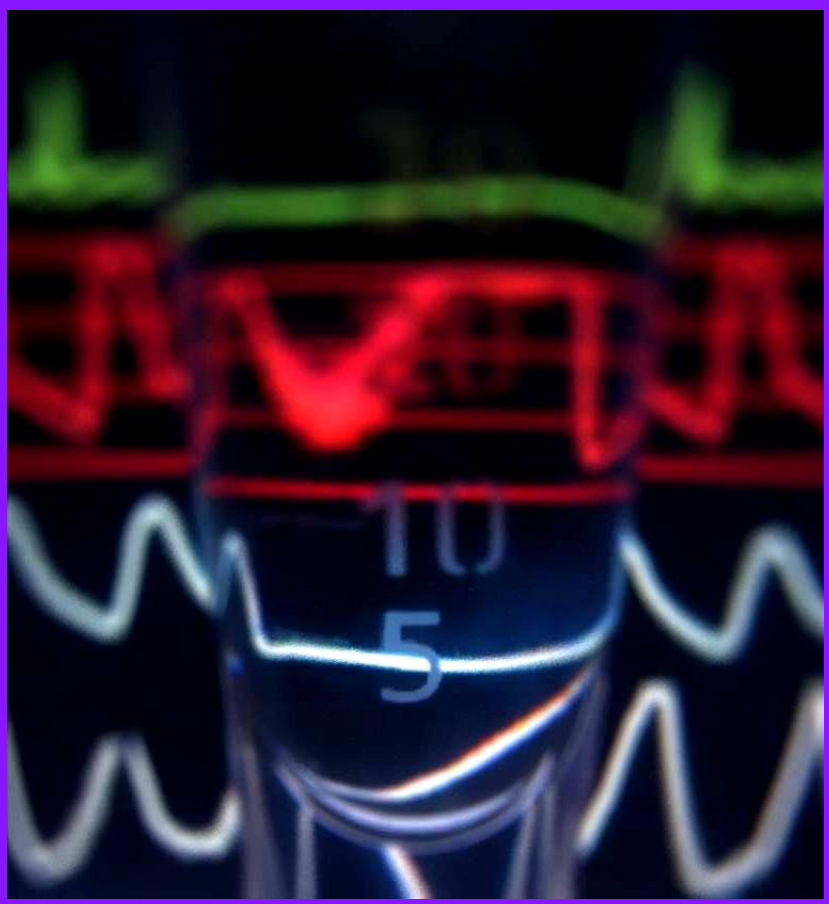
Minimum Infusion Volumes

For fluid restricted critically ill patients

Fourth Edition

December 2012



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V 4.4

Contents

Amendments

The following table lists amendments since the issue of Edition 4.0

Revision	Medication	Alteration made
4.1 08/05/2013	Rifampicin	The data sheet entry has been updated as it no longer recommends a diluent volume
4.2 15/05/2013	Anidulafungin	The data sheet entry has been updated due to a decimal point error
4.3 12/02/2014	Addiphos	Comments for Concentrated Solutions has been updated to correct a potassium content error
4.4 13/02/2014	Naloxone	Suggested minimum dilution typographical error corrected

Introduction

Introduction to 2nd edition (1998)

This document was produced, in 1996, in response to the demands of members of the Critical Care Group. It represents the experience of ICU pharmacists working in the UK. The aim was to provide practical advice for pharmacists managing difficult fluid restricted patients where the manufacturers' guidelines are not practical.

Because of the nature of the information, this document was at first distributed only to members of the UKCPA Critical Care Group. Since then it has become a widely used information source in UK hospital pharmacies. It is, as far as I am aware, the only document of its type in existence.

The majority of the information on minimum volumes cannot be supported except by the anecdotal experiences of the contributing pharmacists. To the best of our knowledge, these dilutions have been used in the UK without any apparent adverse effects but in most cases no published data exists to confirm safety. Every effort has been made to ensure that the information contained in these guidelines is correct, but no liability can be accepted for any inaccuracies or misstatements of fact contained herein. Please use the guidance with these comments in mind, and only apply the minimum volumes where the clinical situation makes it necessary.

I hope that you will find the document useful, and that you will also feedback any experiences or new information to the group so that the document can be kept up to date, and accurate.

Many Thanks.

John P Dade
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Introduction to 3rd edition (2006)

It has been 10 years since the first edition, and while there have been a number of changes, I have been surprised at how few there were. I cannot improve on John's comments above, except to add my thanks: to John for producing the first document which many of us have and continue to rely on, to Catherine and David for their help in putting it together, and to Mark Borthwick for giving it the smart facelift and in the process adding missing information. I also add my thanks to John's to all those people who put forward suggestions and ideas.

Emma Graham-Clarke
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Introduction to 4th edition (2012)

Another 6 years has passed, and again the changes are minimal – a few additions, a few deletions. My thanks go to Brit, Helen, Jane, Nicola and Ruth for their work in reviewing the monographs, and to Mark for formatting skills. A document like this depends on input from those that use it, and I extend my thanks to those who have given suggestions and advice – please continue to supply it!

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Infusion Information

Acetylcysteine

Data Sheet Recommendations

150mg/kg in 200ml over 15 minutes, then 50mg/kg in 500ml over 4 hours, then 100mg/kg in 1 litre over 16 hours.

Diluent: Glucose 5% or Sodium chloride 0.9%.

Suggested Minimum Dilutions

Range of dilutions in 100-250ml Glucose 5%. Some centres use undiluted infusions 200mg/ml (10g in 50ml).

Comments for Concentrated Solutions

Anecdotal.

Use Central Line for strong solutions although some centres will give strong solutions peripherally.

Unlicensed indications include: Acute liver failure, ARDS, pancreatitis.

BNF recommends Glucose as preferable diluent.

Aciclovir

Data Sheet Recommendations

25mg/ml over 1 hour by controlled rate infusion.

(Note: SPCs don't specify central line)

Diluent: Sodium chloride 0.9%, Sodium chloride and glucose or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

If administering by infusion bag then 5mg/ml infused over at least 1 hour.

Comments for Concentrated Solutions

Aciclovir Injection pH 10.5.

Has been given neat.

Ensure the patient is well hydrated.

Addiphos

Data Sheet Recommendations

As part of a parenteral nutrition regimen, maximum concentration 30ml Addiphos in 500ml of compatible fluid.

Suggested Minimum Dilution

100ml of infusion fluid.

Diluent: Glucose 5% to 50%, Vamin 9, Vamin 9 Glucose, Vamin 14, Vamin 14 electrolyte free, Vamin 18 electrolyte free

Comments for Concentrated Solutions

Anecdotal

Note – contains 30mmol/20ml Potassium – concentrated solutions (eg in less than 1 litre) should be given centrally

Adrenaline (Epinephrine)

Data Sheet Recommendations

No specific recommendation - the only licensed route of administration is IM. Usually 5mg in 50ml (1 in 10,000)

Diluent: Sodium chloride 0.9%, Glucose 5%.

Suggested Minimum Dilutions

Undiluted infusions have been used up to 5mg in 10ml

Comments for Concentrated Solutions

Anecdotal.

Central Line Only.

Concentrated solutions are used when patient requires high doses of adrenaline.

Alfentanil

Data Sheet Recommendations

0.5mg/ml to 5mg/ml.

Diluent: Glucose 5%, Sodium chloride 0.9% or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

5mg/ml

Comments for Concentrated Solutions

For ventilated patients only. Caution with using concentrated solution undiluted (5mg/ml) as rate of infusion maybe less than 1ml per hour and accuracy of syringe pump maybe relevant

Alprostadil

Data Sheet Recommendations

Does not specify dilution

UCL guide 3rd edition specifies dose (30mcg per kg) diluted to 10ml with glucose

Diluent: Glucose 5% or Sodium chloride 0.9%.

Add directly to the infusion solution avoiding contact between undiluted Alprostadil and the walls of the infusion container.

Aminophylline

Data Sheet Recommendations

25mg per ml maybe injected undiluted (route not specified) peripheral or central

No dilution specified

Solutions stable over pH range of 3.5 to 8.6 for concentrations not exceeding 40mg per ml (it should be noted ampoule contains 250mg in 10ml, 25mg per ml)

Diluent: Glucose 5%, Sodium chloride 0.9% or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

Variety of dilutions from 2mg/ml to 25mg/ml (undiluted).

Comments for Concentrated Solutions

Ideally give via central line

Amiodarone

Data Sheet Recommendations

From 150mg in 250ml of glucose 5% (0.6mg/ml) up to 1.2g in 500ml of glucose 5% (2.4mg/ml) .
Concentrations of less than 0.6mg/ml are unstable
Diluent: Glucose 5%.

Suggested Minimum Dilutions

Many centres infuse daily dose (up to 900mg) in a total volume of 48-50ml.

Comments for Concentrated Solutions

Anecdotal
Central line only.

Amikacin

Data Sheet Recommendations

250mg per ml injected undiluted
500mg diluted in 200ml to give a 2.5mg per ml solution
Diluent: Sodium chloride 0.9%, Glucose 5% or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

Required dose to be diluted up to 50ml total volume.

Comments for Concentrated Solutions

Over 30 minutes.

Amphotericin (Fungizone)

Data Sheet Recommendations

Not exceeding 0.1mg/ml over 2-4 hours.
Diluent: Glucose 5% (pH >4.2, check with manufacturer of glucose infusion, or adjust using a phosphate buffer as outlined in SPC).
Recommended concentration for infusion is 10mg in 100ml

Suggested Minimum Dilutions

PERIPHERAL: Up to 0.2mg/ml.
CENTRAL: Up to 0.5mg/ml.
Some centres dilute daily dose in 100ml Glucose 5%, others have diluted dose with 10 x volume of fluid (unlicensed use)

Comments for Concentrated Solutions

Anecdotal data for concentrations over 0.2mg/ml.
Concentrations up to 1.4mg/ml stable in Glucose 5% (Trissel).

Amphotericin (Lipid Complex)

Data Sheet Recommendations

Usual 1mg/ml, though 2mg/ml may be used.
2.5mg/kg/hr following test dose.
Diluent: Glucose 5%.

Suggested Minimum Dilutions

Do not exceed 2mg/ml.

Amphotericin (Liposomal)

Data Sheet Recommendations

0.2-2mg/ml over 30-60 mins.
Diluent: Glucose 5%.

Suggested Minimum Dilutions

Do not exceed 2mg/ml although some centres have used 4mg/ml via central line (anecdotal)

Anidulafungin

Data Sheet Recommendations

Dilute to concentration of 0.77mg/ml (as per SPC) and give at a rate not exceeding 1.1mg/minute
Diluent: Sodium Chloride 0.9% or Glucose 5%

Suggested Minimum Dilutions

There is no current literature to support more concentrated solutions

Aprotinin

Data Sheet Recommendations

Undiluted, 5-10ml/min.

Atracurium

Data Sheet Recommendations

Bolus: Undiluted.
Continuous Infusion: Dilute to 0.5-5mg/ml.
Diluent: Glucose 5%, Sodium chloride 0.9%, Sodium Chloride 0.18% + Glucose 4% or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

Use undiluted via central line.

Comments for Concentrated Solutions

Anecdotal
pH 3.2-3.7

Azathioprine

Data Sheet Recommendations

10mg/ml via a fast flowing drip (over at least 1 minute) or neat (but follow with 750ml of sodium chloride 0.9% or sodium chloride 0.18% / glucose 5%.
Diluent: Sodium chloride 0.9% or Sodium chloride and glucose.

Suggested Minimum Dilutions

Some centres dilute to 100ml with Sodium Chloride 0.9% or Dextrose 5% and infuse over 1 hour. One centre has used 50mg in 20ml given via central line

Comments for Concentrated Solutions

Anecdotal.
Diluted pH 8-9.5, undiluted pH 10-12.

Calcium Chloride

Data Sheet Recommendations

Intermittent infusion: undiluted.

Suggested Minimum Dilutions

Undiluted (i.e. 10mmol/10ml) for continuous and intermittent infusions. Concentrations and rates expressed in mmol of Ca^{++}.

Comments for Concentrated Solutions

CENTRAL LINE ONLY:

For intermittent infusions, rate of 0.35-0.9 mmol per minute (Trissel). Continuous Infusions, not greater than 20mmol/hour (AHFS).

Calcium Gluconate

Data Sheet Recommendations

10% solution slow injection or intravenous infusion.

Suggested Minimum Dilutions

Undiluted 10% solution.

Comments for Concentrated Solutions

CENTRAL LINE ONLY:

For intermittent infusions, rate of 0.35-0.9 mmol per minute (Trissel). Continuous Infusions, not greater than 20mmol/hour (AHFS).

Caspofungin

Data Sheet recommendations

70mg in 250ml fluid

50mg in 250 ml fluid

Reduced Volume infusion

50mg in 100ml fluid

Diluent: Sodium Chloride 0.9%. Not stable in diluents which contain Glucose

Suggested minimum dilution

70mg & 50mg – some centres have used volumes ranging from 100ml – 140ml

Clarithromycin

Data Sheet Recommendations

2mg/ml into a large proximal vein over 60 minutes.

Diluent: Sodium chloride 0.9%, Glucose 5% or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

500mg in 100ml fluid although one site has used in 50ml

If less than 500mg dose, add 10ml water to vial to give a concentration of 50mg/ml. Dilute each ml to 10ml

e.g. 100mg dose can be diluted to 20ml

Final Concentration should not exceed 5mg/ml

Comments for Concentrated Solutions

Give via central line (ref UCL handbook)

Infusion Rate not more than 500mg/hour.

Clindamycin

Data Sheet Recommendations

Concentration not greater than 18mg/ml, rate less than 30mg/min.
Diluent: Sodium chloride 0.9% or glucose 5%.

Comments

Not more than 1200mg should be given in a 60- minute period (Trissel).

Clonazepam

Data Sheet Recommendations

Up to 3mg in 250ml, rate 0.25-0.5mg/min.
Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

5-10mg diluted to 48ml sodium chloride 0.9% for 10hrs in polyethylene syringes (Trissel).

Comments for Concentrated Solutions

Clonazepam can be adsorbed onto PVC. If using PVC in infusion system then infuse over less than 2 hours.

Clonidine

Data Sheet Recommendations

Slow IV 150-300 microgram bolus 10-15 minutes.

Suggested Minimum Dilutions

6-50 micrograms/ml infusion.
Diluent: Sodium chloride 0.9% or glucose 5%.

Comments for Concentrated Solutions

Anecdotal.
Central or peripheral
Usually 750mcg in 50ml is used although 1500mcg in 50ml has been used centrally.

Co-trimoxazole

Data Sheet Recommendations

480mg in 75ml over 60 minutes (GlaxoSmithKline UK).
Diluent: Glucose 5%.
1.92g in 125ml in less than 90 minutes (Mayne Pharma plc).
Diluent: Sodium chloride 0.9%.

Suggested Minimum Dilutions

Undiluted injection given centrally over a 1.5-2 hour period or as a continuous infusion.

Comments for Concentrated Solutions

Anecdotal.
Co-trimoxazole infusions in glucose 5% become less stable with increasing concentration.
Dilutions are limited by infusion time, which needs to be at least 1 hour for high dose therapy.

Ciclosporin

Data Sheet Recommendations
0.5-2.5mg/ml over 2-6 hours.
Suggested Minimum Dilutions
2.5mg/ml or required dose to 50ml, over 2-6 hours.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Comments for Concentrated Solutions
Unstable at concentrations exceeding 2.5mg/ml.

Diamorphine

Data Sheet Recommendations
No recommendations.
Diluent: Glucose 5% (preferred) or Sodium Chloride 0.9%.
Suggested Minimum Dilutions
For continuous infusion 100mg/50ml is used but this can be exceeded.
Comments for Concentrated Solutions
Concentrations up to 25mg/ml stable for 24 hours (Trissel).

Digoxin

Data Sheet Recommendations
Undiluted, over at least 5 minutes.
If diluting, use a minimum of 4 fold dilution.
Diluent: Sodium chloride 0.9%, Glucose 5% or Sodium chloride and glucose.

Dobutamine

Data Sheet Recommendations
1-5mg/ml.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
Some centres use 10mg/ml infusion or even undiluted injection.
Comments for Concentrated Solutions
Anecdotal.
Give strong solutions via central line.

Dopamine

Data Sheet Recommendations
Up to 3.2mg/ml.
Diluent: Sodium chloride 0.9%, Glucose 5% or Compound sodium lactate (Hartmann's).
Suggested Minimum Dilutions
Most centres routinely use 4mg/ml solution. No info on stronger dilutions.
Comments for Concentrated Solutions
Anecdotal.
Strong solutions Central Line Only.
One hospital has used 400mg in 50ml via a central line

Dopexamine

Data Sheet Recommendations

4mg/ml - central line only or 1mg/ml – large peripheral vein.
Diluent: Sodium chloride 0.9%, Glucose 5%, Sodium chloride and glucose, or Compound sodium lactate (Hartmann's).

Suggested Minimum Dilutions

Up to 200mg in 50ml.

Comments for Concentrated Solutions

Centrally only.

Epoprostenol

Data Sheet Recommendations

Dilute with not more than 6 times volume of sodium chloride 0.9%, i.e. minimum dilution of 10 microgram /6ml.
Diluent: Sodium chloride 0.9%.

Suggested Minimum Dilutions

Undiluted, i.e. 10 micrograms/ml.

Comments for Concentrated Solutions

Anecdotal.
Limited by practicality and shelf life. Many centres extend to 24 hours with no discernable loss of efficacy.

Erythromycin

Data Sheet Recommendations

Preferred method continuous infusion 1G in 500ml sodium chloride 0.9% (use within 8 hours)
1-5mg/ml over 20-60 minutes, i.e. 1g in 250ml.
Diluent: Sodium chloride 0.9%.

Suggested Minimum Dilutions

Centres routinely use 1g/100ml via central lines.
Anecdotal reports of neat (1g/20ml) or 1g/40ml infusion over 30-60 mins.

Comments for Concentrated Solutions

Use central line only for concentrations
>5mg/ml. If >10mg/ml monitor carefully. If catheter in ventricle can cause extension of Q-R interval (Abbott).

Esomeprazole

Data Sheet Recommendations

80mg in 100ml
Diluent: Sodium chloride 0.9%

Fentanyl

Data Sheet Recommendations

50microg/ml (i.e. undiluted).
Diluent: If diluting can use Sodium chloride
0.9% of Glucose 5%.

Furosemide

Data Sheet Recommendations

Undiluted.

Diluent: Sodium chloride 0.9%.

Suggested Minimum Dilutions

Undiluted.

Comments for Concentrated Solutions

Max rate 4mg/min. In severe renal impairment max rate 2.5mg/min. Some brands contain ethyl alcohol at high concentrations.

Ganciclovir

Data Sheet Recommendations

Not greater than 10mg/ml.

Diluent: Sodium chloride 0.9% or Glucose 5%

Suggested Minimum Dilutions

No experience of infusions of >10mg/ml (Roche).

Gentamicin

Data Sheet Recommendations

Undiluted bolus.

Suggested Minimum Dilutions

Undiluted bolus.

Comments

Note: when giving large doses of gentamicin i.e. once daily regimens most centres dilute in at least 50-100ml and infuse over 30-60 minutes, diluting with Sodium chloride 0.9% or Glucose 5%.

Glyceryl trinitrate

Data Sheet Recommendations

Dependant on Brand, 1mg/ml.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

50mg in 50ml.

Haloperidol

Data Sheet Recommendations

Unlicensed

Suggested Minimum Dilutions

INFUSION AS A LAST RESORT

0.75mg/ml in sodium chloride 0.9% (stable for 24 hours)

3mg/ml in glucose 5%

(Ref Riker RR, Fraser GL, Cox PM. Continuous infusion of haloperidol controls agitation in critically ill patients. Crit Care Med 1994; 22: 433-40.)

Hydralazine

Data Sheet Recommendations
Bolus: 2mg/ml, Infusion: 20mg/500ml.
Diluent: Sodium chloride 0.9%.
Suggested Minimum Dilutions
60mg in 60ml.
Comments for Concentrated Solutions
Anecdotal.
Central or peripheral.

Hydrocortisone

Data Sheet Recommendations
100mg in not less than 100ml.
Diluent: Sodium chloride 0.9% or glucose 5%.
Suggested Minimum Dilutions
100mg in 50ml.
Comments for Concentrated Solutions
Anecdotal.

Imipenem & Cilastatin

Data Sheet Recommendations
500mg (imipenem) in 100ml over 20-30 mins.
Diluent: Sodium chloride 0.9%. In exceptional circumstances, if sodium chloride contraindicated, then Glucose 5%.
Suggested Minimum Dilutions
500mg/60ml (MSD).

Isoprenaline

Data Sheet Recommendations
None.
Diluent: Glucose 5%.
Suggested Minimum Dilutions
2 to 4mg in 50ml (central line only).
Comments for Concentrated Solutions
Anecdotal.

Ketamine

Data Sheet Recommendations
1mg/ml.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
50mg/ml undiluted.
Comments for Concentrated Solutions
Anecdotal.

Labetalol

Data Sheet Recommendations
1mg/ml.
Diluent: Glucose 5% or Sodium chloride 0.9%.
Suggested Minimum Dilutions
Undiluted (central line only).
Comments for Concentrated Solutions
Anecdotal.

Lidocaine (Lignocaine)

Data Sheet Recommendations
Usually 1-2mg/ml.
Diluent: Glucose 5%.
Suggested Minimum Dilutions
8mg-20mg/ml has been used.
Comments for Concentrated Solutions
Anecdotal.
Extravasation may cause tissue damage.

Liothyronine

Data Sheet Recommendations
Thyrotardin-Inject N - 100mcg in 50ml.
Goldshield - 20mcg/ml.
Diluent: Sodium Chloride 0.9%.
Suggested Minimum Dilutions
20mcg in 20ml – transplant donors
Diluent: Sodium chloride 0.9% or Glucose 5%
Comments for Concentrated Solutions
Anecdotal

Lorazepam

Data Sheet Recommendations
Can dilute 1:1. A common dilution for continuous infusion is 10mg/50ml.
Diluent: Sodium chloride 0.9% or Water for injections.
Suggested Minimum Dilutions
Undiluted.
Comments for Concentrated Solutions
Avoid injecting into small veins.

Magnesium sulphate

Data Sheet Recommendations
Peripheral Infusion not greater than 10% (i.e.4mmol/10ml Mg).
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
Centrally 25-50% (i.e. 1-2mmol/ml).
Comments for Concentrated Solutions
Magnesium sulphate can be given by slow bolus for small doses (up to 8mmol) or as continuous infusion (up to 160mmol over 24 hours) (Trissel).

Meropenem

Data Sheet Recommendations
500mg in 5ml or bolus 1g/20ml.
Suggested Minimum Dilutions
1g in 10ml.
Comments for Concentrated Solutions
Anecdotal.
US – 1g in 5-20ml.

Methylthioninium Chloride (Methylene blue)

Data Sheet Recommendations
Can dilute in 50ml with glucose 5%.
Suggested Minimum Dilutions
Undiluted.
Comments for Concentrated Solutions
Anecdotal.

Methylprednisolone (sodium succinate)

Data Sheet Recommendations
Dose in 50-100ml.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
Undiluted infusions have been given.
Comments for Concentrated Solutions
Anecdotal.
Smaller doses of methylprednisolone can be given by slow bolus injection. Larger doses are preferably given as an intermittent (1/2 hour) or continuous infusion.

Micafungin

Data Sheet Recommendations
2mg/1ml.
Suggested Minimum Dilutions
No information
Comments for Concentrated Solutions
No information

Midazolam

Data Sheet Recommendations

Use undiluted infusion solution 10mg/5ml, centrally or peripherally.

Diluent, if used: Sodium chloride 0.9% or Glucose 5%.

Comments

Some centres have used 10mg/2ml injection undiluted as an infusion.

Milrinone

Data Sheet Recommendations

200micrograms/ml

Diluent: Sodium chloride 0.9%, Sodium chloride 0.45% or Glucose 5%.

Comments

SPC states other concentrations may be used dependant on patient's fluid status

Morphine

Data Sheet Recommendations

1-2mg/ml by infusion, peripherally or centrally.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

1-2mg/ml used normally. Stronger solutions probably OK, but unlikely to be needed.

Comments for Concentrated Solutions

Anecdotal.

Higher concentrations are more likely to precipitate (Trissel).

Naloxone

Data Sheet Recommendations

2mg/500ml Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

10mg/50ml Sodium chloride 0.9% or Glucose 5%. Bolus is given undiluted.

Comments for Concentrated Solutions

Anecdotal.

Noradrenaline (Norepinephrine)

Data Sheet Recommendations

Start at 40mg/litre and titrate according to response. Central line only.

Diluent: Glucose 5%.

Suggested Minimum Dilutions

Start with 4mg/50ml and double concentration as required, up to 32mg/50ml. Undiluted injection has been used.

Comments for Concentrated Solutions

Anecdotal.

Always give via a central line.

Octreotide acetate

Data Sheet Recommendations

Dilute to not less than 1vol: 1vol and not more than 1vol: 9vol. Diluted solution should be used within 8 hours of preparation.

Diluent: Sodium chloride 0.9% or Isotonic sodium chloride and glucose.

Suggested Minimum Dilutions

Has been used undiluted. More practical to adjust concentration according to rate of administration, i.e. 10-100ug/ml.

Comments for Concentrated Solutions

Anecdotal

Omeprazole Infusion

Data Sheet Recommendations

40mg in 100ml over 20-30 mins.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

No data. Bolus administration not recommended by manufacturers. Stability with 80mg/100ml is 12 hours Sodium chloride 0.9% or 6 hours Glucose 5%.

Comments for Concentrated Solutions

Anecdotal.

Rate of infusion is the critical factor.

Oseltamivir

Data Sheet Recommendations

Unlicensed. Recommendation from company is 2mg/1ml.

Suggested Minimum Dilutions

4mg/1ml.

Comments for Concentrated Solutions

From UKCPA 'Antiviral management of influenza A, Version 4'.

Pantoprazole

Data Sheet Recommendations

Slow IV bolus or dilute with 100mls.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Parenteral Nutrition Vitamins

Data Sheet Recommendations

Additrace: 10ml in 500-1000ml Glucose 5-50%.
Cernevit: May give as undiluted bolus or dilute further.
Decan: 40ml in 250ml Sodium chloride 0.9% or 500ml Glucose 5-70%.

Suggested Minimum Dilutions

Vitlipid N: 10ml in 100ml Sodium chloride 0.9% or Glucose 5% (but may be given undiluted as slow bolus).
Solivito N: 10ml in 50-100ml Glucose 5-60%.
Additrace: 10ml in 100ml Sodium chloride 0.9% or Glucose 5%.
All three of the above may be combined in a 100ml infusion of Sodium chloride 0.9% or Glucose 5%.
Cernevit: 5ml in 100ml Sodium chloride 0.9% or Glucose 5%.
Decan (40ml) may be combined with Cernevit in a 100ml infusion of Glucose 5%.

Comments for Concentrated Solutions

Unlicensed information regarding vitlipid N, solivito N and additrace from Fresenius Kabi. Remaining vitamins/trace elements, anecdotal.

Phenylephrine

Data Sheet Recommendations

10mg to 500mls
Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

20mg in 50ml or 50mg/50ml

Comments for Concentrated Solutions

Anecdotal.

Phenytoin

Data Sheet Recommendations

Undiluted followed by 50ml Sodium Chloride 0.9% flush. Rate not exceeding 50mg/min.

Suggested Minimum Dilutions

Use smaller flush volume, i.e. 10ml Sodium Chloride 0.9%.
Intermittent infusion: dilute to not more than 10mg/ml in Sodium Chloride 0.9% and use within 1 hour.
Use 0.2-0.5 microns in-line filter.
Precipitation can occur.

Comments for Concentrated Solutions

Anecdotal.
Do not use if infusion becomes cloudy.

Potassium canrenoate

Data Sheet Recommendations- drug unlicensed in UK

Bolus: 200mg.

Infusion: Dilute to 250mls.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

No information

Comments for Concentrated Solutions

No information

Potassium Chloride

Data Sheet Recommendations

Usual max= 40mmol/L into peripheral line at a rate not exceeding 20mmol/hour.

Diluent: Sodium chloride 0.9%, Glucose 5%, Sodium chloride and glucose, Compound sodium lactate solution (Hartmann's).

Suggested Minimum Dilutions

Various dilutions used nationally, usually in fluid restricted patients. These range from 40mmol/100ml to undiluted (i.e. 2mmol/ml).

The most common maximum concentration is 1mmol/ml.

Comments for Concentrated Solutions

Anecdotal.

Strong solutions, i.e. >80mmol/l should be given via a central line only. ECG cover is mandatory if very strong solutions are used.

Potassium Phosphate

Data Sheet Recommendations

Concentration and rate is limited by potassium content. Usual max of 40mmol/L potassium is used via a peripheral line Concentrations over 80mmol/L **must** be given via a central line.

Diluent: Sodium chloride 0.9%, Glucose 5% or Sodium chloride and glucose.

Suggested Minimum Dilutions

Various concentrations used: 20- 40mmol/100ml potassium content, 1mmol/ml potassium content and undiluted.

Comments for Concentrated Solutions

Anecdotal.

BNF gives an infusion rate for phosphate of 18mmol over 24 hrs, but states that in critically ill patients the dose can be increased to 500mcg/kg (max 50mmol) over 6-12 hours.

Some units however give 15mmol over 2 hours up to 3 times a day. Ref: Crit Care Med 1995; 23:1204.

See Potassium Chloride for safety guidelines.

Ranitidine

Data Sheet Recommendations
50mg in 20ml over at least 2 min.
Diluent: Sodium chloride 0.9%
Suggested Minimum Dilutions
Undiluted injection over at least 2 mins used in many centres.
Comments for Concentrated Solutions
Anecdotal.
Rate of injection more important than dilution.

Remifentanil

Data Sheet Recommendations
12.5mg in 50ml.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
Up to 20mg in 50ml has been used.
Comments for Concentrated Solutions
Anecdotal.

Rifampicin

Data Sheet Recommendations
Rifadin: 600mg over 2-3 hours
Diluent: Sodium chloride 0.9% or Glucose 5%.
No volume is given, but 100ml used in practice

Rocuronium

Data Sheet Recommendations
Undiluted.

Salbutamol Infusion

Data Sheet Recommendations
5mg in 500ml.
Diluent: Sodium chloride 0.9%, Glucose 5% or Sodium chloride and glucose.
Suggested Minimum Dilutions
10mg in 50ml (datasheet recommendation for premature labour).
Comments for Concentrated Solutions
Anecdotal.
Centrally or peripherally.

Sodium Fusidate

Data Sheet Recommendations

Preparation being discontinued

500mg in 500ml, centrally over 2 hours or peripheral over 6 hours.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Suggested Minimum Dilutions

Centrally - 500mg in 100ml, peripherally - 500mg in 250ml.

Comments for Concentrated Solutions

Anecdotal.

Concentrated solutions must be given over at least 6 hours.

Sodium Glycerophosphate

Data Sheet Recommendations

10-20 mmol added to infusion solution or to the admixture for which compatibility has been proved

Diluent: Glucose 5%, Glucose 20%, Glucose 50%

Suggested Minimum Dilutions

20mmol in 50ml (centrally) or 100ml (peripherally).

Concentrated glucose solutions can only be administered centrally.

Comments for Concentrated Solutions

Anecdotal

Sodium Nitroprusside

Data Sheet Recommendations

Available as special only – information from previous licensed product

50mg in 250-1000ml.

Diluent: Glucose 5%.

Suggested Minimum Dilutions

1mg/ml.

Comments for Concentrated Solutions

Anecdotal.

Central line only.

Sodium valproate

Data Sheet Recommendations

Bolus over 3-5 minutes.

Tacrolimus

Data Sheet Recommendations

5mg in 50ml.

Diluent: Sodium chloride 0.9% or Glucose 5%.

Tazocin (Piperacillin with tazobactam)

Data Sheet Recommendations
4.5g in 20ml.
Diluent: Sodium chloride 0.9% or Water for injections.

Thiopental (Thiopentone)

Data Sheet Recommendations
500mg in 10ml water for injections.
Comments
Centrally, high pH leading to peripheral vein irritancy.

Vasopressin (Argipressin)

Data Sheet Recommendations
0.5unit per ml
Diluent: Glucose 5%.
Suggested Minimum Dilutions
Some centres use 20units in 50ml.
Comments for Concentrated Solutions
Anecdotal.
Centrally only.

Vancomycin

Data Sheet Recommendations
5-10mg/ml via central or peripheral line for bolus doses
1-2g in a 'suitable' volume for continuous infusion.
Diluent: Sodium chloride 0.9% or Glucose 5%.
Suggested Minimum Dilutions
10mg/ml is a commonly used dilution. 20mg/ml has been used in some centres.
Comments for Concentrated Solutions
Anecdotal.
Give concentrations >5mg/ml via a fast flowing vein. Can be given by continuous infusion.

Vecuronium

Data Sheet Recommendations
2mg/ml (Undiluted).