

STRAIN
INQUEST

NOTES.

11

STABLE PLASMA PROTEIN SOLUTION 4.5%

Human Plasma Protein Solution (PH. EUR.)

Description

Stable Plasma Protein Solution 4.5% is a slightly opalescent, pale yellow-amber, aqueous solution containing human plasma proteins, stabilised against the effects of heating (pasteurisation) so that they remain in solution. Stable Plasma Protein Solution 4.5% is manufactured by fractionation of large pools of human plasma.

The preparation contains approximately 45g/l protein of which not less than 85% is human albumin, the remainder being primarily alpha and beta globulins. The preparation contains no detectable immunoglobulin. Sodium n-octanoate is added at a concentration of 8mmol/l, as a stabiliser against the effects of heating.

Stable Plasma Protein Solution 4.5% is supplied in two dose sizes:

1. Single vial containing 4.5g plasma protein in 100ml.
2. Single vial containing 18g plasma protein in 400ml.

Storage

Stable Plasma Protein Solution 4.5% should be stored at temperatures below +25°C, protected from light. **DO NOT FREEZE.**

Under these conditions Stable Plasma Protein Solution 4.5% has a shelf-life of 3 years.

Usage

Stable Plasma Protein Solution 4.5% is used for the volume replacement of plasma and is for intravenous use in the following indications.

Indications:

1. Acute blood volume replacement
2. To maintain or correct plasma volume where excessive amount of protein and fluid are lost from the circulation especially extensive burns, small bowel infarction and acute pancreatitis.
3. As an exchange medium in therapeutic plasmapheresis.

Dosage

The exact requirement depends on the size of the patient, the severity of trauma and on continuing losses. Fluids including Stable Plasma Protein Solution are given in sufficient volume to restore and maintain an effective circulation without overload. Particularly careful monitoring is required in the very young, the very old and in patients with limited cardiac reserves. Additional non-protein fluid will frequently be required to compensate for respiratory and other losses and to maintain urine output.

- a) A previously healthy adult can tolerate a blood loss of 1.5l with volume replacement only. When large amounts of Stable Plasma Protein Solution 4.5% are given, red cells may be required to maintain the oxygen transport of the blood.
- b) When protein and fluid losses predominate, as in burns, the dosage is adjusted to correct any excessive rise in haematocrit and hence in blood viscosity.
- c) In therapeutic plasmapheresis the volume of exchange medium is related to the volume of plasma removed. Different regimes use different proportions of Stable Plasma Protein Solution in the exchange medium.

Administration

Stable Plasma Protein Solution 4.5% is for intravenous infusion. Stable Plasma Protein Solution 4.5% must not be used if the solution appears turbid or contains a deposit. The solution should be used within 3 hours of opening, and any remaining solution discarded.

18.6.96
W. Hechey

Inquest

Adam Strain

Court Tester - Deposition read.

Court made aware of death - spoken to by Dr Savage
09.00 - Dr Webb pronounced dead.

2pm Wed 29th Nov '95 identified body to Dr Armour

No questions.

Deposition signed.

Deborah Strain

Deposition read.

Surgery from 3 months old

in Ulster → RBHSC : 4 ops until Jan '92. Then left
water attached to right.

Gastrostomy tubes, dialysis from Sept '94.

Oct '95 surgery.

26 Nov '95 - ~~MPH~~ ward for
900mls of water fed.

Taken to theatre before 7am.

9.30am Dr Savage said going well.

Dr Keane & Dr Brown. -

Things taking longer. Saw him at 12.15pm
skew to water
knew something wrong but not told.

Later told something seriously wrong. Later told
little hope.

Potassium had risen & needed dialysis, but unsuccessful
Ndr told of sodium problems.

Told everything being done & knew this was so.

Dr Taylor said this was 1 in a million thing
Searching for explanation.

Adam had ongoing sodium problem & want to know
why more care ~~being~~ was not taken about
this.

~~with~~

Questions :

GB None
in deposition.
Counsel: Said not very happy with Mr K & Mr B
Just with
DS: Mr Brown was Curo surgeon as he was never
successful & I wanted him change
Covner - Mr B needs to be told if complaint
being made.

Counsel - Part of concern about appearance - affe
all of team, Not putting any further th
Main concern Sodium & catheter in neck

Appearance after surgery
Extremely
DS: Completely bloated. Looked overloaded with
fluid 12-15. Think op over at 12. Dr Scur
& Dr Connell keeping me informed.
Not awake. Usually after surgery awake
when I saw him. knew different.

Covner - Usually awake & ast of anaesthetic
easily IT yes.

Counsel - showed photos. Birthdays + 19 days before
death. + photo on 28th Nov - 24
hrs after surgery.

DS - Really bloated after op - This went
down a bit before this photo.

Does not look like himself at all.
why? Pyjamas were too big before he went
into surgery & fitted him after.

Covner - Photos passed to witnesses

Counsel - ? re ongoing sodium problem

DS - Had 12.5 mls sodium bicarbonate
4 times per day + normal saline
100 mls per day into feeds.

Did not look into his eyes after surgery
to have Generally very healthy. Didn't eat or drink.
Well nourished. One of the best
nourished of those waiting for transplant
Hosp looked after him very well in that

rel - Several ops with Adam - Procedure prior to ops?
Usually anaesthetist came to see prior to op & go over things generally & go to theatre with him.
Saw Dr Savage night before.
Expected to see Dr Taylor on morning of surgery before going to theatre.
Would have expected him to ask about lines etc.

Counsel - Difficulty with left side of neck access ie
D.S. - Had ^{tried on 3 days} central line in for 2 1/2 yrs removed a few months earlier, Jan 195

Coroner - Is this to show that Dr's did not know of this on the day? Counsel Did Dr Taylor know?

D.S. There is scarring there & quite prominent.

Coroner - This can be explored. Do I need to record this?

Counsel - I understand 3 attempts on left & this scarring may have been why & it may have been better to try the right side.

res Added: Unhappy Mr B. due to previous surg.
Thirstily bloated 12.15. Not awake. Pres recovered very quickly.

Sodium problem. - Sod bicarb + saline

Did not look into eyes.

Well nourished.

Not spoken to by Cons on morning of op.

Diff re left side insertion may be due to scarring from previous line.

Armour.

Deposition read.

Report C2.

Cause of death - Cerebral oedema - swelling of brain

d.N - low sodium.

IPF

Commentary read.

Coroner - You have considered reports of Dr Alexander & Dr Sumner.

Any contrary view to theirs
Dr A - No.

Coroner ICP - Dr A Cerebral oedema - have seen many cases of this ^{in comparison} this was massive ~~C.O~~ in a child of this age. Never came across cerebral oedema of this degree.

Variety of causes - trauma, hypoxia (ie lack of oxygen), infection.

Cause here - I understand to be a rare one. Never encountered this before.

Coroner - on basis of brief report - Do you conclude - world wide this is rare?

Dr A - That is my understanding - yes.

SB Questions : Highly complex, difficult case

Dr A : No of reasons

Underlying condition - kidneys, nit by mouth: fluid to be maintained many ops. renal transplant more diff due to earlier ops.

Subs blood loss during op. - made this fluids ~~very~~ extremely diff to manage ie his circulating blood volume & how much fluid he needed replaced kidney transplant? Very healthy child?

Dr A. Not my view. Would describe him as a sick little boy

GB Sodium levels? 4th line commentary 139 ^{level} section

Dr A : Within the normal range

GB: Gross cerebral oedema ^{of brain} - no sign of ^{oedema} of other organs
Is this strange?

Dr A: My understanding ^{in cases like this} - fluid absorbed into brain in preference to any other organ.

In cases of dilutional hyponatraemia + hypo. hyponatraemia per se - low sodium dilutional - diluted by something

eg - farmer due to vomiting / diarrhoea

Genes - dilutional - diluted because of fluids given.

Dr A - Yes.

GB - hypon. Oedema - hypoxia a hyponat. Here you say d.N. Dr. A - Yes

GB: Can person be more susceptible?

Dr A: Children & (females) more susceptible to cerebral oedema from any cause than adults. Females more suscept to dilutional hyponatraemia than males.

GB - Literature on dilut hypo?

Dr. A - The Arief papers. It deals with healthy children.

[No doubt sodium low at start of procedure. At 9:32 low sodium ¹²³ - This was 2 hrs into op.]

Yes think the Arief is good reference to this case even though it deals with healthy children & Adam not healthy.

GB: Poor cerebral perfusion?

Dr. A: Blood flow around the brain. Suture on left side - from previous line
Catheter tip in right side of neck - impaired on left & catheter on right so impaired cerebral perfusion.

Blood loss - Substantial - Were you aware bladder spasm?
Aware of suprapubic catheter.
3. Blood loss - diff for anaesthetist? - not my area
Need to replace fluids - need to replace blood.

counsel. Blood loss during op. Reduced sodium
critical for this - prevent if higher Na & less
fluid give

Dr. A. feel this is outside my area.
10 sets of notes but notes re op in particular.
Ntte shown - re fluids - looks familiar
received statements from Dr Taylor & Dr Savage +
patients. Used all these for readings.

Counsel - Swelling caused by overloading?

Dr. A - Can't answer about overload.

Counsel Obstruction?

Dr. A. 1. Combination of suture on left side
catheter in right - not sure if this affected
Because of left suture, catheter may have
had a role to play in affecting circulation.
Jugular tied off - can't say how much
effect.

My understanding suture there for some time
not on day of op.

Counsel Suture & scarring on left. Would you attempt
to insert line here?

Dr. A. Not my area.

Counsel Fluids - Aniff article. You think applicable
Measuring sodium in simple procedures.

for renal ops - more important to measure electrolytes

Dr. A - Outside my area.

Counsel Did you not say Adam more susceptible?
Dr. A Only stated the fact that the report dealt with healthy children & Adam was not.

Counsel Blood loss - made fluids more diff.

Dr. A: Any attempts in hosp notes as to calculation?

Dr. A: This was given to me verbally at autopsy.
Can't remember if in the notes.

Counsel: Clarify dilutional / hyponatraemia. Is Adam likely

Dr. A: ^{to suffer} ~~the~~ kidney failure - ability to maintain electrolyte balance impaired. May suffer from Na fluctuations. Can't say if more susceptible to the condition of ~~the~~ hyp.

Not just hypo - there was an op. different circumstances.

Can't comment on likelihood of hyponatraemia

Counsel fluids given low Na concentration: low sodium all along

Dr. A: Need to talk to someone who dealt with during life.

Counsel Setting aside renal problems - he was relatively healthy. - Not saying he was healthy
CVP - measured to avoid overloading & monitors fluid load. Indicator to avoid dil hyp.

Dr. A: For transplant - need to be well perfused during op.

Counsel: ~~Dr. A~~ How regularly should CVP readings?

Dr. A: Not an anaesthetist

Can't comment on app during op. ~~at~~ autopsy can comment on appearance. Can't say how long it took.

Haematocrit - red cell volume.

Could indicate - bleeding or dilutional state.
Don't know procedure when these readings should be taken.

Coroner Added: Massive C.O. Never come across. Ext rare cause - Never come across.

Technical diff. Blood loss during op - hypotension
diff to manage manage

fluid into brain in pref.

dil^{hyp} due to fluids

paper - good ref.

ICP - suture left - catheter right

Blood loss - high don't know what problems

this caused for anaesthetist

Suture & catheter on right may have role to play.

Haematocrit could indicate bleeding or dilutional state.

Summer

Coroner After Adams death - felt required advice & assistance - Took 2 anaesthetic visits - Dr Alexander + Dr Summer.

Deposition read. C3.

Perused recent notes.

AV child on 50 centile. Height normal. Weight - chubby.

Orchidopexy - opto bring testicle down

Significance of catheter? To ^{see} who there continuous monitoring of urine during procedure?

PD = Peritoneal Dialysis

ones - Blood gas at 9.32.

S - logical to take for electrolyte & blood gas shortly after Adam on table - say 7.30 / 8 am.

Page 8. Change at earliest opportunity i.e. after it has been discovered.

Common practice transducer attached to bed so the zero is same.

if table raised & lowered then the zero remains the same.

Coverer Dr. A Adam very sick little boy. Mother says healthy relative to others.

Dr S: Sick child but relatively healthy compared to other children on renal transplant programs.

Coverer: Arief paper - dealing with healthy children. What about someone like Adam. Dr. A. Thought good basis for reference.

Dr S: Very important paper on subject but not much general knowledge.

Process for hyponatraemia same in Adam as for any child

Worldwide - Think this is very rare.

Personally - not come across this before.

Coverer: Child brain prone to oedema.

Dr. S Agree - although think poor evidence of oedema in other organs.

Think brain more sensitive.

Coverer: If exclude your view of cause for cerebral oedema. - any other possibilities?

Dr S: Problems with venous drainage from head may have been contributory hypoxic ischaemia - No evidence of this

Coverer: Renal problems - make him more susceptible?

Dr S: Think only way to know is if we had known Na immediately prior to op. Night before fix.

Don't know if likely to have low Na prior to op. Child bleeding, passing urine, kidney op so need to be generous with fluids.

Difficult to say if he is more prone than renal child.

These cases very difficult to manage. Need to give fluids for transplanted kidney.

Don't think dilutional hyponat at top of mind when anaesthetising this child.

Very difficult case - highest level of skill needed

Hindsight - might/would have liked more info on electrolytes & haematocrit prior to surgery.

Don't know if local problems for getting these done. Very busy anaesthetic for 2 people.

Work cut out to manage - anaesthesia side + whole fluid balance issue.

(Local problems - Dr Taylor will give evidence)

Anieff - very interesting paper. know about it. Dil hyponatraemia not at top of list.

First sodium at 9.32 123 is low.

Looking at Anieff paper - the range they showed 101-123 so Adam at top of their range.

Maybe Adam needed additional factor such as the poor drainage from the head.

Top of range so not necessarily too bad state

Dr S: 123 is low result - need to do something about it. Would not have Anieff figures in mind.

Only with hindsight say top of Anieff range.

B: Complex & tragic case. Dr Taylor looked after child for no of years.

Na at 9.32. 123. Low but high

end of Anieff

S: Said this, Think low figure. Should not go lower. Need to do something

Dr T. giving Hartmanns, also covering blood loss.

GB - ~~AN~~ ^{that} fluids given contained sodium

Dr S - ~~That~~ is correct.

GB - 1/5 solution 30 mmol per lit.

Dr. S: 38.

Hartmanns 131

HPPF same as normal saline

GB: line to neck. Could this explain state.

Dr S: With hindsight
Problem with venal drainage from neck. Don't think Dr Taylor could have known this. Although line in neck - very often not tied off. Would have known line there but could not have guessed line tied off.

GB: Lines on table. - react to bed. - dips on bed

Dr S: Table moved - so ~~clip~~ need to re-calibrate

GB: Practice to reset each time level of table ~~&~~ changed.

Dr T. will give evidence on reasons - to keep free from towels, & keep away from table.

Counsel: Experience of these - Usually talk to parent.

Dr S: One member of team always sees prior to op. Need not be consultant. Trainer is capable of doing this.

Don't know that Miss Strain would have known tied off.

Vein still patent. Highly skilled to put these in child chubby so very difficult.

Don't criticize Dr Taylor for trying the left side.

Counsel: Scars on skin indicate central line. Would this deter you?

S. Usually go to right first. Possible that Adam had also had lines in the right
miss - Only line in right when baby
S - Don't ^{introduce} ~~have tried right~~ Dr T for trying left. I would put
Need line in upper part of body for kidney transplant

Counsel: It may be Dr T was involved in pre op?

Dr. S: If saw this then should have known but could still go for other left jugular.
Dr. T. in very difficult situation... Did he remember suture. Had to get line in upper part. Had he known of this there was no alternative to putting line in neck.
Would surprise me if only line in groin.
Not aware of line in groin. May have been put in in ICU.

Counsel: Should Dr T have known about the tied vein.

Dr. S: Traditionally head on one side - usually away from side that central line is in.
Anxiety about cerebral perfusion puts not in Dr T's mind even had he remembered about the tied vein.

Counsel Head on left - would this affect more

Dr. S Dr A said vein dilated because other tied. Turning on left could have occluded vein.

Counsel CVP return when head in normal position

Dr. S line in right - CVP measuring pressure in right vein. Could not tell if this has any relevance to the pressure on left side.

Counsel If aware left closed - couldn't know impaired drainage on left

Dr. S Couldn't know as the other vein would take flow, possibly affected by head turned.

I Always have head turned to one side or other

el. Blood gases - Once line in place can take bloods
3 points

Dr S: Arterial line in wrist - Measure BP & sample
blood gases + electrolyte.

venous line 3 lumen catheter: give volume fluids (large lumen)
Measure CVP continuously
administer drugs continuously eg dopamine
as here.

Counsel: Arterial line in place at outset of op. How long to
get in

Dr S: If have taken an hour. Prob Dr T took 20/30
mins.

Counsel: Electrolytes?

Dr S: Usually Na, K & haematocrit measurement.

Machine measures blood gases. - or can go to
lab. Very slow.

This was Fam - Maybe an hour to get
result if lucky.

Complex case eg transplant, cardiovascular, neuro,
~~may~~ do blood gases, beginning, middle &
end.

Counsel Here only done middle & end.

Op lasted 4-5. Usual.

Dr S: Think surgery complete in 4 hours. Can take to
if training.

If surgery longer - yes take more blood gases
as more changes. eg 6 hr op take 4 sets.

4 hr - 1 beg 1 mid 1 end.

5 hr - maybe 4.

Depends on previous results & the dynamics
of the op. May not feel the need to do.

Haematocrit 18 Na 123 at 9.32.

139. Previous night can't be taken as baseline as
he had dialysis during the night.

123 outside normal range.

If Na falls below 128 (definition of hyponatraemia)
Progressively below this ^{creates risk} danger of water getting
into cells esp brain.

Sodium crucial substance in body. Stabilisation
of cell membranes. Ratio of that outside & inside
cells is crucial.

Sodium serum is the outside cell.

Low outside then water goes into cells... get swelling

9:32 Hyponatraemia. - 123 Na level.

Would think could be some associated swelling
of tissues - the beginning of this.

know children vulnerable to hyponatraemia. Difficult
to identify under anaesthesia - headaches, lethargy.

Signs masked by anaesthesia.

counsel Low Na can lead to brain damage or death so
expect regular Na monitoring?

Coroner - Think stepping over boundary of Inquest. Think
stepping into another area for another ^{dis} cause.

Dr. S could Dr T be asked what he ~~would~~ ^{did} do

Counsel Purpose is to make application to Coroner to
make recommendation about monitoring of sodium levels
to prevent this happening to other children

Coroner - Mr Brangam aware of this & may wish to
make an application -

? you seem to be asking Dr S to comment on
the reasonableness. Perhaps going into area of civil
liability.

Counsel If Na level monitored & low level addressed
can you say what outcome would have been

Dr. S. Combination of dil hyp & renal drainage. Without
the drainage might have been ok. Think
the combination caused this.

Think Na 123 - don't know what it was before. Can survive intact with Na of 123 so long as doesn't fall further.

Hyponatraemia: Na low as losing sodium eg diarrhea

Dilutional hypo - connected with administered fluids.
eg psychiatric pts.
or caused by physician.

Re Dialysis - I understand can affect this. Outside my area. Need Nephrologist to look at this

Sodium bicarb ppts given for the alkali bicarbonate

Think well worked out. Not given before op so

Possibly ~~not~~ affected.

Counsel Inability to drain urine would increase fluid in system?

Dr. S Can't answer as don't know quality or quantity of urine being put out.

Counsel Polyuria

Dr. S Passing a lot of urine. Think 3.5 mls/kilo/hour.

No info of during op. Bladder open at some stage so wouldn't know.

Urine ^{records} ppts not usually kept. Kidney - often no or little urine. Think of it for general fluid balance.

Counsel Bladder swollen during op. - Was this the case?

Dr. S Can't remember.

Counsel Excessive blood loss.

Dr. S Think a factor in overall. Fluids given which contained less sodium.

Very difficult. One factor. Level of sodium important in assessing fluids to give.

For kidney op - need to provide a great deal of fluid.

Doesn't override sodium requirement.

Haematocrit x low sodium at 9:32.

Indicate sol given: no red cells & too little sodium.

Haematocrit on its own - excessive loss of red cells
together with low sodium - know clogging blood loss but
low sodium indicates a lot of water given

Combination of blood loss & sodium containing fluid
& replacing by fluids with insufficient sodium

Q Record of fluids given: 7am

Surprised that so much of '15 saline given?

S BP ok. No need to pre-load children for epidural
wondered about thinking behind this.

If difficulty inserting lines. fluid load to increase
CVP can make it easier to insert line. Often 'dry'
after dialysis so give fluids.

Central veins always reasonably filled even if
mild dehydration. Sometimes do give fluid.

Q If increased to put in line - did this contribute to
excessive fluid?

S This was given before much lost. Dr T. gave 500mls
immediately which is ok but may then cut back
He gave more than his calculation perhaps by
a third again. Need paper to calculate.

ones - Don't think he should be tied to this.

S Fluid balance very controversial esp in paediatrics.

There is an enormous range.

He worked it out. Deviated perhaps for good reason
& I can't read his mind on this.

for lunch..

Cassell explanations for extra fluid

1. Maintain bp.

Dr. S

Renal transplant. Need to keep kidney very well perfused. Need more fluid than normal.

MH Does BP drop when clamps released?

Dr. S Need to give enough to ensure when clamps released BP will not fall. Best given gradually over op.
Can give bolus before or gradually give for 1 hr. or give just as clamps released.

Include in calculations

Not an exact science. Huge controversy about this. General feeling for transplant need a lot of fluid. Have figure in background in mind & change it in course of op. Clamps are a fixed point but can't predict when this will happen.

Dehydration - then administer.

MH Other reasons to give more?

Dr. S. Not other than these or to fill veins in neck.

Dr T didn't believe the CVP reading. When monitoring need to assess readings. With hindsight think readings were accurate. Got feeling Dr T was questioning the reading. I would probably err on the side of believing the reading.

High CVP -

This represents cardiac filling. If high can be - heart failing
or administered too much fluid

In a child the CVP very distensible i.e. it can expand. You can get very little

change with adding a lot of fluid.

High CVP ~~indicates~~ ~~a~~ could mean a high blood volume. ~~could indicate~~

is there an indicator of excess fluid?

If reading ~~glucose~~ then knowing the haematocrit low & sodium low - then too much fluid.

Maybe slow down fluid, maybe change solution eg Hartmanns.

Low haematocrit reflected loss of blood & the high fluid.

Approp to start blood transfusion at that time.

CVP. not written but appear on printout.

Last CVP reading just before 11:30. Would have been continued in ICU or on ward.

Having finished op start to dismantle equipment to move from theatre - can take 15-20 mins. Seems they moved him around 11:40 when other monitoring stopped.

Adhesions from previous surgery.

used Miss Strain told op would take 2-3 hrs. Would adhesions have prolonged op by 2 hrs?

Jr.S. They would slow it down. Can't say by how much. Sometimes adhesions more difficult than others - can be very dense.

Swelling on photos. Difficult to tell from photos. how swollen. Can occur very quickly ~~they~~ maybe within an hour.

Regularly anaesthetise a similar child with no kidneys - mother can detect swelling around eyes & assess 100mls of fluid. They swell quickly with relatively small amounts of fluid. Once taken place can speed up.

Drape during procedure so head not very

accessible — not easy to determine intra-operatively
Wt of brain —

Swelling of brain was gross. Can't see the
brain swelling. Brain can be more swollen than
face. Can have gross brain swelling without gross
swelling of ~~brain~~ face.

Not an indicator of each other. Can be
independent

osmotic
P, low Na, Venous drainage all make facial swelling possible.
Might have a lock a feel if there was swelling.
Don't usually test for this.

Low sodium indicative of hyponatraemia.

Article 0.34% of ²⁴⁴¹² these cases had post-op hyponatraemia
83 cases used a certain cut off 128 Na. In whole of
US. 7 deaths. 3pts in 10000 die.

Only a small percentage would have symptoms.

Counsel
Dr. S 3pt in 10000 die. High figure for something so simple.
Certainly unusual. When does it become rare?
Med practice in states different. They are more keen
to give large volumes of fluids.

MH
Dr. S 3 out of 10000 die of this. Is this high?
A child who goes for tonsillectomy — shocking
if they die from this. 3 in 10000 is unusual & US
if lower different policy.
Adam not having a simple op — he was
not a well child.

MH Sodium deficiency — electrolyte balance.
Was it not important to measure Sodium

Dr. S Think I said this this morning. Know they
tried but it was difficult in ward.
Would have been helpful to have at start of op.
Stand by concluding paragraph.

Co. ones

Bloods - taken on op.

Sick child - healthy relative to renal pts.
brain more sensitive

unpaired blood flow from the ~~head~~ brain
case management extremely difficult

123 - should not go lower.

All fluids contained Na.

With hindsight

One member of team to see parents

Putting lines in highly skilled - normally I go to right

Drainage may have been unpaired

At head to one side

Central line - 3 points

Blood gases measured by machine/lab.

- beg/middle/end.

6hr op - perhaps 4 sets

Under Na 128 = hyponatraemia

Balance.

Hyponat can be masked during op.

With 123 reading, without the venous pedicle Adam
may have survived. - so long as doesn't fall further

Polyurea - passes lot of urine.

Fluids didn't contain enough fluids.

Haematocrit + Na readings not enough red cells & relatively
insufficient sodium in that excess water.

Extra fluids perhaps to increase CVP.

With kidneys op - need extra fluids

Dr T not believing CVP readings. I think I would have
believed

High CVP.

Would transfuse.

Last CVP 11.30. Constrained in ICU.

Swelling perhaps within 1hr.

Not so easy intra operatively

Brain face swelling can be independent or can be linked

3 in 10000 is unusual.

Coroner - Do you concur with Dr Summers?

Dr Al . Yes

GB . Complex case . Great debate about fluids
Page 1. clear fluid was diuretic - 952mls.
Normally get 1500mls.
Would he be in deficit?

Dr Al : Suspect for reasonably balance at that time.
Deficit for 2 hrs when fluid stopped prior to theatre.

GB : Child passed 100mls per hour. normal precaution prior to theatre

Dr Al : Difficult to measure normally.

Impossible to measure output during surgery.
In a perfect world nice to measure everything
but partic during complex surgery not always
possible to measure. Catheters do not necessarily
drain during surgery.

GB Was anaesthetist compromised? (urine measures)

Dr Al Would create difficulties

GB Also by blood loss?

Dr Al Child lost 3/4 of blood volume. Serious
situation.

GB 9.32. Na low at 123 + haematocrit
level had fallen. Latter?

Dr Al : Considerable blood loss replaced fluids
without blood cells.

GB At end AB normal indicates blood
loss replaced by careful judicious
management

Dr Al . Yes

GB . CVP. Measured throughout. 17 reading

Dr Al : 17 is abnormally high.

GB : If tip of catheter some distance from
heart would reading be higher/lower?

r al ^{How} Tip in neck vein &

Pressure measurements normal.

Most unusual for reading to be high if tip of catheter elsewhere.

Reading very high from start before fluids administered. - concern something wrong with transducer.

Had reading gone up later what would feel?

Dr Al If started at normal & increased - this is what one is looking for. Want high CVP Adult kidney & large proportion of blood flow goes into kidney. Need high CVP to cope with this.

GB Drainage from head?

Dr Al Understanding if tie off one internal jugular & compensation ^{would} occur very easily as other veins. ^{Have heard} Even if both jugulars tied off makes no difference - Not convinced that it would affect the drainage.

Absolutely No way anaesthetist would be aware of compromise in drainage. Child covered up. Difficulty in seeing swelling / colour

GB Dr Sumner - No problems ~~with~~

Drainage causing problem.

Dr Think pure speculation. Possible that it was a factor. but Not convinced that 1 jugular ligation created sufficiently high pressure in veins to create this tragedy. Can't discount but not convinced

Dr Dr S. if ligation not there - then could cope with low sodium

2 Hyponatraemia page 3 "one might speculate"

not this

J.A. Another real difficulty. Reading of 702 - kidneys
excreting water but nothing else.
Would not concur with Dr Sumner that child is
more vulnerable ^{to this}

not sure this
is right.

MH Aneff's article - The Message critical to measure sodium
levels even in simple op.

~~Dr Al~~

Dr Al Want to take issue with this Article being
placed.

US pop for hosp 24400. Child given IV
infusions - little sodium. Practice almost unheard
of in this country.

Aneff - all these children were hypoxic - 1/2
O₂ levels which may have contributed
with ~~this~~ to brain damage.

Not arguing that sodium levels should be monitored.

MH There has been a problem with child's sodium -
Ch Dr Savage can give evidence on this.

MH Child taking sodium supplements.

Dr Al Believe more important to measure sodium in
this instance.

MH Adam required to take saline + sodium bicarb

Dr Al Can't comment on this.

~~Ch~~ MH Dextrose + saline given. Is this unusual?

Dr Al Yes.

MH Similar to the test cases?

Dr Al Not an identical scenario. Aneff 3-48 hrs during
prolonged infusions. This is quite different.
Not distinguishing between fluids given.
Aneff - hypoxic. Not applicable in this case.

— Renal failure makes susceptible to hyponatraemia?
— susceptible to develop complications from hyponatraemia

Such an unusual situation, not aware of it before Nov
Now maybe different.

This had not stuck in my mind before Nov.

Think Na⁺ levels today should be monitored. Before this happened in Nov not many people would have been aware.

MH page 2 - line 4 second para. No dramatic changes
What about the sodium levels.

Dr. Al Not much experience in children. In adult level of 123, concerned but not particularly alarmed. Would take action.

— with Haematocrit as well?

Dr. Al Would be concerned. ~~Then~~

MH Response to these? Management?

Dr. Al ~~Response~~ Indication for giving blood transfusion following transfusion, prob take further sample for electrolytes & haematocrit.

Blood gas - depends on machine.

MH CVP reading of 17. Too much fluid already? Why - faulty transducer.

Dr. Al Would be very hard to transfuse to this unless pt in gross heart failure.

MH BP low Pulse normal + CVP meant transducer OK.

Dr. Al Believe Dr. Sumner said this. Not sure convinced. Very early morning. Theatre technicians may not be available. Using all anaesthetist skills. Busy business.

Cpt another transducer if giving faulty reading.

Dr. S said may give blood to expand veins.

Dr. Al 1000 mls had not been given prior to

reading

Counsel

Dr. Al

MH

Don't know when reading taken.

By 8am op well under way.

Because of failed attempts the 1000 mls was administered to increase CVP so line could be set up. Could this account for high CVP reading of 17.

Dr. Al

MH

Dr. Al

MH

Dr. Al

Think unlikely.

How much fluid to get reading of 17?

Can't say. Never achieved this.

Problem could have been recognised by signs

Would not accept this. Could not have been recognised until after surgery.

Recognise by Pupils dilated

Swelling of face.

MH

Dr. Al

Could ^{tragedy} have been averted? if Na addressed

Na 123 - Upper limit where Aniff says problems might arise. Would not expect gross cerebral oedema at that level.

MH

Dr. Al

At end of op. Na down to 119. At what point was it critical.

Only experience of this in adults. At 120 would be very concerned.

During op. Unless following Na levels are very close intervals don't think I can answer that question.

MH

Dr. Al

Every unit drop below 123 is cause for ^{grave} concern?

~~Aniff's~~ medium 115. Would increase the risk.

Counsel added

Fluid deficit 5-7. Normal precaution

During surg imposs to measure urine

2/3 blood volume loss

17 reading - something wrong with transducer.

Drainage - not canniced.

US practice not followed here.

① Anieff - hypoxia.

Should monitor for Na - but was not the practice
Haematocrit reading - give transfusion.

Transducer faulty - get another

Daik knows what volume to get 17.

Very concerned if 120 level.

drop Below 123 increases risk.

MH The unusually high amount of dextrose/saline
here. What this included.

Both in Anieff paper & in this case a high
infusion of fluids.

summary recalled.

Dr Alex said what happened in Nov has
concentrated minds on what should be monitored
with hindsight perhaps monitor Na different

Dr. S. with hindsight monitor sodium here more
closely

Did know about Anieff paper - but unusual in
this country & Europe as fluid practice different -
this is more small point in Dr's minds.

Think children with major surgery - measure electrolyte

Blood gas machines measure sodium. UK

have had these for several years.

Measure at beginning, middle & end.

For kidney transplant need this early.

But need not spill over into simple ops as less

fluid given

Anieff paper very important - benchmark.

Adams' death several yrs after this. Look at it in conjunction
with paper. Parallels with some of these cases.

Dilutional hyponatraemia - cerebral ~~fluid~~ edema.

Is there a method of disseminating this?

Think there should be. Our view - it wouldn't happen here as we give less fluid.

But here unique operation because of need to give high fluids - verge on fluid overload for new kidney.

Message to go out - continued monitoring of electrolytes during complex surgery.

Keane.

Deposition read.

~~Op at 7.30.~~

~~kidney put in.~~

~~Not performing as well~~

Covener - Is change transmitted to surgeon.

Mr K - Surgeon attention totally on procedure.

Talk to anaesthetist. Dr Savage in & out.

Initial changes from hyponatraemia insidious.

Anaesthesia masks signs. We are in abdomen.

Blood loss referred to is technically a total fluid loss. Blood + fluid from ^{peritoneal} cavity + urine

Bladder left distended. Monitoring of urine is never done during kidney transplant.

Covener Adhesions. cause diff?

Mr K Difficulties :- previous surgery in area of vessels where implanting

almost largest abdominal surgery for a child.

guess of amount of fluid to come out.

Sequester fluid in bowel.

large incision - evaporation. fluid going in.

Estimate to cover this. Release of clamp need to fill kidney. CVP & total fluid volume need to be high.

MH

Op to start at 7.

Mr K

7.15 → 8 by time child asleep.

kidney arrived right before. fresh.

Problem - the most major op for child.

Earliest 12 so 1.30 or 2 for op. Myocardium?

24 Ok 36-48 - Not so good.

24-36 Yes.

Did not feel that I should undertake this surgery at 2 am.

As fresh as possible - Standard up to 36.

Don't know when donor died.

MH

No query about the kidney.

Mr K

Would have been ludicrous to go in at 2 am.

Procedure 4 hrs. off table at about 11.30/11.40

Same time after surgery before anaesthetic over.

MH

Can you tell if CVP high?

Mr K

No. Indirect method of assessing pressure.

Impossible to say from what we see. That is why need dejective measurements.

Need BP & CVP.

Haematocrit relevant here but not normally.

Would not have looked for this value.

Total blood loss.

Not worried that massive haemorrhage. Never concerned about this. Not informed that haematocrit level.

Only clinical situation

in Urology - a prostate - hypo can occur

In paediatric have never seen hypo

Never seen in kidney transplant.

Do ask for sodium level. Not familiar with

Arriff case. Not aware of it before today.

Coverages Is this not for anaesthetist?

Dr K

Never seen it before. But in light of this would ask for sodium.

keep bladder distended for procedure.

Dialysis in view of fluid - get electrolyte back to normal

Added

Mon of wine never in transplant.

Don't undertake surgery at 2 am.

Believe used in normal time

After op problems noted

In light of Adams experience consider staff for future surgery.

Blood gas machines - gives Na reading. Level of 123 needs treated.

Rise. Those who have given evidence need not come.

MH - Not free tomorrow. Ins SD was to get back to me.

Coverage - Can't give guarantees.

OB -

Dr Savage + Dr Taylor

↓ controversial point about sodium.

Mon Tues / Wed, Thurs.

This week - Thurs = Apps Stevenson
Fri = Mckeown Campbell RGH
Private

Next Week - Mon - Private 7 am
Tues - interview 2-10
Free otherwise

Wed - Presentations

Thurs - Diffen 10-30 1.30 Rev V

Friday - Talk - Pol Don. Damm, D...

11

Friday 8am - Resume.

age

MH Sodium below 128. Is this significant?

Dr S Yes

owner No one disagreeing but due to factors no one knew position

MH Procedures allowed this to be identified
Dr S expert on kidneys & on sodium level & perhaps best to explain this

Dr S As anaesthetist would be concerned. Upstaff would be aware of this. Important teaching re sodium regardless of Anaff
Kidneys regulate Na. During this op even knowing law may not be in a position to correct it if kidneys not working
This has happened to other people. Other children have got into bother in this

MH Not trying to upset. Sorry if you feel this. Just trying to clarify.

kidney available ~~at~~ earlier but discussion about when to op

Dr S Not my decision.

MH You made a note about what is happening
You were responsible for electrolytes night before. Notes.

owner : Where are you going with this?

MH : Note in records re elect ok to be repeated in morning

Dr S : Problems obtaining blood.

Miss Strain there all night & knows attempts made. Decided leave until theatre.

MH : Would you expect them to be taken in theatre.

Dr S : Judge if electrolytes had changed. Can't make judgments outside clinical situation

MH You said didn't expect electrolytes to change so why did you say they should be done in the morning?

S. You think I shouldn't have?

nes. You are not allowed to ~~answer~~ ^{ask} ~~ask~~ ^{ask} questions.

r S. It would have been the safe thing to do to reassure.

nes. Can't compare practice here with another hosp.

This is not the area for this Court.

Open into with Mr Keene - not going to cover same ground.

r S. Standard practice - test elect near start of op. - whether during op is up to those performing. In view of Adams death would be as view to monitor electrolytes more closely. Think Dr Sumner also saying this.

In & out of theatre but not aware of 9.32 readings. Did intend to be there.

Tragedy to all of us. know spoke to Miss Strain a no of times. Doing other work.

MH Miss Strain thought ended midday.

Dr S. Next saw Adam coming into ICU around midday.

MH Hyponatraemia. Aware of this. Undergoing renal transplant - danger of this?

Dr S. - Yes.

MH - Previous op - central line removed in Jan '95. Were you involved?

Dr S. Coroner: Not sure of relevance.

MH: Do you agree with Dr Sumners view as cause of death?

Dr S: Yes I think this is cause of death.

MH: When did Adam die?

Dr S: Think died during op if you accept brain

death as death, but he was kept on machines

8) until 28th

D Removed machines on 28th as per autopsy.

MH ^{Agee} Fluid overbalance due to brain size.

Dr S : Swelling due to dilutional hyponatraemia

MH : This arises due to excessive fluids containing ^{insufficient} sodium being administered which absorbed ^{into} brain

Dr S : Can't say gross fluid overload. High DL hypo. High risk for children that will affect brain if Na changed rapidly. Dr Sumner pointed this out.

Rapid change because it happened within 12 hrs

GB Has long did you know Adam

Dr S : known a no of years - since 1991 - since he got into trouble with his kidneys.

Because we all knew him - all extremely upset by his death.

lively, special character - will never be forgotten

Photo in ward.

Administration for Miss St.

GB : Any alternative to op?

Dr S : Had to have this to live normal life & live longer. Hope for successful transplant.

Big step for mother as she knew there were risks. Sometimes guilty of playing down risks but did discuss.

Also discussed with Dr Taylor. He had intended to see an evening but when op put off till morning he didn't. Satisfied we discussed everything.

Feeding discussed in detail.

Dr Taylor would have been aware of normal feeding routine. Discussed this. Aware normally got 1500 mls. Agreement to give some fluids overnight. 900. Needed to switch from tube to IV 2 hrs prior to op but couldn't get line in to do this

GB Satisfied that all anaesthetic staff had all info they needed.

Dr S Yes. We work as a team.

GB : Info - re 9 other deaths over 5 yrs.
Was this available prior to op.

Dr S : No. Spoke to colleagues in England following this due to concern & get this information.

GB : Composition of fluids.

Asked Dr Sumner did all contain Na.

Dr S : Yes all contained sodium & none contained any less sodium than his normal food.

GB : Suggested helpful if you could pick a figure to ~~use~~ as a limit.

Dr S : Can't pick arbitrary figure.

Even Anieff saying 128 but highest they saw was 123. Erred on safe side.

Can't pick a figure. Matter for clinical judgment.

To take electrolytes

At 7 am to take ^{results} test it would take about 1 hour ^{for} Standard emergency result.

14 All fluids during op contained Na.

Does it seem clear he did not get enough Na

S With hindsight this Na became too low. Could be either too much water or too little Na.

14 : The machine readings - how reliable?

S Blood gas machine which gives sodium reading.

Never used that machine.

Not designed for Na.

Na well controlled.

Speed of change of electrolytes significant

Potential for low Na being managed
with kidney problems - children likely to have Na problems
would measure more as result.

At 128 need to redress balance
under 120 need urgent attention.

Not aware of 9.32.

Renal failure - greater risk of Na imbalance.

~~Accept~~ Accept pathologist cause of death.

Adam had to have op. Discussed with mother & Dr Taylor.

900 mls - switch from gastro \rightarrow IV feed but no line.
Can't pick figure to determine hyponatraemia. Matter for
clinical judgment.

Lab analysis better than blood gas machine for electrolytes

Coroner - If op proceeds well? normal life expectancy

Dr S - Life expect of kidney 10-20 yrs. Then need another
one. Better quality - normal life.

For children with kidney probs - not 70 yr expectation

Coroner - Problem of getting kidneys. 5000 needed 1800
transplanted.

Dr S: Donated childrens kidneys go to children.

Miss St. offered Adams organs for transplant.

Heart valves & eyes donated.

Measure of mother's commitment to this

Coroner: Would be useful if monitoring body looked at
these deaths. I will also write if you feel
it would strengthen case.

Perhaps instructing SL could let me know.

Taylor

Deposition read.

Normotensive - normal BP.

Children with kidney problems can have high BP.

Difference in blood loss - other swabs on table included.

Coroner

Do you agree with cause of death

Dr T

Cerebral oedema - Yes.

hypernatraemia - Yes

ICP - Don't understand how this was impaired

Usually blood flow to the brain.

Can't understand this to full extent.

Coroner : Dr Sumner report.

Summary read out. Do you agree with this?

Dr T : The question of the 1/5 normal saline - is the area concentrated on.

The reason for giving this made the greatest sense.

Coroner : Do you agree with this?

Dr T : Normal fluids to replace deficit.
Why this caused hyponatraemia I am at a loss to explain

Dr. S. connects these.

Same concentration of Na + sugar as he usually got.

Coroner ? Can't see connection between fluids he normally got & dilutional hyponatraemia occurring.

Dr T : That is correct. Can't understand this.

Coroner : Comment re impaired blood flow difference between Dr A & Dr S.

Dr T : The disagreement signifies the complexity. This is confused. PM lodes at head & neck vessels. No evidence of obstruction, congestion. Dr A said plenty of vessels. Divergency of opinion. May have been contributory - I do not know. The

evidence is conflicting. Don't know whether it occurred in Adams case.

Q: Dr Savage heard ^{verbally} of other 9 deaths: You had no other knowledge of these?

A: No.

Q: P.M. report.

Do you accept cause of death except for phrase ICP.

A: Accept what she says. Not sure: I understand would put hypotraemia - Not sure about dilutional. ICP don't understand reasoning.

Q: Why electrolytes not measured until 9:32.

A: Ideal measurements have to be balanced with the practicalities.

In Adams case it was not practical to do these at about 7:30, in my opinion.

Q: Don't think anyone expects you to give an explanation of what happened.

This appears to be situation.

Dr Savage said now ~~the~~ procedure takes on board what happened: Cpt impression that this can change quickly so a no. of tests needed

A: Dynamic situation.

Balance practicalities of carrying out procedure. Talking about labs is outside my expertise. Machine is primarily blood gas. Currently looking at other models of machine with perhaps more accurate readings.

Q: Know Adam before op.

A: Can't specifically remember ops.

Don't remember if in Jan '95 op.

2 types of central line: one which anaesthetists put in & one which surgeons put in.

MH If suture & scar it is a surgical central line
The apparent scar could have been

- lump removal
- shunt
- anything involving surgery.

Did see scar prior to op.

Should we use this. It is reasonable to try access to this site. Sites are limited. If you don't use them you run out of sites. In my opinion it is possible to gain access to ligated vein.

Ideally would talk to parents. Invariably for ^{elective} ~~possible~~ but for this type of case not always

Prover What is purpose of this?

MH Just to see re his knowledge

Dr S Other factors: if never met, concerned to ensure theatre ready; urgency of case; no delay to put back viability of kidney.

All these factors were involved in this case.

MH Could have refreshed your memory - Sodium deficiency & central lines

Prover Lord Chief Justice comments on Inquest's scope.

Think straying into High Court / County Court area.
Deal with different manner.

Dr T: Adam not deficient. Na requirements 3mm/kg per day. At 2kg - needed 60mm.
He received this amount.

MH: Did suffer deficiency which was being treated.

Dr T: Have explained this is child's requirement.

In line with this type of fluid given contained the correct amount.

Dr T: Ideally electrolyte results be available before child goes to theatre.

At 11pm the result was 139. Dr S requested test to confirm that 139 hadn't changed.

From dialysis charts, no reason to think that

these would have changed from 11 pm.

Should be done & be normal & nothing to interfere with these in between when can rely on

Ideally may be worth checking but if one has recent electrolyte & nothing intervening to change then take it as the same.

ner: During op electrolytes before/middle/end
or 4 times for 6 hr op.

J: Not my practice nor my training. Matter for clinical judgments.

kidney pts usually no urine so only give the fluids being lost.

Adams case - ^{very unusual} only polyuric child for renal

transplant, so need to replace normal fluids.

Unusual for renal transplant.

Increased amount of fluid because of nature of op. etc.

MH This involves risk of dilution of Na levels?

Dr T No doesn't follow.

MH: Either too much liquid or too little Na.

Volume for volume but not enough Na

or Excess fluid given.

Dr T Don't understand.

MH: My understanding from Dr Sumner's report.

Coroner: Dr T does not agree that cause of death was dilutional.

Dr T: Hyponatraemia due to drop in fluids.

Coroner: My understanding - This fluid regime used before so why cause dil hyp in this case.

Dr T: Same concentration as he had been getting

Coroner: Will ask pathologist about this

MH: kidney transplant - need greater fluid. fluids never able to mimic what he usually got.

P.T.

CVP did increase. Careful to exactly measure input to output - to replace loss. ^{Don't expect} Unlikely that fluid go to brain. Heart problems more likely initially. New kidney not working - consider that need more fluid. It became pink but then paled. fluids re-assessed.

The blood gas done was to ensure ok before clamps released.

Can't mimic fluids as can't give feed. Needed to give glucose as his body expected ~~fluid~~ sugar. Adequate volume for this op means more fluid than he usually got.

Always assess & re-assess. When kidney did not function the team discussed fluid & concluded that we had underestimated & needed to give a bolus of fluid acting on evidence before us.

MH Fluid Chart passed over

7 - 7.30 500 mls dextrose/saline
7.30 - ~~8.40~~ 8.40 " " "
8.45 - ICU " " "

Arrows approx rate.

Maintenance fluid as dextrose sd mls per hour.

Replacing losses - given as boluses.

Not given together - May be into same vein - not same tube.

HPPF 400 - given after 9.30.

H what fluids given at 9.30

D.T. 9.32 confirmed O₂ ok. Acid/base balance ok. Body prepared to accept kidney.

As haematocrit ^{level low} - gave packed cells.

Gave HPPF - Gave both for blood replacement + extra fluid for perfusion of kidney.

Would have liked blood to confirm Na before going to theatre.

Once in theatre - electrolytes meaningless as the results are an hour later.

Although op can take 2-3hrs but can take less.

At time expecting kidney to be in in an hour.

With Mr Keane can be 45 mins to an hour.

So expecting kidney to be in.

Balance ideal with the practical. Need to keep team practising & watching life of child.

Need to secure line to immediately take blood out you can lose the line.

The arterial line is for beat to beat pressure.

Once secure & known to be working you can take blood.

Not that easy from central line - Don't usually.

Every time you touch line in child you run risk of infection especially if impaired immune

mer We are concerned with facts of why Adam died. If discussing ^{differing} practices this is area of another Court

1 He has not said practice. Did he depart from usual then has departed from the facts which this Court can look at.

Dr. T. Securing site - to take blood sample meant possibly losing the site.

MH : CVP baseline before op. Why did you not.

Dr. T. : Once line in did check CVP.

Not written down

MH : Why not? Critical

Dr. T. : Looking at continuous display on monitor & get computer printout which gives clearer record.

First CVP about 7.30. 500 mls had been given by this time

Coroner : What is purpose.

MH : CVP not taken at start.

Inaccurate baseline reading

Coroner : Not for me to reach a decision on this.

MH : Indicator

If distasteful hypo. CVP is a critical indicator.

Coroner : Feel we need not get into very technical issues

Dr I : From 12.05 - not my notes.

Think overseas Registrar.

who. Says unsure of 17 correct. Multiple lines & veins tied off.

MH If reading accurate - it was a serious situation. What steps did you take to deal with this?

Coroner : This is High Court questioning.

GB : My instructions allow as much latitude but disquieted.

MH : 9.32 reading. Na at this time

Dr I : Had just started Hartmanns.

Surprised by reading. Had started to diminish ^{the} $\frac{1}{8}$ normal.

further changes - to use normal salt & cut back on low salt.

Electrolytes at 9.32 not in normal range.

Concerned as already commenced full salt & reduced low salt.

Team involved in ensuring pre-load. Blood checked. Were of the opinion that although reading low we were already taking measures to deal with this as higher Na sol being given.

Skin closure at 11 & the reversal being given by this time.

Major consideration of Na - New kidney in & team busy in ensuring vital signs & bleed support. Next list of tests blood sugar & electrolytes once happy blood etc normal. This

is ongoing process. Expecting op to finish in 10-15 mins. - then do all post op tests. but things changed somewhat.

Concerned about reading. ~~my~~ After discussion we would then check at end of op.

B Think this has been answered.

ones Way beyond what we are here to do.

Dr T: Familiar with Aniff article since it was written for symptomatic hyponatraemia.

Symptoms are physical factors. Maybe suppressed by anaesthetic.

NH Does this flag up addressing low sodium

Dr T: We had already started higher sodium. We expected this to address & sodium to rise. Would do at end.

NH With hindsight what would you have done?
Dr T: Don't know what would have done.
ones You don't need to answer that question

NH CVP reading. Head to left.
Evidence given
Perhaps venous drainage impaired.

ones Not sure this is the evidence. Dr Alexander & Dr Taylor don't agree.

LH Turning head to left. with sutured vein. Could this impair venous drainage

I Could be argued. But I don't think this occurred but don't know.

H Position of catheter - could it have impaired venous drainage

Dr T: Don't think enough evidence to say either way. PM showed no evidence of congestion
CVP 10-12 in midline.

LH: Before head in midline CVP - 30

Dr T: For brief interval CVP 28 - Also Table had

beams moved.

1 CVP.
~~about~~ at op end 22.
on Moving head 10-12.

Doesn't this suggest drainage problem.

IT could be & also had given up on fluids at this time. Cut back on fluids & not try to perfuse kidney
So ICU had cut back on fluids.

Losses still ongoing.

NH 10-12 post op. So 17 baseline was high & not a baseline.

Dr T You think this is normal.

Dr Alexander

CVP of 17 impossible without heart failure signs. He had never achieved reading of this

Can't explain - may have been a transducer problem

NH : Do you think death could have been prevented?

Coroner : You are not obliged to answer this.

Can consult with GB.

Are you going to answer?

Dr T : No sir.

No further questions

GB : Machine for blood gases.

Main purpose blood gas. As additive prints sodium value.

If you want electrolytes?

Dr T Done by labs not this machine.

GB : Sodium levels. Would you rely on machine?

Dr T : No. Common practice in RBHSC.

Not sure how widely used in NI -

Confine it to my hosp. The regional paediatric centre for NI.

Child polytrauma. First time encountered for this op
others anaest.

At start of procedure bladder open.

Created difficulty - ~~Thought~~ it did. affect my calculations.

GB CVP. Where was tip.

Dr T Reasonably sure from pressure - not close to death. Confirmed manually by touching side of neck & touching tip of catheter.

GB Impaired of fluid drainage from head.

Dr T Persuaded by literature & med evidence - no clear view on the effect of this.

GB If there had been a problem - could you have been aware of it during op?

Dr T. No

GB Dr Alexander also said this.

Coverer Also my recollection

GB 9:32 clamps being removed. Critical time

Dr T Yes.

Team took view that this op would be over shortly.

Involved in many kidney transplants.

Reasonable view.

Later proved not the case.

Aware of sodium.

Fluids given were isotonic ie same osmotic power/potential as plasma.

Administered to mimic what Adam receiving vital to management of every child under anaesthetic.

Can only go by what is problem among experts. Still can't understand the physiological reason for death.

GB How to manage in future?

Dr T Draft Statement CS. read out.

Coverer added

Cause of death can't understand ICP.
Can't understand why fluid regime caused this
Other 9 deaths were known afterwards.
Believe involved in pre surgery.
Reasonable to try to access this vein
No reason to expect change in electrolytes from
11 pm.
Fluids neither restrictive nor excessive
Re-assessed.
Thought had taken adequate measures to
redress sodium.
Aware of Aniff.
Don't know what would have done differently
Machine purpose to analyse blood gas would not
rely on to do electrolytes.
Would expect surgery to complete shortly after
clamps released.

Statement given.

Dr Armour

Coverer - Views on points by Dr Taylor on
cause of death.

Did Not agree dilutional only hyponatraemia,
& doesn't understand ICP.

Dr A In my opinion - little doubt that dilutional
hyponatraemia with ref to Aniff. Circumstances similar

ICP subject for debate.

Was my view more than one factor
Steeking to cause of death recorded.

B. Only issued about recommendation. Don't believe necessary.

Coroner Don't think so ethics. Can understand need to closely examine esp with other deaths. Would be happy to write letter if need be.

NH: My submission is to ask you to make recommendation. Few cases more appropriate. Rec would carry weight. Might push forward the project & plans to measure sodium. Ask you to reconsider position.

Indications - some steps may be taken. Individuals involved will certainly remember but more good could be achieved & would be a considerable achievement for Miss Strain

In Cases of major paediatric surgery recommend monitoring.

Simple procedure ~~but~~.

Rare disease but 1 in 25000 & 9 in UK have died. Potentially very serious.

ref to aspirin - much rarer.

Whooping cough - despite risk.

In light of these. Very reasonable to recommend this simple procedure.

Coroner Have been thinking about a lot. Evidence given has made me feel this is not an appropriate case. Medical opinion not certain. Management not clear.

Will not make recommendation if not crystal clear to me.

Proposals by Dr Savage much clearer.

Findings 12.

Adams St. died 28 Nov '95 RBHSC
Cause of death
~~due to~~
as PM.

Onset caused by acute onset of hypos
by fluids with small amount Na.
Affected by possibly dialysis, low sodium fluids.
Complex & diff the medical background was.
Aware those of us with healthy children unaware
of the bond of parents with Drs.

They can't feel as keenly as parent but terrible
blow to all staff.

He was regularly treated.

Express great admiration for mother. enormous burden.
Doubt if I could have undertaken. Consultants paid tribute.
One wonders if he otherwise would have been fit for
surgery.

Death was rare occurrence even worldwide
& other cases in UK. Agree & support that these
should be formally investigated. Any common denominators
with view to preventing future occurrences.

Pay tribute to mother. Trauma of looking after
for 4 yrs. Disappointment of his death. Found time
to think of others to allow organ donation. Tribute
to her conduct. Long road to today.

Tragic case. Attending staff + Trust extend heartfelt
condolences.