ADDENDUM BRIEF FOR EXPERT ON HYPONATREMIA

ADAM STRAIN

RECEIVED : DECEMBER 9 , 2011

RESPONSE : JANUARY 15 , 2012

ISSUE 2

Adam was prescribed 50 ml of 20% mannitol iv at 12:00 on Nov. 27 and a further 100 ml of 20% mannitol at 14:00 . His hourly urine volume was 115 ml at 13:00 , 35 ml at 14:00 , 90 ml at 15:00 , followed by a mean of 90 ml/hr between 15:00 and 23:00 .

Explain your view on the urine output capabilities of Adam's native kidneys having regard to the effect of the mannitol stimulus in PICU .

Comment : Before the renal transplant operation Adam was said to be polyuric with daily urinary volumes estimated to be in excess of 1000 ml (Prof.Savage's testimony). This amount corresponds to hourly urinary volumes between 42 ml (if the daily urine output had been 1000 ml) and 62 ml (if the daily urine output had been 1500 ml). Compared to these the hourly urinary volumes produced by Adam on Nov.27 between 12:00 and 13:00 (115 ml) and between 14:00 and 23:00 (90 ml) were increased volumes .

Relation to mannitol : The available literature on mannitol induced osmotic diuresis does not discuss osmotic diuresis in the circumstance of a severely impaired renal function . In Adam serum creatinine values were between 552 and 743 umol/L , i.e. severely elevated . (Literature on osmotic diuresis : FJ Gennari , JP Kassirer : Osmotic diuresis , New Engl J Med , 1974 , 291:714-720 ; JI Park et al., Recurrent symptomatic hyperglycemia on maintainance hemodialysis is not necessarily related to hypertonicity . Electrolyte and Blood Pressure Research , 2008 , 6:56-59 ; Martindale , The Complete Drug Reference : Mannitol , pp. 900-901 , 32.nd edition , 1999 .) None the less the literature does suggest that the mechanisms causing osmotic diuresis under normal circumstances are likely to be in operation in the setting of a severely impaired renal function as well – although less effectively . Thus glomerular filtration of mannitol should still occur but in a reduced manner because of the reduced glomerular filtration rate . The mannitol induced inhibition of proximal tubular water reabsorption should still occur - but at a lower intensity than it would normally do – because of the reduced number of functioning proximal tubules and possibly because of hyperfiltration in the remaining functional nephrons . The mannitol induced reduction of medullary tonicity should still be generated – but less than under normal circumstances – because of a reduced number of medullary blood vessels . **These aspects suggest that a mannitol induced osmotic diuresis would be possible even in the setting of a severely impaired renal function but that it would be of attenuated effectiveness .**

The article by Gennari and Kassirer mentioned here previously further states that **water and sodium excretion increase within minutes** after intravenous infusion of the osmotic diuretic . Again , this reaction should be delayed in the circumstance of an impaired renal function .

Extrapolating these features of mannitol to Adam's pattern of urination (increased urinary volume between 12:00 and 13:00 and increased volumes after 14:00 with Adam having received 50 ml of mannitol at 12:00 and 100 ml of mannitol at 14:00) is compatible with the view that mannitol did contribute to the observed urine excretion rate during those periods . However such a chain of events is not certain because Adam's fluid overload during the transplant operation to which his kidneys might have reacted after the end of anesthesia could also be contributory .

Taken together : a mild osmotic diuresis from mannitol is likely to have occurred in Adam after 12:00 and after 14:00 on Nov.27 but other contributing factors to the diuresis such as fluid overload cannot be excluded .

ISSUE 3

Dr.Alison Armour stated in her final autopsy report the brain weight (swollen brain , after fixation) as 1680 grams . In contemporaneous notes from the autopsy she mentioned the (fresh) brain weight (swollen brain , unfixed) as 1302 grams . In her witness statement to the Inquiry Dr.Armour stated that the average weight of a brain for a boy of Adam's age was 1300 grams (without swelling and unfixed). In her witness statement to the Inquiry Dr.Armour said that the figure of 1302 grams (for the swollen , unfixed brain) was probably an error . In the same context she suggested that since Adam's brain had been massively swollen the fresh weight of the brain was more likely to be 1520 grams (swollen brain , unfixed). She stated that fixation increases the brain weight by 5 to 10% and she confirmed the 1680 grams (swollen brain , after fixation).

In my previous description I had worked with the 1680 grams (swollen brain , after fixation) , 1300 grams (normal brain in a 4 year old , taken from Arieff's publication) and a calculated 1417 grams for Adam's swollen brain before fixation (calculated on the basis of Adam's hyponatremia). In the previous description I had been unable to explain the difference between the 1417 grams and 1680 grams . Previously I had been unaware of Dr.Armour's contemporaneous notes (1302 grams , swollen brain , unfixed).

The present request is : Outline any further comments (to the brain weight , as reported by Dr.Alison Armour) particularly with reference to your previous comments regarding Adam's brain weight .

Comment : I am unable to know why there may be two different weights for Adam's swollen unfixed brain (1302 and 1520 grams) . However **I find it plausible that Adam's brain weight (unswollen and unfixed) was approximately 1300 grams (Dr.Arieff's publication , Dr.Armour's suggestion) , that the "fresh" brain weight (swollen , unfixed) in Adam was between 1417 and 1520 grams (as calculated by me , and as proposed by Dr.Armour) and that the difference between these figures and the 1680 grams is explained by the effects of fixation (as proposed by Dr.Armour).** – I wish to add two more aspects to the proposal of Adam's normal brain weight having been approximately 1300 grams : Prof.M.Savage (011-001,Adam Strain,Coroner) described Adam as "well grown , with height near the 50.th centile" , i.e. normal , also documented in a growth diagram on Adam . This suggests to me 4

that Adam's bones did not seem to have deviated from the norm for his age , including the skull and hence Arieff's figures should be applicable . I realize that Adam was not 4 years old but 4 years , 3 months and 24 days . I am also aware that Adam's weight was at the 90.th centile for his age . Therefore Adam's normal brain weight may have been a few grams higher than the 1300 grams . – My second aspect is : If the 1302 grams represented Adam's "fresh" brain weight (swollen,unfixed) the difference to the 1680 grams of the swollen brain after fixation would be 378 grams or 29% . This large figure seems difficult to reconcile with Dr.Armour's 5 – 10% weight gain due to fixation .

ISSUE 4 a

State what you consider **Adam's daily fluid intake to have been prior to admission** to RBHSC on Nov. 26.th , 1995

The daily volume of fluid intake was 2100 ml (by gastrostomy tube) . This was stated by Debra Strain (011-006 ; 011 – 076) and by Prof. M.Savage (WS – 002 / page 9 and WS – 002 / 1) . Adam did not seem to take additional fluids or feedings by mouth . (Debra Strain 011 – 006). The composition of the 2100 ml / day was either made up of 1200 ml of pediatric Nutrison , 100 ml of normal saline , 800 ml of water and a small amount of fluid (less than 50 ml) from a daily supplement of 24 mmol of sodium bicarbonate (WS – 002 / page 9 ; 057 – 068 – 128) – or it consisted of 1500 ml of pediatric Nutrison , 100 ml of normal saline , 500 ml of water and a small amount of fluid from the sodium bicarbonate (WS – 002 / page 1) .

Further comments : Prof.M.Savage indicated a tendency in Adam to vomit (WS – 002 / 2 , page 6) . There is a nursing note to the same effect , dated July 7 , 1995 (011 – 048) . Therefore vomiting may have reduced Adam's fluid intake on some occasions . – I would like to indicate that in my previous report (201 – 004 – 101) I had erroneously stated that Adam was receiving 2100 ml of pediatric Nutrison per day .

ISSUE 4 b

State what you consider Adam's **average daily fluid output to have been prior to his admission** to RBHSC on Nov.26.th , 1995

Urinary volume : Prof.M.Savage pointed out the difficulty of measuring the 24 hour urinary volume in an incontinent child (like Adam) that did not tolerate a bladder catheter (like Adam) . He estimated Adam's urine output to be in excess of 1000 ml/day , or between 1200 and 1500 ml/day (WS – 002/1 page 3) . I therefore assume that a mean figure like 1350 ml/day may describe Adam's daily urine output . **Adam's average daily urine output appears to have been 1350 ml .**

Dialytic ultrafiltration : Prof.M.Savage estimated Adam's fluid loss from dialytic ultrafiltration at 400 ml / 24 hrs . (WS – 002 / 2 page 10). Adam's mother provided an estimate of it being 290 ml / 24 hrs on average . Both figures are relatively close to each other . Prof . M. Savage stated that Adam's mother was meticulous in performing his peritoneal dialysis and that her record keeping was excellent . **I assume Adam's average daily dialysis related fluid losses to have been 290 ml .**

Insensible losses : In a textbook (Brenner & Rector , The Kidney , 6.th edition , 2000 , p.869) it is suggested that normal insensible losses (skin,breathing,feces) at Adam's weight should be 340 ml/day . In a publication by Holliday et al., Pediatrics , 19:823 , 1957 it is suggested that insensible losses in acutely ill children (without fever) at Adam's weight would be 750 ml . It may not be appropriate to liken Adam's state to that of an acutely ill child , having higher insensible losses . **I therefore assumed Adam's daily insensible losses (skin,breathing,feces) to have been approximately 500 ml/day** .

Taken together these figures yield an estimated daily fluid output of 2140 ml .

(Further comment : in my previous report 201 – 004 – 101 I had proposed daily insensible losses to be approximately 250 ml/day .)

ISSUE 4 c

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period from Nov.26 , 22:00 to Nov 27 , 0500**

Insensible losses :	147 ml	
Urine output :	392 ml	
Blood loss :	0 ml	
Dialysis loss :	154 ml	
Total fluid loss :		693 ml
Actual fluid intake (952 ml Dioralyte, 18 ml nl saline)		970 ml
Estimated fluid excess :		**+277 ml**

Na content fluids given (57 mmol from Dioralyte ; 2.5 saline) **59.5 mmol**

Na content in losses (4.4 mmol ins.loss , 19.6 urine , 20.3 dialysis) **44.3 mmol**

Reasons for change of regimen : The positive fluid balance should be watched . It should not increase much further .

Comments : For the insensible losses I used a sodium concentration of 30 mmol/L . This was derived from a publication by CF Consolazio et al. . J.Nutrition , 63 : 407 , 1963 reporting a sodium concentration in sweat of 45 mmol/l . I reduced this concentration to an assumed 30 mmol/L because the insensible losses as discussed here include a water volume for virtually salt free breath , too .

For the urine output I used an assumed sodium concentration of 50 mmol/L . I made the following consideration : In December of 1993 when Adam's serum creatinine was already at 480 umol/L (end stage renal failure) two measured urinary sodium concentrations yielded a mean of 30 mmol/L . There were no later measurements of urinary sodium concentrations . Peritoneal dialysis had been started in Adam in Sep. 1994 ; it removes sodium from the body in the form of the daily ultrafiltrate (290 ml) which will reduce the sodium concentration in excreted urine . On the other hand in a reference on end stage renal failure Alfrey and Chan stated that urinary sodium concentrations in end stage renal failure may amount to 70 mmol/L (in : RW Schrier , Renal and electrolyte disorders , 4.th edition , 1992 , p. 549) Hence I assumed that a mean value between these divergent aspects may be applicable to Adam's situation .

The dialysis loss was estimated to be 154 ml , based on a usual mean ultrafiltration loss of 290 ml/day and considering the fact that only 8 cycles at a volume of 750 ml each were performed that night , whereas Adam's usual regimen was 15 cycles .

ISSUE 4c-f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period from 05:00 to 07:00 on Nov. 27.th**

Insensible losses :	42 ml	
Urine output :	112 ml	
Blood loss :	0 ml	
Dialysis loss :	0 ml	
Total fluid loss :		154 ml
Actual fluid input :		0 ml
Estimated fluid excess :		**- 154 ml**
Sodium content of fluids given :		**0 mmol**
Sodium content losses(5.6 mmol urine;1.4 insens.loss**)**		**7.4 mmol**

Reasons for change of regimen : None (the fluid and sodium lost during this period helped to reduce the fluid and sodium gain of the preceding period , however a small amount of fluid excess – 120 ml- remains.)

Comment : Data was taken from the fluid balance sheet 057 – 010 – 013 .

ISSUE 4 c-f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period from 07:00 to 08:00 on Nov.27.th**

Insensible losses :	21 ml	
Urine output :	56 ml	
Blood loss :	0 ml	
Dialysis loss :	0 ml	
Total fluid losses :		77 ml
Actual fluid input (0.18%NaCl/4% glucose) :		650 ml
Estimated fluid excess :		**+ 573 ml**
Na content of fluids given :		**16 mmol**
Na content of losses (urine 2.8 mmol;insens.loss 0.6)		**3.4 mmol**

Reasons for change of regimen : The total water excess (previous plus present) appears to be between 550 and 600 ml if the slightly positive sodium balance is included . This water excess is equal to approximately 5% of total body water in Adam . This water excess should not increase further rather it should be reduced .

Comments : data are from 058 – 003

Further comment : Since the line "cumulative urine output" on the fluid record (058 – 003 pdf) is left empty between 07:00 and 08:00 - possibly related to Adam being incontinent of urine- it is none the less also possible that Adam failed to excrete the assumed 56 ml of urine . In such a circumstance the fluid excess would not be +573 ml but approximately 625 ml .

ISSUE 4 c-f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period from 08:00 to 10:00 on Nov 27**

Insens.losses :	20 ml	
Urine output :	112 ml	
Blood loss : (692 ml of blood)	518 ml (of serum)	
Total fluid loss :		650 ml
Actual fluid input (800 ml HPPF;300 Hartman's;650 of 0.18%NaCl/4% glucose)		1750 ml
Estimated fluid excess :		**+ 1100 ml**
Sodium content of fluids given (116 mmol HPPF;39 Hartman's; 18.2 in 0.18%NaCl/4% g.)		**173 mmol**
Sodium content of losses(0.6 mmol insens.losses ; 5.6 urine ; 65 in 518 ml of serum)		**71 mmol**

Reasons for change of regimen : In this period Adam had a positive fluid balance by 1100 ml and a positive sodium balance by 102 mmol . Given that normal saline –a physiologic fluid preparation- has between 140 and 154 mmol/L of sodium Adam's positive fluid balance in this period can be said to consist of 728 ml of normal saline (at 140 mmol/L of sodium) and 372 ml of sodium free water . If this water is added to the amount remaining from the previous period (550 to 600 ml) one arrives at 922 to 972 ml , approximately 8% of total body water in Adam . This is quite an unphysiologic state .

Further comments : Data was taken from WS – 008/1 page 5 and from 058 – 003 pdf .

Blood loss : in 058 – 007 pdf the blood loss is recorded as follows : 500 ml bottle , 411 ml swabs , 300 ml towels . This yields 1211 ml total . Because no more specific record is available I made the assumption that the blood loss occurred more or less steadily between 08:00 and 11:30 , the time of surgery . This figure leads to an hourly blood loss of 346 ml , or of 259 ml/hr of serum if a hematocrit of 25% is assumed . In calculating the sodium lost in this serum I assumed a sodium concentration of 125 mmol/L. My assumptions are somewhat at variance with a blood loss of 600 ml/hr , first 2 hours , proposed by Dr.Taylor (WS – 008/1 page 5) . These considerations concerning the blood loss do not impact the estimated sodium free water excess .

Insensible losses : In this period I reduced the amount of insensible losses from 21 to 10 ml/hr because of intubation (less water loss from breathing) and because a partly naked patient in a temperature controlled operating room probably sweats less than normally .

Urine production : Since the line "cumulative urine output" was left empty in the record (058 – 003 pdf) during the present period - possibly related to Adam's incontinence for urine – it is however also possible that Adam did not produce the assumed 112 ml of urine and made no urine . In that case the estimated fluid excess would not be 1100 ml but 1212 ml .

Packed cells : I omitted the 250 ml of packed cells given to Adam between 09:00 and 10:00 from the calculation of the fluid balance because this material consists largely of cells (erythrocytes) and makes only a miniscule contribution to his fluid and sodium balances .

ISSUE 4 c-f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period from 10:00 to 10:30 of Nov. 27**

Insensible losses :	5 ml	
Urine output :	28 ml	
Blood loss : (173 ml of blood)	130 ml (of serum)	
Total fluid losses :		163 ml
Actual fluid input(100 ml Hartman's ; 100 of 0.18%NaCl/ 4% glucose)		200 ml
Estimated fluid excess		**+ 37 ml**
Sodium content of fluids given(13 mmol Hartman's , 2.8 in 0.18% NaCl/4% glucose)		**15.8 mmol**
Sodium content of losses(0.15 insens.losses ; 1.5 urine ; 16.2 serum**)**		**18 mmol**

Reasons for change of regimen : during this period the water- and sodium-balances arrived at by the end of the previous period did not change significantly .

Comment : this data is from 058-003 pdf .

Urine : since in the record the line on "cumulative urine output" is left blank it is also possible that Adam failed to produce the assumed 28 ml of urine and that his estimated fluid excess then would have been +65 ml rather than +37 ml .

Hartman solution : I assumed the amount given to be 100 ml , but there are no details to be learned from the record (058-003 pdf) . Hence it is possible that this amount could have been smaller than 100 ml .

ISSUE 4 c-f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in **the period from 10:30 to 11:30 on Nov. 27**

Insensible losses :	10 ml	
Urine output :	56 ml	
Blood loss :(346 ml of blood)	259 ml (of serum)	
Total fluid losses :		325 ml
Actual fluid input :(100 ml 0.18%NaCl/4% glucose ; 100 Hartman's; 200 HPPF)		400 ml
Estimated fluid excess :		**+ 75 ml**
Sodium content of fluids given : (2.8 mmol 0.18%NaCl/4% glucose;13 Hartman's;29 HPPF)		**44.8 mmol**
Sodium content of losses :(0.3 mmol insens.losses; 3 urine ; 32.4 serum)		**36 mmol**

Reasons for change of regimen : during this period the positive fluid balance increased by 75 ml , but in view of the positive sodium balance the fluid gain may be considered like isotonic saline , not like water . (The previously stated positive water balance continued unchanged.)

Additional comments : Packed cells : I disregarded the 250 ml of packed cells that Adam received during this period from the fluid balance calculation , because packed cell bags contain primarily erythrocytes and only miniscule amounts of isotonic fluid which will not change the fluid balance .

The record on "cumulative urine output" is left blank during this period (058-003 pdf) – perhaps because Adam was making urine which could not be

collected because of incontinence- but the recording might also mean that Adam failed to make urine . In the latter circumstance the fluid balance would not have been + 75 ml but + 131 ml .

Velocity of blood loss : I made the assumption that the blood loss should be calculated as if it had occurred evenly over the 3.5 hrs from 08:00 to 11:30 during which it was recorded . There appears to be no record on the velocity at which the blood loss occurred , only the volume and the total amount are given in the document . Dr.Taylor indicated in his statement that the blood loss seemed to be more voluminous during the first 90 min of the operation (from 08:00 to 09:30) than thereafter . Had this been so it would not change the figures for the positive water balance in the respective periods .

ISSUE 4 c – f

State what you consider Adam's fluid losses , fluid intake , sodium content of fluids given , sodium content of losses in the **period between 11:30 and 12:15 on Nov. 27**

Insens.losses(Adam no longer ventilated by machine)	16 ml	
Urine output	42 ml	
Blood loss	0 ml	
Total fluid losses		58 ml
Actual fluid input (No records ; I assumed that normal saline was given to keep the iv line open)		25 ml
Estimated fluid excess		**- 33 ml**
Sodium content of fluids given		**3.5 mmol**
Sodium content of losses(0.5 mmol insens.loss; 2.1 for urine)		**2.6 mmol**

Reasons for change of regimen : There was a small reduction of the (overall) positive fluid balance during this period , but no significant change of the positive water balance .

Further comment : in general I found no information in terms of records for this period in 058 – 003 pdf and only limited information in 057 – 018 . I therefore assumed that Adam was mostly observed in this period , that blood losses had stopped , that the iv access was kept open by infusing normal saline at minimal infusion rates , that insensible losses occurred at an increased rate again because Adam was no longer ventilated by machine and I assumed that Adam produced his standart amount of urine .

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ISSUE 5

Table showing phases in a pediatric renal transplant operation . Modify it as needed and identify the personnel that should have been involved .

Response : This is a question requiring the competence and judgement of a pediatric surgeon and maybe that of an anesthesiologist . This is not a question for an internist (like me) , who never has to consider the work (and how it is to be accomplished) in an operating room . I am very sorry about this but I am the wrong physician for this purpose . (When your bicycle needs repair you would not take it to a watchmaker .)

Dresden, January 31, 2012

Peter Groß

Statement of Truth

I understand that my duty as an expert is to provide evidence for the benefit of the Inquiry and not for any individual party or parties, on the matters within my expertise. I believe that I have complied with that duty and confirm that I will continue to do so.

I confirm that I have made clear which facts and matters referred to in my report(s) are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which I refer, having studied all the relevant documents supplied to me.

I confirm that I have no conflict of interest of any kind, other than any disclosed in my report(s). I do not consider that any interest that I have disclosed affects my suitability as an expert witness on any issue on which I have given evidence. I undertake to advise the Inquiry if there is any change in circumstances that affects the above. I have no personal interest in supporting any particular point of view.

I understand that I may be called to give evidence.

Signed: Pete Gross

Date: Jan. 31. st, 2012

Adam's perioperative fluid balance. (Assumes weight of 20 kg; surface area = 0.8 m-2)

Adam's usual daily intake (known)	Enteral intake = [2100] **ml**
Adam's usual daily output (estimated)	Urine output = [1350] ml; insensible perspiration and respiratory loss = [400] ml; dialysis loss = [290] ml; faecal loss = [100] ml. **Total** = [2140] **ml**

	Time between ward admission & start of preoperative fasting 2200-0500 = 7 h	**Time between start of preoperative fasting period & anaesthesia 0500-0700 = 2 h**	**Time between induction of anaesthesia & start of surgery 0700-0800 = 1 h**
Fluid losses			
a) Insensible losses	[1.05] ml/kg/h = [147] ml	[1.05] ml/kg/h = [42] ml	[1.05] ml/kg/h = [21] ml
b) Urine output	[2.8] ml/kg/h = [392] ml	[2.8] ml/kg/h = [112] ml	[2.8] ml/kg/h = [56] ml
c) Blood loss	[0] ml	[0] ml	[0] ml
d) Dialysis loss	[154] ml	[0] ml	[0] ml
Total fluid losses	**[693] ml**	**[154] ml**	**[77] ml**
Actual fluid input	**[970] ml**	**[0] ml**	**[650] ml**
Estimated fluid excess	**[+ 277] ml**	**[- 154] ml**	**[+ 573] ml**
Comments + relevant information regarding Na^+ content of : **a) input fluids** **b) losses**	Comments: Na^+ content of fluids given:59.5 mmol Na^+ content of losses:44.3 mmol	Comments: Na^+ content of fluids given: 0 mmol Na^+ content of losses: 7.4 mmol	Comments: Na^+ content of fluids given:16 mmol Na^+ content of losses:3.4 mmol
Reasons why planned fluid infusion (content or infusion rate) should change due to change in estimated loss	The positive fluid balance should be watched . It should not increase much further .	The fluid and sodium gains from the preceding period are diminished by the small present losses . A small amount of total fluid excess (by 120 ml) remains however .	The total water excess (considering the total fluid excess of 696 ml and the total sodium excess of 20.4 mmol) is now 555 ml .

Adam's perioperative fluid balance. (Assumes weight = 20 kg; surface area = 0.8 m^2)

	Time from start of surgery until vascular clamps on (0800-1000)	Time while vascular clamps applied (1000-1030)	Time from when clamps released until end of surgery (1030-1130)	Time from end of surgery until arrival in ICU (1130-1215)
Fluid losses				
a) Insensible losses	[0.5] ml/kg/h = [20] ml	[0.5] ml/kg/h = [5] ml	[0.5] ml/kg/h = [10] ml	[1.05] ml/kg/h = [16] ml
b) Urine output	[2.8] ml/kg/h = [112] ml	[2.8] ml/kg/h = [28] ml	[2.8] ml/kg/h = [56] ml	[2.8] ml/kg/h = [42] ml
c) Blood loss	[518] ml (serum)	[130] ml (serum)	[259] ml (serum)	[0] ml
Total fluid losses	**[650] ml**	**[163] ml**	**[325] ml**	**[58] ml**
Actual fluid input	**[1750] ml**	**[200] ml**	**[400] ml**	**[25] ml**
Estimated fluid excess	**[+ 1100] ml**	**[+ 37] ml**	**[+ 75] ml**	**[- 33] ml**
Comments + relevant information regarding Na^+ content of : **a) input fluids** **b) losses**	Comments: Na^+ content of fluids given: 173 mmol Na^+ content of losses: 71 mmol	Comments: Na^+ content of fluids given:15.8 mmol Na^+ content of losses:18 mmol	Comments: Na^+ content of fluids given:44.8 mmol Na^+ content of losses:36 mmol	Comments: Na^+ content of fluids given:3.5 mmol Na^+ content of losses:2.6 mmol
Reasons why planned fluid infusion (content or infusion rate) should change due to change in estimated loss	**The previous positive (total) fluid balance(696 ml) increased by a further 1100 ml . Because of the present positive sodium balance (102 mmol) the previous (total) positive water balance(555 ml) is now increased by an additional 372 ml .**	**The previous positive water balance (927 ml) increased mildly by 37 ml .**	**The previous (total) positive fluid balance increased by 75 ml . In view of the positive sodium balance in this period the positive (total) water balance may be said to have remained unchanged .**	**The previous(total) positive fluid balance decreased by 33 ml . The sodium balance was minimally positive . The previous positive(total)water balance decreased mildly by 33 ml .**