Workshop report on rationalisation of intravenous fluids

Intravenous fluid therapy in babies

Intravenous fluid therapy is often necessary in babies, the type and volume determined by individual circumstances.1

Resuscitation fluid should be isotonic with serum. The composition of rehydration fluid is determined by the type of dehydration and associated electrolyte disturbances. Maintenance fluid should fulfill the daily needs of fluids and electrolytes. It is used when there are no electrolyte or acid-base disturbances, and intravenous fluids are indicated because oral or enteral feeds are contraindicated.

Maintenance intravenous fluids

Fluid requirements are determined by numerous factors.2 The volume of fluid is easily determined according to individual requirements. The amount of electrolytes infused is determined by the volume infused and should be considered in the composition of intravenous fluids.

Sodium

The daily requirement of sodium remains fairly constant during life and is calculated at 1 - 3 mmol/kg/day. The newborn kidney is unable to handle excess sodium.3 On the other hand the newborn kidney cannot conserve sodium and sufficient sodium should be given.4

According to Shaw6 the fetus accumulates 1,0 - 1,5 mmol/kg/day from 26 - 40 weeks' gestation. It is well known that the small premature baby has poor sodium absorption, in addition to losing sodium due to poor renal function.5,6 During intravenous therapy it is not necessary to compensate for poor absorption, only for the increased renal loss. Small premature babies receive an adequate supply of sodium if calculated at 3 mmol/kg/day.10 A solution which supplies 3 mmol Na+/kg/day will not supply too much sodium in the larger baby and will be sufficient for most premature babies, with few exceptions.

If 3 mmol/kg/day are infused daily, the concentration of the intravenous fluid will be determined by volume/kg given daily. Such a solution should be sufficient for most babies, with a few exceptions which will need special formulas. If 150 ml/kg/day are given and contain 3 mmol Na+, the concentration of sodium will be 20 mmol/l. Premature babies often need more than 150 ml/kg/day and will receive more than 3 mmol Na+/kg/day if a concentration of 20 mmol Na+/l is used.

Sometimes it is necessary to limit fluid intake because of a patent ductus arteriosus. If 100 ml/kg/day are given, the amount of sodium at 2 mmol/kg/day will be insufficient in a few small premature babies.

Potassium

The normal requirement of potassium is 1 - 3 mmol/kg/day.11 A solution containing 15 mmol/l will supply 2 mmol/kg/day if 150 ml/kg/day is infused.

Potassium-free solutions are recommended during the first few days.12 However, newborn babies are offered colostrum (74 mmol/l) and breast-milk (13 mmol/l) without any ill effects.13 As with milk, the volume of intravenous fluids is restricted during the first few days after birth, except with high insensible loss of water. The normal newborn baby will thus receive little potassium. Insensible losses should be replaced with an electrolyte-free solution.

Calcium, phosphate and magnesium

The intravenous requirement for calcium is 0,5 - 1,5 mmol/kg/day, for magnesium 0,15 - 0,25 mmol/kg/day and for phosphate 0,4 - 0,8 mmol/kg/day.11

Glucose

During short-term maintenance a 10% dextrose solution will supply a reasonable amount of the calorie requirement.14 Some very small babies have a tendency to develop hyperglycaemia and a 5% dextrose solution should be used.

Conclusion

Intravenous maintenance solutions will conform to the electrolyte requirements in most babies if electrolytes are supplied daily per kg of body-weight according to Table I.

### Table I. Electrolyte Requirements

<table>
<thead>
<tr>
<th>Electrolyte</th>
<th>Neonatolyte</th>
<th>Neolyte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na+</td>
<td>1 - 3 mmol</td>
<td>20 mmol/l</td>
</tr>
<tr>
<td>K+</td>
<td>1 - 2 mmol</td>
<td>15</td>
</tr>
<tr>
<td>Cl-</td>
<td>1 - 3 mmol</td>
<td>20</td>
</tr>
<tr>
<td>Ca++</td>
<td>0,5 - 1 mmol</td>
<td>2,5</td>
</tr>
<tr>
<td>Mg++</td>
<td>0,5 - 8 mmol</td>
<td>0,5</td>
</tr>
<tr>
<td>PO4</td>
<td>0,15 - 0,25 mmol</td>
<td>3,75</td>
</tr>
<tr>
<td>Lactate</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>M0sm/kg water</td>
<td>638</td>
<td>638</td>
</tr>
<tr>
<td>kJ</td>
<td>1680</td>
<td>1672</td>
</tr>
<tr>
<td>pH</td>
<td>4,2</td>
<td>4,0</td>
</tr>
</tbody>
</table>

If fluid is restricted to 100 mg/kg/day, enough electrolytes will be supplied except in a few very small low-birth-weight neonates who will require more sodium.

Determination of electrolytes is preferable before starting maintenance solutions, because these solutions are contraindicated in the presence of electrolyte disturbances. Maintenance solutions will not supply enough calories and essential nutrients, and total oral, enteral or parenteral nutrition should commence after 3 - 4 days.

Intravenous fluid therapy in older babies and the preschool child

The workshop is concerned because unphysiological maintenance solutions are used in this age group, for example, half-Darrow solution, Maintelyte and Surgisol.

The electrolyte requirements in older babies and preschool children is about the same as neonates, but the fluid requirements...
This formulation is not adequate if electrolyte disturbances are present. Calcium or bicarbonate can safely be added. They cannot be added to the Labethica maintenance solution. For this reason, we do not recommend this solution for the older age group.

Intravenous maintenance therapy is only an interim measure and should be followed or supplemented after a few days with enteral or parenteral nutrition.

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Postscript
The Paediatric Maintenance Solution (Baxter), suitable for use in babies and preschool children, was introduced as a direct result of this workshop report.

Department of National Health and Population Development: Recommendations pertaining to the use of viral vaccines: influenza

Review of influenza activity — 1989

Witwatersrand area — National Institute for Virology

Influenza activity during the winter of 1989 was moderate in intensity. The school absenteeism monitoring programme did not rise above the upper limit of the absentee rate expected during winters of non-epidemic years. A total of 73 isolates was made from April to October, the vast majority from actively recruited specimens taken from the National Institute for Virology's viral watch programme. Most of the isolates (45) were influenza A (H3N2) strains and typed closest to A/Victoria/36/88 — this in contrast to 1988 when no H3N2 isolates were made. The 27 influenza A (H3N2) isolates differed from the prevalent vaccines for the 1990 season: particularly notable in the schools.


Cape Town area — Department of Medical Microbiology, UCT

Both anecdotal reports and 'absentee surveillance' suggest that influenza activity in 1989 was above that expected in the winter months of July and August, particularly the weeks commencing 23 and 30 of July and 6 August (i.e. weeks 30, 31 and 32). It was caused severe influenza epidemic activity in the UK and Europe. The 27 influenza A (H3N2) isolates differed from the prevalent A/Sichuan/2/87 strain of 1988 and typed closest to A/Shanghai/11/87, A/OMS/589/88 and A/England/427/88 strains which caused severe influenza epidemic activity in the UK and Europe. The single influenza B isolated type closest to B/Victoria/2/87.

Recommended vaccine formulation

The following strains should be included in the formulation of vaccines for the 1990 season:

A/Shanghai/11/87 H3N2 and A/Sichuan/2/87 H3N2.

Recommended vaccine formulation

The following strains should be included in the formulation of vaccines for the 1990 season:

A/Shanghai/11/87 H3N2
A/Singapore/6/86 H3N2
B/Yamagata/16/88

These type strains are very similar to prevalent circulating strains at present in the northern hemisphere and the expected strains for the 1990 winter in South Africa and will provide adequate immunity against them, e.g. A/Shanghai/11/87 is very similar to A/England/427/88, A/Singapore/6/86 to A/Taiwan/1/86 and A/Victoria/36/88, B/Yamagata/16/88 to B/Victoria/2/87.

Indications for immunisation

1. Persons who are at high risk for influenza and its complications because of underlying medical conditions and who are receiving regular medical care for conditions such as chronic pulmonary and cardiac disease, chronic renal diseases, diabetes mellitus and similar metabolic disorders, and individuals who are immunosuppressed.
2. Residents of old-age homes, chronic care and rehabilitation institutions.
3. Children on long-term aspirin therapy.
4. Medical and nursing staff responsible for the care of high-risk cases.
5. Adults and children who are family contacts of high-risk cases.
6. All persons over the age of 65 years.
7. Any persons wishing to protect themselves from the risk of contracting influenza, especially in industrial settings where large-scale absenteeism could cause significant economic losses.

Contraindications

1. Persons with a history of severe hypersensitivity to eggs.
2. Persons with acute febrile illnesses should preferably be treated before administration of vaccine.
3. Persons with a history of severe worm infections, and similar metabolic disorders, and individuals who are immunosuppressed.
4. Persons with a history of severe hypertension, and cardiac disease, chronic renal diseases, diabetes mellitus and similar metabolic disorders, and individuals who are immunosuppressed.
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Timing

Ideally, vaccine should be administered during March to provide adequate protection before the commencement of winter. Antibody response takes about 2 weeks to develop.

Chemothrophylaxis

In cases where vaccine has not been administered, consideration should be given to the use of supplementary chemothrophylaxis with amantadine in certain high-risk individuals, such as patients with chronic lung and heart diseases. Amantadine should be administered in a dosage of 200 mg daily in 2 divided doses for the duration of the epidemic activity, that is, about 6-12 weeks. The dosage should be reduced in persons with renal disease and persons over the age of 65 years.