response to the diagnosis of a dystonic reaction.

I am guided by my expert advice that the diagnosis of a dystonic reaction to Stemetil was reasonable in the circumstances. Following his initial diagnosis, Dr D played no further part

in Miss C's care that day. In my opinion Dr D provided surgical services to Miss C with reasonable care and skill and did not breach Right 4(1) of the Code.

Opinion: No breach – Dr E

Right 4(1)

IV Drip
Dr E, as anaesthetist, was responsible for prescribing the flow rate of the drip set up in theatre, and for prescribing a flow rate prior to transfer to the recovery ward. In preparation for the operation, Dr E commenced Miss C on IV fluids. Miss C's drip set was a continuous flow set which is regulated by means of a variable aperture clamp. By this method the drip rate is manually regulated by staff who adjust the clamp to run at the prescribed rate. The rate is able to be calculated as 20 drops equals 1.0ml of fluid.

The private hospital's IV policy in place at the time of Miss C's surgery required that "children < 10 years to have a Burette or Floguard". I have been advised that this policy is flexibly applied in the theatre because of the close monitoring in that setting and possible changes to flow rate that may be required during an operation. Theatre staff keep preference sheets for each anaesthetist who operates at the private hospital. Dr E's preference sheet required a Buretrol set only in children under three years old, in order to regulate the flow more accurately for the smaller volumes required for these children.

My anaesthetist advisor informed me that the continuous flow method is the norm in both adult patients and older children. This practice is acceptable because both the anaesthetist and his assistant are closely and constantly observing the flow rate as part of in-theatre monitoring of the patient.

Dr E prescribed his usual post-op regime for Miss C with regard to fluid administration (80ml per hour) and analgesia. Miss C was then transferred to recovery, and subsequently to the ward, where nursing staff took over the responsibility for monitoring the drip at the rate prescribed by Dr E. There is no evidence that Miss C was administered more than the prescribed amount of fluid while in the care of Dr E. On Miss C's transfer to the recovery room, and the ward, it was reasonable for Dr E to assume that the drip was running at the rate he prescribed.

My anaesthetist advisor considered that Dr E's standard of care in relation to the setting up of the IV drip was acceptable. I am guided by my expert advice. Accordingly, in my opinion, Dr E did not breach right 4(1) of the Code.

Diagnosis of dystonic reaction to Stemetil
The ward nurse, Ms I, contacted Dr E about 12 midday when Miss C started vomiting. Dr E ordered Phenergan to be administered as an anti-emetic in order to settle her vomiting. My anaesthetist advisor considered this was acceptable as Dr E was continuing the same

drug that he had given Miss C in theatre, knowing that she had experienced no problems with it earlier.

Dr E was not involved in the initial diagnosis of dystonic reaction to Stemetil, made by Dr L and Dr D. However, on the afternoon shift, Ms K contacted Dr E and informed him that Dr D and Dr L had attended to Miss C and diagnosed a dystonic reaction to Stemetil.

Dr E was contacted by Mrs M again shortly after she arrived to special Miss C at about 6.00pm. At that time, Dr E verbally ordered more Cogentin to be given. The drug chart records that 0.4mg of Cogentin was administered intravenously at 6.29pm. About 7.30pm, after Miss C had fitted again, Mrs M contacted Dr E once more and he arranged for a further dose of Cogentin to be given. The drug chart records that a reduced dose (0.1mg) of Cogentin was administered intravenously at 7.30pm.

My anaesthetist advisor considered that Dr E's decision to prescribe further Cogentin when Miss C's fits continued was in accordance with standard practice as dystonic reactions may require repeated doses. My advisor also informed me that Dr E's order for a further dose of Cogentin was the correct response to the diagnosis made by other medical practitioners, having regard to the information relayed to him over the telephone by Mrs M.

When Dr E arrived at 8.30pm, Miss C appeared to be in a post-ictal state and unconscious. While he was examining her she had an epileptic type seizure and Dr E decided to transfer her to the Intensive Care Unit at the public hospital. At 8.45pm, prior to transferring Miss C to the public hospital, Dr E prescribed IV Valium to stop her fitting. My anaesthetist advisor considered that Valium was the correct choice of drug. My advisor also noted that when Dr E did examine Miss C, it was clear to him that the original diagnosis was in doubt, and that his course of action from then on was in accordance with good professional practice.

I am guided by my expert advice. I accept that Dr E acted in accordance with good professional practice in his management of Miss C's condition. He responded appropriately to the information relayed to him by telephone by the ward nurses, and responded appropriately when he physically examined Miss C later that evening. Accordingly, in my opinion Dr E provided anaesthetic services to Miss C with reasonable care and skill and did not breach Right 4(1) of the Code.

Opinion: No breach – Mr F

Rights 4(1) and 4(2)

In my opinion Mr F did not breach the Code.

Mr F set up Miss C's drip in theatre under the guidance of the anaesthetist, Dr E. Dr E prescribed the rate of IV fluid to Miss C at 80mls per hour. The IV was assembled by Mr F

with a continuous flow set and was not regulated with either a burette or an infusion pump. My anaesthetist advisor noted that this was in accordance with Dr E's preference sheet, which stated that he required a Buretrol set only in children under the age of three years. My anaesthetist advisor considered that this practice was acceptable, as discussed above. Mr F informed me that at the time it was normal practice for the anaesthetic nurse to assemble the IV line with a continuous flow set unless otherwise ordered by the doctor or if the child was an infant.

Mr F set up the IV drip in accordance with hospital policy and nursing guidelines, according to Dr E's preference. There is no evidence that Miss C was administered more than the prescribed amount of dextrose saline while in the care of Mr F. In my opinion, Mr F provided nursing services to Miss C with reasonable care and skill, and in compliance with relevant standards, and did not breach Rights 4(1) and 4(2) of the Code.

Opinion: No Breach – Ms H

Rights 4(1) and 4(2)

In my opinion Ms H did not breach the Code.

Ms H was involved in Miss C's care on her transfer from theatre to the recovery room. On transfer, Dr E prescribed Miss C's IV flow rate at 80mls/hr. Both my advisors informed me that monitoring the drip at the prescribed rate is a nursing responsibility.

My anaesthetist advisor considered that once a patient leaves the theatre setting, and no longer has one-on-one care, it is easier, safer, and more accurate to change from a continuous flow rate, to other measures to regulate the flow of IV fluid. However, my nursing advisor informed me that the recovery room can be considered as part of the theatre setting because of the close monitoring of the patient (one-on-one) that occurs there. In this respect, I accept that it was reasonable for the nurses in the recovery room (Ms H and Ms G) to continue manually regulating the IV flow with a continuous flow set.

Ms H assisted with the immediate preliminary procedures that all patients receive while in recovery. She recalled checking the intravenous line and altered the flow rate by reducing it to accommodate the requirements charted by Dr E. Ms H was then required to receive another patient from the operating theatre and had no further involvement with Miss C.

The evidence suggests that Miss C received the appropriate amount of fluid while in the care of Ms H. Accordingly, in my opinion Ms H provided nursing services to Miss C with reasonable care and skill, in compliance with relevant standards, and did not breach Rights 4(1) and 4(2) of the Code.

Opinion: No breach – Ms G

Rights 4(1) and 4(2)

In my opinion Ms G did not breach the Code.

Together with Ms H, Ms G was on duty in the recovery room the morning that Miss C underwent her adenotonsillectomy. Ms G said Miss C's IV drip ran at the prescribed rate of 80mls per hour during her time in recovery. Ms G said the drip rate was a continuous flow set and was regulated manually by herself and Ms H and maintained at the prescribed rate. Both she and Ms H shared responsibility for Miss C's care during this time, apart from relieving each other for morning tea.

The theatre setting use of a continuous flow IV set was appropriate in the recovery room setting. Furthermore, the evidence suggests that Miss C received the appropriate amount of fluid while in the care of Ms G. Accordingly, in my opinion, Ms G provided nursing services to Miss C with reasonable care and skill, in compliance with relevant standards, and did not breach Rights 4(1) and 4(2) of the Code.

Opinion: Breach – Ms I, Ms K and Mrs M

Rights 4(1) and 4(2)

Miss C arrived in the hospital ward at 11.15am, with instructions from Dr E that she receive fluid at the rate of 80mls/hr. My anaesthetist advisor stated that close monitoring of IV flow rate is a crucial part of total patient care. Both my advisors informed me that monitoring IV fluids at the prescribed rate is a nursing responsibility.

When Miss C was transferred to the ward, her fluids were being administered by a continuous flow set. Many factors can affect the flow rate, and the drip does not necessarily continue to run at the rate originally set. My nursing advisor informed me that the nurse must therefore monitor the drip frequently (15-30 minute intervals) to ensure that the fluid is running at the prescribed rate. My nursing advisor also stated that in her opinion, because of the difficulty of maintaining the flow with a continuous flow set, Miss C needed either a burette or a pump or both to regulate her fluid administration. My anaesthetist advisor stated that once a patient has left the theatre setting, it is easier, safer, and more accurate to change to other measures to regulate the flow.

The private hospital's policy required all ward patients to have a burette on line if being given additives, and children under the age of ten to have a burette or Floguard. The private hospital's policy also stated that the fluid type, rate and the time fluid is commenced is to be recorded.

The Nursing Council standards cited by my nursing advisor state that nurses must document appropriate nursing information and communicate this to the other team members; and that nurses must administer and monitor the effect of prescribed interventions, treatments and medications in accordance with current nursing knowledge, the authorised prescription, and established policy and guidelines.

Ms I
In my opinion Ms I breached Rights 4(1) and 4(2) of the Code.

Ms I assumed responsibility for Miss C's care when she was first received into the ward at approximately 11.15am. On Miss C's arrival into the ward, Ms I noted that she was on an unregulated continuous flow IV drip of dextrose saline and that the rate prescribed by Dr E in theatre was 80mls/hour. She could not recall how much IV fluid had been administered to Miss C when she arrived in the ward, but estimated about 200mls as the bag appeared "near full". Ms I did not check the drop rate, as she assumed it had been set in recovery. In my opinion such an assumption was careless and unacceptable.

Ms I failed to monitor Miss C's IV drip from the time of her arrival in the ward to ensure that it was running at the prescribed rate of 80mls/hour. My nursing advisor considered that when Miss C was returned to the ward she needed either a burette or pump or both to ensure fluids were administered at the correct flow rate. At the time the private hospital's IV protocol required children less than 10 years of age to have a burette or Floguard pump. Miss C was nine years old. My nursing advisor considered that in regard to her monitoring of Miss C's IV infusion, Ms I did not meet professional standards of practice, and did not act in accordance with Nursing Council standards or hospital policy. Had the hospital policy been adhered to, the risk of Miss C receiving too much fluid would have been minimised.

Ms I did not chart that she had commenced a second bag of fluid at 1.00pm. This meant that there was no written information or guidance for the nurses on the afternoon shift to draw their attention to the amount of IV fluid that Miss C had been given. This was an unacceptable omission by Ms I. Her failure led to serious consequences for Miss C's health, and contravened Nursing Council standards and the hospital policy.

At 1.00pm, Ms I administered 10mg IV Phenergan to Miss C by slow injection into a port in the IV line. I accept that the Phenergan was not to be administered via a burette. However, the private hospital's IV protocol clearly required all ward patients being administered additives to have a burette on line. The Phenergan was an additive, and in my opinion there should have been a burette on line, regardless of the mode of its administration.

I am guided by my expert advice that Ms I did not exercise reasonable care and skill, and acted in contravention of the Nursing Council standards and hospital policy. First, Ms I failed to check that Miss C's drip was running at the rate prescribed by Dr E, on her arrival in the ward. Secondly, Ms I failed to adequately monitor Miss C's drip. Thirdly, Ms I failed to chart the second fluid bag. Finally, in spite of IV Phenergan, an additive, being

administered to Miss C, Ms I failed to ensure that there was a burette on line. In these circumstances, Ms I breached Rights 4(1) and 4(2) of the Code.

Ms K
In my opinion Ms K breached Rights 4(1) and 4(2) of the Code.

Ms K was on the afternoon shift on 18 October 1999. At handover Ms I informed her of Miss C's continual vomiting and that IV Stemetil had been given at 3.00pm.

Ms K visually monitored the IV rate and believed it to be running at about 80mls/hour. She failed to notice that there was no burette or Floguard pump in place. I am not satisfied that during the afternoon Ms K monitored the IV drip with reasonable care and skill. Had she done so, she would have noticed that the drip was running at a much greater rate than 80mls/hour.

At 5.15pm, after a fit, Miss C was diagnosed with a dystonic reaction to Stemetil, and at 5.35pm Dr L administered Cogentin. When Miss C convulsed again, Ms K administered another dose of Cogentin at 6.29pm, via the side arm of Miss C's drip. I accept that this method of administration was in accordance with the *Notes on Injectable Drugs* (New Zealand HealthCare Pharmacists' Association, 4th ed). However, the private hospital's IV protocol clearly required all ward patients being administered additives to have a burette on line. In my opinion, there should have been a burette on line, regardless of how the additives were being administered.

At approximately 6.00pm, Ms K replaced the second empty bag of dextrose saline. It was not obvious to her that this was the third bag of fluid to be put up, as the fluid balance chart had not been filled out since the initial bag had been recorded in theatre. In her haste she also failed to chart this third bag on the fluid balance chart. By failing to document that the third bag of IV fluid had been set up, Ms K failed to comply with Nursing Council standards or hospital policy.

By failing to adequately monitor Miss C's drip, ensure there was a burette on line when additives were being administered, and to document the third bag of fluid, Ms K did not provide nursing services to Miss C with reasonable care and skill, and acted in contravention of hospital policy and Nursing Council standards. Had the policy and guidelines been adhered to, the risk of Miss C receiving too much fluid would have been minimised. In these circumstances, Ms K breached Rights 4(1) and 4(2) of the Code.

Mrs M
In my opinion Mrs M breached Right 4(1) and 4(2) of the Code.

Mrs M was called in at about 6.00pm to provide special care to Miss C. On arrival Mrs M noticed that Miss C had an IV drip in place and recalled that the drip was unregulated and was running quite fast. She estimated that, at the time, approximately 500mls of the IV dextrose saline had been infused. After she had changed Miss C, who had been incontinent of urine during a fit, she slowed down the IV drip rate.

Mrs M said that about this time she asked a registered nurse, who was nearby, to collect her a Floguard infusion pump to regulate the IV rate. Mrs M did not want to leave Miss C because of her condition. After a short while, when the nurse failed to return with the Floguard, she requested another nurse to go and get it. Mrs M thought the Floguard took about half an hour to arrive. This would be sometime between 6.30pm and 6.45pm. Although it was prudent for Mrs M to slow down the IV drip rate when she noticed it was running fast, and to request a Floguard when she noticed that the rate was unregulated, during the time from her arrival until 8.00pm or 8.30pm when the Cogentin infusion pump was set up, Miss C received approximately another 700mls of fluid. This meant that for at least two hours, Miss C's drip was running at approximately 250ml/hour as opposed to 80ml/hour as prescribed by Dr E.

In my nursing advisor's opinion Mrs M did not exercise reasonable skill or care in monitoring and regulating Miss C's drip, and did not meet the requirements of the private hospital's Intravenous Policy or Nursing Council standards. Had the policy and guidelines been adhered to, the risk of Miss C receiving too much fluid would have been minimised.

Mrs M informed me she did not question the amount of fluid or rate of IV that Miss C had received on her arrival, as sometimes the IV fluid therapy can be altered according to the situation, particularly in an emergency situation. I accept that Mrs M could not have known how much fluid had been administered as neither Ms I nor Ms K had completed the fluid balance chart. In fact the fluid balance chart recorded that the original bag set up in theatre was still running.

However, when Mrs M was putting Miss C's medical records together to fax to the public hospital, she noted from the Intravenous Fluid Check Form that four 1000ml bags of IV fluid had been commenced for Miss C during the course of the day. She also noted that the fluid balance sheet had not been completed since the first IV bag was recorded to have been commenced in theatre. She updated the fluid balance sheet in retrospect, without recording that this is what she had done. In doing so, she made assumptions about how much fluid had been given, without consulting any of the other nursing staff involved in Miss C's care. She further advised me that it was not until 30 minutes to an hour after faxing the records to the public hospital, when she was putting Miss C's records together in her private hospital file, that she realised that Miss C had "received a lot of fluid" from the time she was in theatre to the time of her transfer. Mrs M did not tell anyone about this at the time, because she thought staff at the public hospital would already have arrived at their own diagnoses.

I accept that at the time of this incident, Mrs M was a new graduate, having been registered as a nurse only two months previously. I note that my advisor considered that a new graduate nurse should not be put in the position of 'specialling' a child as critically ill as Miss C. However, I do not believe this fact excuses Mrs M's conduct.

When Mrs M put together the records and noticed that four bags of fluid had been commenced, she should have realised that Miss C had received excessive amounts of IV fluid. As a registered nurse, she should have been aware of the seriousness of the situation and alerted medical staff and senior nursing staff. Mrs M should not have updated the fluid balance sheet without checking with other nursing staff as to how much fluid had been

administered. It does not appear to have dawned on Mrs M that Miss C had received "a lot of fluid" until after she sent the records to the public hospital. At that point, she still had the opportunity to alert medical staff and senior nursing staff, who could then have notified the public hospital staff. She did not do so, assuming that the public hospital staff would have already diagnosed the problem. This assumption was unjustified.

From the time Mrs M came on duty, Miss C received two additives in the form of Cogentin, at 6.29pm and at 7.30pm. There was no burette in place during these administrations, in breach of the private hospital's IV Policy. While a burette may not have been required to administer the Cogentin, the private hospital's IV protocol clearly required all ward patients being administered additives to have a burette on line. In my opinion, Mrs M ought to have been aware of this policy, and there should have been a burette on line.

In my opinion, Mrs M did not provide nursing services to Miss C with reasonable care and skill, and failed to adhere to hospital policy and Nursing Council standards. In these circumstances, Mrs M breached Rights 4(1) and 4(2) of the Code.

Opinion: Breach – Ms J

Rights 4(1) and 4(2)

Ms J was acting charge nurse on the ward on the afternoon Miss C was admitted. Ms J's duties included allocating staff to patients, assisting staff as required and being available in an advisory role.

Ms J had direct clinical contact with Miss C on more than one occasion on 18 October 1999. On these occasions she was not simply acting in a supervisory capacity relying on information obtained third hand.

Ms J's first contact was following Ms I's request for advice shortly after Miss C arrived in the ward, and was vomiting. A cursory examination of Miss C's IV fluids would have alerted Ms J to the fact that there was no burette or Floguard in place. Ms J advised Ms I to contact Dr E in order to get Phenergan charted to stop Miss C's vomiting. Even if Ms J had previously noted that IV fluids were running on continuous infusion and had thought nothing of it, as senior nurse she should have been aware of the private hospital's policy that a burette or Floguard be put in place when intravenous additives, such as Phenergan, were to be given.

Ms J had a further opportunity to observe Miss C when she monitored Miss C's pulse rate during nurses' meal breaks and noted in the clinical record that Miss C was settled. Phenergan had been charted by this stage so even if a rapid drip rate was not apparent, Ms J should have noticed that a burette or Floguard had not been put in place when the medication had been administered.

My nursing advisor did not specifically comment on Ms J's actions. My advisor noted that managing intravenous infusions is a nursing responsibility and flow rate should be monitored frequently. Even if it was acceptable for Ms J to rely on information from Ms I about the flow rate at the time Miss C's vomit was examined for the presence of blood (and I am not convinced that any discussion about IV fluids occurred at this time), Ms J took responsibility for monitoring and recording Miss C's observations during nurses' meal breaks and it was on these occasions that her monitoring should have included checking the IV fluids. Had she done this she would have realised that the private hospital's Intravenous Policy was being contravened. Not only was IV fluid being administered to a child under 10 without a burette or Floguard in place, but additives were being administered without a burette in place.

In my opinion Ms J's failure to observe that a burette was not in place fell short of acceptable nursing standards, and amounted to a breach of Rights 4(1) and 4(2) of the Code.

Opinion: No breach – The private hospital

Vicarious liability
Employers are vicariously liable under section 72(2) of the Health and Disability Commissioner Act for ensuring that employees comply with the Code of Health and Disability Services Consumers' Rights. Under section 72(5) it is a defence for an employing authority to prove that it took such steps as were reasonably practicable to prevent the employee from doing or omitting to do the thing that breached the Code.

The private hospital was the employer of Ms I, Ms K, Mrs M, and Ms J. I am satisfied that the private hospital had an adequate written policy on IV management and clear guidelines in place for nursing staff, which accorded with good clinical practice. It is clear that the nursing staff involved did not follow the hospital's written policy. Had they done so, Miss C would have had her drip regulated by a burette or Floguard and would not have been overloaded with fluid. In response to the incident, the private hospital's Director of Nursing reviewed the policy and some minor changes were made.

By having a protocol in place that required children under ten to have a burette, the private hospital took reasonable steps to prevent Ms I, Ms K, Mrs M, and Ms J from breaching the Code, and is not vicariously liable for their omissions. I emphasise, however, the need for the private hospital to ensure that its staff are aware of, and trained in, current hospital policies. I am also concerned about the nurses' level of training in IV care, given the serious departures from acceptable clinical practice in this case. The private hospital needs to make sure its nurses are suitably trained, and receive ongoing training and re-certification if necessary.

I note that nowhere in the private hospital's Intravenous Policy is it stated that the policy may be departed from in the theatre setting. While I am guided by my expert advice that the

policy was adequate and that flexibility in theatre was appropriate, what happened to Miss C highlights the need for staff who receive patients into the ward after surgery to check the drip set-up to ensure it meets the requirements for the ward setting.

Actions

- I will refer this matter to the Director of Proceedings to decide whether any further action should be taken.
- A copy of this opinion will be sent to the Medical Council of New Zealand and the Nursing Council of New Zealand.
- A copy of this opinion with identifying features removed will be sent to the Royal Australasian College of Anaesthetists and the New Zealand Private Hospitals Association, and placed on the Health and Disability Commissioner's website, www.hdc.org.nz, for educational purposes.

Addendum

The Director of Proceedings laid before the Nursing Council of New Zealand a charge against Nurses I, K, and M alleging professional misconduct. The charge was upheld against Nurses I and K and it imposed a penalty of censure and a fine of $2,640, being 35% of the costs and expenses of and incidental to the inquiry. The charge against Nurse M was deemed a serious oversight but the Council considered it did not reach the threshold for professional misconduct.