

SOUTH



AUSTRALIA

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 16th and 17th days of March, and 12th day of April, 2000, before Wayne Cromwell Chivell, a Coroner for the said State, concerning the death of Brian Edward Russell.

I, the said Coroner, do find that Brian Edward Russell, aged 80 years, late of St. Basil's Hostel, 10 Morton Road, Christie Downs, died at the Flinders Medical Centre, Bedford Park on the 28th day of May, 1998 as a result of bronchopneumonia complicated by morphine toxicity. I find that the circumstances of death were as follows:-

1. **Introduction**

1.1 Mr. Brian Edward Russell, aged 80 years, died at the Flinders Medical Centre on 28 May 1998. Mr. Russell had been suffering from terminal liver disease. His last admission to Flinders Medical Centre was on 11 May 1998. Since that time he had been treated with morphine. During the afternoon of 28 May 1998 Mr. Russell received an abnormally large dose of morphine in a short time as a result of an infusion pump being set incorrectly by nursing staff. A doctor tried to correct the effects of the morphine by using the opioid antagonist Narcan (naloxone), after which Mr. Russell began showing signs of distress. Further morphine was administered. Mr. Russell died at about 7.45p.m. that evening. A post mortem examination conducted the following day disclosed that the cause of death was bronchopneumonia complicated by morphine toxicity.

2. **Background**

2.1 Mr. Russell had been ill for a considerable time before May 1998. He had suffered from long-standing liver disease. He fractured his hip in September 1997 and underwent an extensive rehabilitation process. He had a total hip replacement in

January 1998, and had complications with infection. He had a number of admissions to the Repatriation General Hospital, and to Flinders Medical Centre.

2.2 When Mr Russell was admitted to Flinders Medical Centre on 11 May 1998, he was diagnosed with spontaneous bacterial peritonitis and ascites. At that time, he and his family raised the issue of euthanasia with medical staff. This was refused, but it was agreed that no resuscitation would be attempted in the event of a cardiac arrest. At a later meeting on 15 May his treating consultant, Dr Catherine Dillon, told the family that morphine would not be used to hasten Mr Russell's death. She commented:

“Some family members were not happy with this”. (Exhibit C.8a, p2).

2.3 A morphine infusion commenced on 17 May 1998 and continued for five days. This was changed to an oral slow-release dosage on 22 May 1998.

2.4 On 27 May 1998, Mr. Russell's condition deteriorated during the evening. Dr. Dillon called the family into the hospital and advised them of a plan for palliative care with subcutaneous fluid replacement and intermittent morphine.

2.5 On 28 May 1998, Registered Nurse B.M. Neumann manually administered three doses of 2.5mg of morphine subcutaneously from 9.30a.m. to 3.00p.m. She said that Mr. Russell's daughter inquired about a continuous infusion. She discussed the issue with Dr. M.F. LeMire, the gastro-enterology registrar, and he agreed. He directed that the morphine be administered at a rate of 15mg of morphine in 10ml of saline solution to be administered at the rate of 1ml per hour (see Exhibit C.11a, p2). RN Neumann suggested that a Graseby pump be used rather than the Terumo pump which is more commonly used for this purpose, as the Graseby pump could not be manually purged. She was concerned that Mr. Russell may be at risk having regard to the previous inquiries having been made about euthanasia (Exhibit C.21, p3).

2.6 RN Neumann had never used a Graseby infusion pump before, although she had seen them used. She said that she telephoned the Pain Management Unit (“PMU”) at the hospital, and asked the nurse on duty there (she was unable to state the identity of this person) to set the pump at the appropriate rate. She said that she read out Dr. LeMire's order for the medication (T.36).

2.7 The instrument in question was a Graseby MS16A Syringe Driver. They are commonly referred to as a pump, although that is not how they work. I will refer to it

in these findings as the Graseby pump. The pump in question in this case has been engraved "FMC PMU 4" and forms part of Exhibit C.19c. It is a battery-operated device, rectangular in shape, approximately 17cm x 5cm x 2cm. In very simple terms, it consists of a battery-driven motor which drives the plunger of a conventional syringe containing medication, at a fixed, pre-determined rate. The medication enters the patient by way of a "butterfly" needle.

- 2.8 When RN Neumann received the pump, it was set at "99". These two digits appeared in small windows between two screws on the front of the machine. It occurred to Ms. Neumann that this might be too high. The setting can be changed by turning each of the screws, thereby changing the digits. The lowest setting is "01", indicating that the driver will operate at 1mm per hour, and the highest setting is "99", indicating that the driver will operate at 99mms per hour. The screws on this machine were made of a plastic material, and were badly damaged, apparently by people using an inappropriate instrument to turn them. Ms. Neumann tried to change the setting by using a paper clip. When she was unable to do so, she decided (or perhaps hoped) that it had been set by the PMU using a special key, and so she desisted (T.38).
- 2.9 RN Neumann then took the pump to Mr. Russell's room, connected it to the butterfly needle and activated the pump. RN Sue Last confirmed that she was with RN Neumann when she set up the pump. However, she said that she had not used this type of pump for years and was not familiar with it. She said that RN Neumann seemed to know how to use it. She confirmed that it was set at "99" (although she thought that meant 9.9mls per hour). She said:-
- "We both thought that it was the right rate of administering, so we both left it". (Exhibit C.20, p2).
- 2.10 The pump was set up at 3.15p.m. RN's Neumann and Last completed their shift at 3.30p.m., and left the ward.
- 2.11 The error was discovered when RN Vicki Peters checked the pump at about 3.45p.m. and found the syringe empty. According to Dr. LeMire's order, the infusion should have lasted ten hours. Ms. Peters confirmed that the dial was set at "99". Dr. LeMire was called and he directed that Mr. Russell be given 0.4mg of Narcan (naloxone) to counteract the effects of the morphine. RN Peters, who administered the Narcan, said that, although Mr. Russell remained un-rouseable after the injection, he groaned

immediately afterwards (Exhibit C.9a, p3). She said that this groaning continued throughout the afternoon.

- 2.12 Dr. LeMire saw Mr. Russell again at about 7.00p.m. He described him as “agitated and uncomfortable” (Exhibit C.11a, p3). He did not consider that Mr. Russell was “narcotised” (in other words, still suffering from the toxic effects of the morphine), so he ordered a further 2.5mg of morphine to be given. This was given at 7.20p.m. Mr. Russell died at about 7.40p.m. (see Exhibit C.9a, p4).

3. **Post-death procedures**

- 3.1 Following Mr. Russell’s death, the following events took place, some of which made the investigation of Mr. Russell’s death more difficult:-

- Dr. F.A. Wright certified death at 8.15p.m. (Exhibit C2a, p2);
- Registered Nurse R.L. Carman removed the butterfly needle and placed it into the sharps container. She removed the syringe from the Graseby pump and placed it into the rubbish bin. She removed the Graseby pump from the ward and placed it in the office of the Clinical Nurse Consultant (CNC). She did these things as RN Finlay had told her that there would be no coronial investigation (Exhibit C12a, p2);
- a Nursing Coordinator, Kate Thompson, authorised RN Finlay to remove the “subcutaneous access” - the butterfly needle - as “the medical officer had not deemed it to be a suspicious death” (Exhibits C10a, p5, C15a, p2). Ms. Finlay said that she did not know who removed it. The medical officer, Dr. LeMire, knew nothing of this, since he had left the hospital prior to Mr. Russell’s death (see Exhibit C11a, p4);
- on 29 May 1998 the pump was taken from the CNC’s office and returned to the PMU. At 11.00am, Dr. Dillon inquired where the pump was, so RN Finlay ran to the PMU to try and retrieve the pump. She was handed a pump which was not the same one, although she was assured that it was. She gave that pump to Dr. Dillon (Exhibit C10a, p5);
- Registered Nurse S.A. White, in the PMU, had recorded the pump allocated to Mr. Russell as being pump number 1. This was clearly incorrect, as pump number 1 had brass screws rather than plastic ones. This is the reason why number 1 was handed to Ms. Finlay on 29 May. She said:-

“My vision is not 100 percent, and it is possible I recorded the incorrect pump as being issued to Ward 5G. The numbers etched into the rear of the pump are not that clear”. (Exhibit C.14a, p2).

- 3.2 I find Ms. Thompson’s actions especially alarming. Her statement (Exhibit C.15a) indicates that Ms. Finlay was anxious about the fact that the pump had been set at an incorrect rate, and had expressed concern as to whether the relatives of Mr. Russell could have tampered with it. They also discussed an incident which had occurred

“two to three years ago” in Intensive Care, when a relative of a patient did tamper with an infusion pump and admitted doing so (Ms. Thompson is obviously referring to the case of Hester - Inquest No.15/96).

3.3 Ms. Thompson gave Ms. Finlay a copy of a “recent South Australian Health Commission document which explains procedures regarding hospital protocol with suspicious deaths within the hospital, which was to be kept on that ward for reference” (Exhibit C.15a, p3). The protocol being referred to is a protocol entered into between South Australian Health Commission and S.A. Police and is entitled “Protocol for the Police Investigation into Suspicious Deaths and Injuries and/or Major Criminal Activities in Public Health Care Facilities”. The Protocol provides:-

“In line with health unit policy and in consultation with the Health Unit Liaison Officer, the most senior registered nurse on duty must ensure that in dealing with this protocol, the following occurs:-

- the patient and all evidence, e.g. clothing, medical equipment, instruments, disposable material, bedding, and any other relevant items should remain undisturbed insofar as it is possible without detrimentally interfering with the administration of treatment which is essential to preserve life or health;
- the body of the deceased person remains undisturbed;
- there is no attempt to remove from the patient’s body any in situ drain, tubes, catheters, or other medical equipment including respiratory ventilator, pumps, cannulas, needles, gastric suction apparatus, oxygen supply, whether or not such equipment is attached to the body;
- ...
- ensure that staff requiring debriefing are identified and arrange critical incident debriefing as required;
- ...”.

3.4 As will be seen, the protocol clearly makes it the responsibility of the “most senior registered nurse on duty”, who was Ms. Thompson, to ensure that these steps were taken. It seems extraordinary to me that she had possession of a copy of the protocol, and yet still did not think it was her responsibility to comply with it, particularly since it was obvious that, having regard to RN Finlay’s concerns, the death should have been regarded as suspicious at that stage. The medical officer had already left the hospital, and the Health Unit Liaison Officer, a person nominated by the Protocol to be ultimately responsible, had not been informed.

3.5 I draw this issue to the attention of management at Flinders Medical Centre. It seems that, even following the events in the case of Hester, and following development of the detailed and clearly set-out protocol between S.A. Police and the S.A. Health Commission, staff at Flinders Medical Centre still do not understand and accept their responsibilities in relation to the issues dealt with therein.

4. **Cause of death**

4.1 As I have already said, Dr. Gilbert established that the cause of death was “bronchopneumonia complicated by morphine toxicity”. In his report (Exhibit C.3a), Dr. Gilbert commented:-

“2. Interpretation of post mortem morphine levels can be extremely difficult for the following reasons:

- a. The ranges of therapeutic, toxic and lethal concentrations overlap considerably.
- b. The length of time a dosage regime has been in effect needs to be taken into account because of the phenomenon of tolerance.
- c. Co-administration of other central nervous system depressants must be factored in.
- d. Hepatic and/or renal failure may result in accumulation of morphine in the blood despite administration of clinically appropriate doses.
- e. The route of administration affects the rapidity and magnitude of action.

Toxicological examination of hospital serum samples taken from the patient at 0935 hours 22 May, 0930 hours 26 May and 1000 hours 27 May showed relatively low levels of morphine of 0.01, 0.03 and 0.02mg/L respectively. In contrast, the post mortem blood contained 0.31mg/L and the vitreous humour contained 0.10mg/L. It appears that there was a substantial increase in the blood level of morphine between 1000 hours 27 May and death at around 1940 hours 28 May. This may have been contributed to by the bolus dose of morphine but acute on pre-existing chronic renal failure accompanying the development of bronchopneumonia is likely to have resulted in impaired clearance of morphine. It appears on histological grounds that the bronchopneumonia preceded the bolus dose of morphine. Indeed, there was a significant increase in the white blood cell count on 26 May almost certainly due to the development of bronchopneumonia. His biochemistry results indicate a significant increase in blood creatinine on the 26th and 27th of May consistent with a terminal deterioration in renal function. Unfortunately biochemical indices of hepatic function were not being monitored after 22 May but it is quite likely that these too were deteriorating terminally.

Because of the presence of significant bronchopneumonia and impending failure of other organ systems, it is not possible to state that the bolus dose of morphine was the sole proximate cause of death. On the other hand, under normal circumstances the maximal effect from a subcutaneous dose of morphine occurs approximately 50 to 90 minutes after injection. The maximal effect may have been delayed in the

present case because of impaired subcutaneous circulation associated with hepatic, renal and respiratory failure and possible, pre-existing peripheral vascular disease. Therefore, it could be argued that he actually died when the effects of the bolus subcutaneous dose of morphine may well have been maximal.

As indicated above, at the time the bolus dose was given, it was also quite likely that the blood morphine levels were already increasing due to impaired hepatic and renal clearance resulting from the development of bronchopneumonia. This needs to be taken into account when assessing the significance of the substantial increase in circulating morphine levels in the 36 hours prior to death.

The reason for the administration of the 2.5 milligram subcutaneous dose of morphine given shortly before death was not clear from the case notes. It is doubtful that this contributed substantially to the death though. This is because the dose was relatively small and absorption into the bloodstream from the subcutaneous tissues ought to have been impaired at the time it was given. It is very doubtful that much of the dose would have been absorbed into the circulation in 20 minutes.

3. Death has been attributed to bronchopneumonia complicated by morphine toxicity. The bronchopneumonia was likely to have been contributed to by respiratory depression and impaired clearance of respiratory tract secretions due to morphine therapy and also immobility due to the deceased's multiple medical problems and the burn to his left thigh.
4. The deceased's longer term prognosis was poor due to a high likelihood of recurrent ascites, potential haemorrhage from oesophageal varices and overt liver failure resulting from the portal vein thrombosis. This may have been amenable to surgery to shunt blood from the portal venous system into the systemic circulation (portal-systemic shunt) but, given the deceased's age, poor overall condition and other medical problems, this was quite unlikely to be contemplated.

There can be no doubt that morphine treatment, either oral or parenteral, was appropriate for an elderly individual with chronic pain and suffering from conditions that were likely to flare up repeatedly and cause further discomfort or death, most notably hepatic and renal failure associated with portal vein thrombosis complicating alcoholic cirrhosis of the liver. The desired effect of palliative care with, inter alia, morphine treatment, is to minimise pain and distress associated with the illness. The administration of sufficient morphine to achieve these aims will not infrequently result in impaired consciousness, respiratory depression and the development of bronchopneumonia.

It may be justifiably argued that it was inappropriate to fully reverse the effects of the bolus dose of morphine with additional doses of naloxone as this could well have brought the deceased back to consciousness with an accompanying return of pain, distress and discomfort". (Exhibit C.3a, p5-7).

- 4.2 Clearly, the bronchopneumonia, which pre-existed the morphine overdose, is regarded as the primary cause of death. The overdose, however, complicated that condition by adding to respiratory depression. This effect was more marked in Mr. Russell's case because the morphine levels would have been higher, due to impairment to hepatic

(liver) and renal (kidney) functions, resulting both from the long-standing disease and the bronchopneumonia. The morphine levels were already increasing due to that, and the overdose may not have reached its full effect until the time Mr. Russell died.

4.3 I pointed out to counsel the provisions of Section 17 of the Consent to Medical Treatment and Palliative Care Act. That section provides:-

“17.(1) A medical practitioner responsible for the treatment or care of a patient in the terminal phase of a terminal illness, or a person participating in the treatment or care of the patient under the medical practitioner’s supervision, incurs no civil or criminal liability by administering medical treatment with the intention of relieving pain or distress -

- (a) with the consent of the patient or the patient’s representative; and
- (b) in good faith and without negligence; and
- (c) in accordance with proper professional standards of palliative care, even though an incidental effect of the treatment is to hasten the death of the patient.

(2) ...

(3) For the purposes of the law of the State -

- (a) the administration of medical treatment for the relief of pain or distress in accordance with subsection (1) does not constitute an intervening cause¹ of death; and
- (b) the non-application or discontinuance of life sustaining measures in accordance with subsection (2) does not constitute an intervening cause¹ of death.

¹ A novus actus interveniens i.e. a cause that breaks a pre-existing chain of causation”.

4.4 If Mr. Russell’s treatment was in accordance with Section 17(1), then Section 17(3) would prohibit inclusion of morphine toxicity in the cause of death in this case. Mr. Homburg, counsel for RN’s Last and Neumann, argued that this was the case. He pointed out that I am prohibited from finding negligence (or the absence thereof) by the provisions of Section 26(3) of the Coroners Act 1975 which reads:-

“A coroner holding an inquest must not in the inquest make any finding, or suggestion, of criminal or civil liability”.

4.5 In case Mr. Homburg is right about that, I will not deal with Section 17(1)(b) of the Consent to Medical Treatment and Palliative Care Act. I will recommend that the Attorney-General consider the way these two pieces of legislation interact.

4.6 However, I have no hesitation in finding that Mr. Russell’s treatment was not, in the words of Section 17(1)(c), “in accordance with proper professional standards of palliative care”. I do not see how the contrary could be argued. Mr. Homburg

suggested that I had no expert evidence on the subject to justify such a finding. But I am of the opinion that the evidence is so clear that the treatment that Mr. Russell received, an overdose of potentially lethal medication, delivered through a machine which was in a bad state of repair, by a nurse who had no real understanding of how the machine worked, who failed to check either with an experienced nurse or with the procedure manual, and failed to attempt to properly verify the correct operation of the machine in any other way, could not be considered to be in accordance with such standards.

- 4.7 Accordingly, I find that Section 17(3) of the Consent to Medical Treatment and Palliative Care Act does not apply, and I will include the words “complicated by morphine toxicity” in the cause of death.

5. **Condition of the Graseby pump**

- 5.1 Both pumps referred to above were the same model. The first was number 1, handed to RN Finlay by RN White, but which had brass screws. The second was the pump actually used in Mr. Russell’s treatment, number 4, with the damaged plastic screws. Both pumps were tested by Mr. K.R. Zietz, Senior Technical Officer (Clinical Engineering) at the Royal Adelaide Hospital Biomedical Engineering Department. Mr. Zietz’s report is Exhibit C.23.

- 5.2 As to the pump number 1 (which was not involved in Mr. Russell’s death), Mr. Zietz found that, although the machine worked by delivering medication at an appropriate rate, he found that it had “very dirty rate display windows”, and a “damaged instruction label”. His recommendation was:-

“Remove from service. Requires service including cleaning, replacement of missing parts, damaged label, and PMI (preventative maintenance inspection)”.

- 5.3 Pump number 4 (the pump involved in Mr. Russell’s treatment) operated at the appropriate rate when there was no load, but because there was intermittent slippage of the lead screw nut, the plunger thrust could not be tested. His summary of defects was that it had “severely damaged plastic rate adjusting controls”, “lead screw nut failed specification”, “unable to effectively test motor thrust (due to nut failure)”, “failed the front panel ‘test’ function and low battery voltage test”. His recommendation was:-

“Remove from service. Requires extensive repairs - may not be economic”. (Exhibit C.23, p2).

5.4 Mr. Zietz pointed out that the instruction manual for the machine (Exhibit C.23a) contains the following statement:-

“It is recommended that the performance of the syringe driver is checked annually. If the syringe driver is damaged in any way, the performance must always be checked before it is used again. See the section on servicing for further information”. (p.10).

5.5 It is true that the section on servicing (p.11) does not, as Mr. Homburg pointed out, specifically state that servicing should occur at any particular interval. Indeed, a “trouble-shooting” chart indicates that service is only required when the syringe driver is faulty, or where the driver mechanism appears to have worn out.

5.6 Notwithstanding that, I agree with Mr. Zietz that annual checking, servicing and attendance to any apparent faults, is a wise precaution and I will recommend accordingly.

6. **Use of the Graseby pump**

6.1 As I have already said, it is clear from the facts of this case that the nurses who used the Graseby pump in relation to Mr. Russell’s treatment had no proper training in its use, failed to check with a more experienced nurse before using it, failed to check the Nursing Procedure Manual for the same purpose, and generally failed to bring a rigorous professional approach to the use of the machine.

6.2 I heard evidence from Ms Margaret Martin, the Deputy Director of Surgical and Special Services at Flinders Medical Centre, about these issues. Ms Martin has line-management responsibilities for nurses in the ward where Mr Russell was being treated.

6.3 I was surprised to learn that no review of the circumstances of Mr. Russell’s death has yet occurred, nor has there been any follow-up or counselling of the nurses involved. Ms. Martin acknowledged that this should have been done (T.58). Having regard to the fact that Mr. Russell died in May 1998, I think that this failure to review and follow-up is cause for concern. It was certainly cause for trenchant criticism by Mr. Russell’s family members who attended the inquest, criticism with which I agree.

- 6.4 Ms. Martin told me that she had commenced a review of procedures for the use of the Graseby infusion pump in the last few days before the inquest. She pointed out that there was little point in trying to train all nurses at Flinders Medical Centre in the use of the pump, since it is used only rarely except in the PMU, and in Palliative Care and Oncology wards. She said that preliminary discussions have been towards giving staff in those wards, particularly the PMU, responsibility to ensure that when a machine is handed out to staff in another ward, the nurse who will be using the equipment is sufficiently familiar with its use. If not, the more experienced nurse should supervise the setting and connection of the pump to the machine, or in the alternative attend the ward personally and attend to the connection of the pump (T.52). I agree that this is an appropriate response.
- 6.5 Ms. Martin alluded to the passage in the Nursing Procedure Manual (Exhibit C.19d) which deals with the Graseby pump. I agree with Mr. Homburg's criticisms of the instructions on p.2 of that section of the manual, which deals with how to prepare the syringe and set the pump at the appropriate rate. Without going into it in detail, it sets out a rather complex mathematical process which is confusing and uncertain. Ms. Martin acknowledged this (T.53).
- 6.6 The instruction manual for the machine (Exhibit C.23a) sets out a much clearer and easier-to-use procedure for setting the pump. It simply involves filling the syringe with the appropriate volume of medication, measuring the length of that part of the barrel of the syringe containing medication against a scale on the pump, and then dividing the distance by the time over which the infusion is directed to be given. This will produce a rate in millimetres per hour. The rate can then be set by turning the screws on the front of the machine. This is a much simpler and less confusing process than the one set out in the nursing procedure manual. I commend it to the attention of the person assigned the task of revising the manual.
- 6.7 In essence I have heard that the entire procedure for use of the Graseby infusion pump is to be reviewed. Issues such as responsibility for ensuring that the operator is appropriately trained, for ensuring that the equipment is regularly checked and serviced, and that the instructions for its use are clear and simple, will be made clear. I recommend that this be done as a priority.

7. **Finding**

I find that Brian Edward Russell, aged 80 years, late of St. Basil's Hostel, 10 Morton Road, Christie Downs, died at the Flinders Medical Centre, Bedford Park on 28 May 1998 as a result of bronchopneumonia complicated by morphine toxicity.

8. **Recommendations**

Pursuant to Section 25(2) of the Coroners Act, I make the following recommendations:-

- (1) that Nurse Managers at Flinders Medical Centre take steps to ensure that unexpected deaths of patients are reviewed, and follow-up counselling and education is provided to nursing staff involved;
- (2) that Flinders Medical Centre institute an appropriate regime for the use of specialised medical equipment such as the Graseby pump in general wards to ensure that nurses using that equipment are proficient in its use;
- (3) that Flinders Medical Centre institute a regular servicing and maintenance programme for medical and scientific equipment used at the hospital, and in particular review the serviceability of the other Graseby pumps in use.
- (4) that the Attorney-General consider whether an amendment to Section 26(3) of the Coroners Act is required to enable a coroner to find whether or not there has been negligence in the delivery of palliative care, having regard to the provisions of Section 17(3) of the Consent to Medical Treatment and Palliative Care Act.

Key Words: medical treatment; palliative care

In witness whereof the said Coroner has hereunto set and subscribed his hand and

Seal the 12th day of April, 2000.