Intravenous fluids therapy in children

Consultation on draft guideline - Stakeholder comments table
1 June 2015 – 13 July 2015

Comments forms with attachments such as research articles, letters or leaflets cannot be accepted.

Stakeholder	Document	Page No	Line No	Comments Please insert each new comment in a new row	Developer's response Please respond to each comment
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		Overall this is an excellent document and will be welcomed by all specialties involved in the care of children. Members of the GDG are to be congratulated on this important piece of work. In particular the algorithms, diagrams and tables are clear, easy to follow, help to pull everything from the text together and will be very useful to facilitate understanding and implementation. Attention should be drawn to these in the roll out of this guideline. An indictment of the profession is in the lack of decent quality evidence in most of the areas covered. It must be said that the current research organisations and oversight would be afraid of commissioning and liability for any study in this area, which may influence the potential for research in the areas indicated.	Thank you for your comment. The GDG worked to develop research recommendations in areas where uncertainties have been identified, often as a result of a lack of evidence. As outlined in the NICE Research recommendations process and methods guide (http://www.nice.org.uk/About/What-we-do/Research-and-development/Research-recommendations), NICE works closely with the National Institute for Health Research to address research priorities identified during guideline development.
Association of Paediatric Anaesthetists of Great Britain and Northern	Full	General		Anaesthetists as a group are familiar with the issue of hyponatraemia and the	Thank you for your response. We have highlighted the concerns regarding the

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Ireland				prescription of intraoperative fluid is, in general no longer an issue. The challenge with respect to implementation is to ensure that specialties (outside our control) but who also care for perioperative children and are responsible for the prescription of postoperative fluid understand and appreciate the implications of prescribing hypotonic solutions. We are not convinced that previous attempts at addressing this issue, NPSA 2006 and APA Guidelines 2007 achieved penetration beyond the anaesthesia. This is the challenge that this new guideline must address. In particular the widespread use of 0.45% NaCl and 5% Glucose is an issue of some concern. Although beyond the scope of the guideline it might have been useful to reference, in the commentary, some of the headline papers that warned of the dangers of hyponatraemia but that were often overlooked in the 0.18% NaCl and 4% Glucose era. (Arieff et al BMJ 1992, Moritz and	use of hypotonic fluids and the development of hyponatraemia and these have been outlined in the introduction to Chapter 7 and Chapter 9. We have passed it to the NICE implementation support team to inform their support activities for this guideline.

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				Ayus Pediatrics 2004). This "setting the scene" would help to reinforce the message and aid implementation.	
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		Following the withdrawal of 0.18% NaCl with 4% Glucose there is now widespread use of 0.45%NaCl with 5% Glucose both for post-operative maintenance fluid therapy and general fluid therapy in children. It would be helpful if some commentary were provided on the legitimacy of using this solution since this is a typical, often default paediatric ward prescription. This will not change unless there is a clear directive to do so and this is an issue with respect to implementation and is rooted in the perception that all children need to be given glucose. Is this still considered to be a suitable IV fluid in these situations?	Thank you for your response. We have highlighted the concerns regarding the use of hypotonic fluids and the development of hyponatraemia and these have been outlined in the introduction to Chapter 7 and Chapter 9. In addition, we have passed it to the NICE implementation support team to inform their support activities for this guideline.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		We have real problems obtaining an isotonic preparation containing glucose (ideally Hartmann's). To us this is our main barrier. We need to put pressure on the manufacturers to provide us with	Thank you for your response. We have passed it to the NICE implementation support team to inform their support activities for this guideline.

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				what we need. There is some availability of 1% glucose in Hartmann's in Europe and the ESPA statement on this is valuable.	
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		A big barrier is the varied and inadequate nature of most fluid prescription charts. It would extremely helpful if an example **universal chart** could be included within the guideline, that can be amended for use in all hospitals, with all the relevant details, information, calculations etc. on it. This would be much better for trainees who are always moving around. This could be helpful with respect to universal implementation.	Thank you for your comment. It is outside the remit of the current guideline to develop a universal fluid prescription chart; however, recommendation 1.2.3 (5) outlines the relevant information that should be included in all fluid prescription charts. We are aware of an example of a universal chart, developed in Northern Ireland, and we have cross-referred to this within the Linking evidence to recommendations section.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		Fluid charts: We would be supportive of diligent weighing and recording fluid balance on all hospital patients. Every child that needs careful fluid balance needs a 24 hour chart that records inputs and outputs clearly, relates this to daily weights and has sufficient space such that complex patients can have several columns of inputs and outputs recorded on the same	Thank you for your comment. It is outside the remit of the current guideline to develop a universal fluid prescription chart or spreadsheet; however, recommendation 1.2.3 (5) outlines the relevant information that should be included in all fluid prescription charts and this includes the recording of actual or estimated body weight from the previous day, the current day and the difference between the two, or body surface area if used. We have passed your comment to the NICE

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				chart and that this allows totals to be added correctly. It would be even better if they were on a spreadsheet. Basic maths may be a problem in some bedside carers so the chart format alone is not enough. Poor fluid recording is often a marker for overall poor care, or inadequate time per patient for each career.	implementation support team to inform their support activities for this guideline.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	General		The issue of transition between children's IV fluid prescription and prescription for adults is not dealt with at all. At 16 years of age a child with fluid based on the Holliday/Segar will at a stroke have fluid calculated according to the adult guide – completely different calculation and considerably less in volume **and could be prescribed 4%dextrose/0.18% saline which is the antithesis of the Children's guide!** Some commentary dealing with the issue of transition would be welcome!	Thank you for your comment. When transitioning to adult services, changes in treatment should be determined by clinical judgement.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	35	Algorithm2	And in the relevant text regarding resuscitation. We recognise that the scope of this guideline does not include the use of blood or	Thank you for your comment. The use of blood products was outside the scope of the guideline. Recommendations on the use of the use of blood products in adults, children and young people will

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				blood products however this algorithm on resuscitation feels incomplete without any mention of when blood might be used in **resuscitation due to blood loss**. Even if this is to be considered after 40-60/kg then this should be mentioned. The ILCOR and RCUK and APLS guidance will be changing from October 2015 and consideration should be given to potential conflict with these well recognised sources of guidance as if this guidance is out of step with these bodies then implementation will be a nightmare and will seed variation in practice across the UK. The use of blood or blood products on an alternating basis with crystalloid is rumoured to be contained within APLS 2015 changes in the treatment of hypovolaemic shock due to blood loss, though we are unable to confirm this.	be included in the NICE clinical guideline Transfusion, due for publication in November 2015 and the NICE clinical guideline Major Trauma, due for publication in February 2016. A cross reference to these guidelines has been included in the 'Linking evidence to recommendations' section of the full guideline. For clarity, we have deleted recommendation 12 on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	41 43 56	9 28	How often is it recommended that children should be weighed? The implication from the studies is that strategy 8 is supported, i.e.	Thank you for your comment. We have amended recommendation 1.2.3 (5) to clarify that daily body weight should be recorded and to clarify when actual and estimated body

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				children should be weighed on a daily basis and have full fluid balance monitoring. This is perhaps implied in the recommendation but not completely clear. Please could this be clarified?	weight should be used.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	45	24 and 29	Duplicate points 23 and 24	Thank you for your comment. We agree and have removed this duplication.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	45	39	Hartmann's solution should be considered for intra-operative use. This is clear but there is a considerable body of consensus that consideration should be given to the addition of a small amount of Glucose (1 or 2%) in some situations. This is recommended in the European Consensus Statement (Sumpelmann et al, EJA 2011 28:637-639) We note that a research priority is work to look at glucose requirements however there is already some evidence that some glucose is helpful in certain groups of patient. Presumably this did not meet inclusion criteria being a consensus statement but it is	Thank you for your comment. On the basis of stakeholder feedback, recommendation 1.5.2 (26) has been amended to clarify that Hartmann's solution is one isotonic crystalloid that could be used for redistribution losses, including those developing perioperatively.

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				worth mentioning within the commentary.	
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	Full	128 and 129		2.7% NaCl in the recommendations (129) and 3% NaCl (128) are both mentioned (hypertonic saline) so there is some inconsistency here. Since 2.7% is the standard available solution there should be consistency throughout recommendations regarding hypertonic saline. The unit cost for 2.7% could easily be transposed here.	Thank you for your comment. This should have read 2.7% and has been amended. However we have also kept the 3% concentration as it is used in some hospitals.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	12	7	Premature neonates are an especially vulnerable group with respect to iatrogenic hyponatraemia. Accepting that this is beyond the scope of this guideline could consideration could be given to the extension of this recommendation to this group of neonates or the inclusion of some commentary expressing the vulnerability of this group.	Thank you for your comment. It is outside the scope of the guideline to consider babies born prematurely whose corrected age is less than term and therefore we are unable to develop recommendations relating to this population.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	14	30	A&E The correct term is EU (Emergency Unit). This should be consistent throughout the document.	Thank you for your comment. In accordance with NICE Style, we have chosen to retain the term A&E.
Association of Paediatric	NICE	15	Table	Normal Respiratory pattern –	Thank you for your comment. We agree and have

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Anaesthetists of Great Britain and Northern Ireland			1	Followed by Tachypnoea – this is a rate not a pattern. The first box should read **"Normal Respiratory rate" Rate is not a pattern!** **Hypotension (decompensated shock)** Hypotension is the sign, decompensated shock is not a sign it is the diagnosis, semantics, but different.	amended to 'Normal breathing rate'. We have retained the terms hypotension and decompensated shock for information.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	16	18	Doesn't make sense as this means that above 60 ml/kg you don't have to seek expert advice. Suggest "more than 40-60ml/kg"	Thank you for your comment, this has been amended to clarify that expert advice should be sought if a child requires 40-60 ml/kg or more of IV fluid.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	16	24	"any remaining weight" is very clumsy English! Do you mean "for each kg thereafter" ??	Thank you for your comment, this has been amended to clarify that this is for any weight above 20 kg.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	19	3 and 11	Consider suggesting a % glucose. We note that this is a suggested area for further study but a conservative example may help prevent over-administration of dextrose	Thank you for your comment. No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is usual practice for infants and young children to receive glucose-containing IV fluids, and that

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					these may also be required by older children and the GDG felt this should continue.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	19 20	12, 28	Both acute hypernatraemic dehydration and symptomatic hyponatraemia are medical emergencies and should be managed in an HDU/ICU environment. This needs to be emphasised in the document.	Thank you for your comment. We agree that acute hypernatraemia and hyponatraemia are acute medical emergencies, however it was outside the scope of the guideline to provide recommendations on where these conditions should be treated and this should be determined locally.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	20	13,14	The phrase “Immediate expert help” needs to be qualified – we would consider that the most appropriate “expert” would be from an anaesthetic/PICU background rather than advice from other, less acute specialties.	Thank you for your comment. We agree and have clarified what the GDG consider to be expert advice in these instances.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	20	15,17 ,22	Hypertonic saline: Might it be better to suggest this be given centrally if possible?	Thank you for your comment. It was outside the scope of the guideline to provide recommendations on the preferred route of fluid administration.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	20	15, 17 and 22	We are concerned that it says ‘consider’ giving hypertonic saline. In this situation it is part of the treatment and could be life-saving. It should just say **‘administer’**. You are not going to make things worse if the child is fitting.	Thank you for your comment. As outlined in Section 3.4 of the full guideline, the GDG chose to reflect the quality and availability of the evidence when agreeing the strength of the recommendation. Given the lack of available evidence relating to the management of hyponatraemia, the GDG chose to base the recommendation upon consensus of the group, and as such felt that it was appropriate to develop a weaker ‘consider’ recommendation.
Association of Paediatric	NICE	20	15	We have always used 3% saline	Thank you for your comment.

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Anaesthetists of Great Britain and Northern Ireland			and sequence	in these situations. I have never seen 2.7% saline prescribed. This may highlight a procurement issue and will have implications for implementation. This may warrant some investigation of contract around the UK. In Wales for example the Welsh contract is for 2.7% saline, and this is the only preparation stocked on PICU in Cardiff. This may not reflected in the regions of the UK.	3% saline is an off-label drug and the GDG recommendation was to use 2.7% saline, which is a licensed preparation which is widely available. We have passed your comment to the NICE implementation support team to inform their support activities for this guideline.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	20	26	Hyponatraemia encephalopathy – is incorrect it should read **hyponatraemic** encephalopathy	Thank you for your comment, this has been amended.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	22	Algorithm 1	Malignancy is a better term than "cancer"; we suggest that this would be more appropriate in this context and in the text to describe fluid calculation when using BSA. Suggest a minimum frequency of measurement of glucose if there is a risk of hypoglycaemia	Thank you for your comment. We have retained the term 'cancer' in line with NICE style. The GDG felt that this would be dependent upon the clinical situation and would be considered on a case-by-case basis using clinical judgement.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	24	Algorithm 3	Non osmotic ADH is a much better term than inappropriate ADH secretion	Thank you for your comment, this term has been used throughout.
Association of Paediatric Anaesthetists of Great	NICE	26	Algorithm 5	Suggest a glucose concentration to add to 0.45% saline, to	Thank you for your comment. No evidence was identified to allow the GDG to

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Britain and Northern Ireland				compliment comment on text p19, L 3 and 11, vide supra.	develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. For clarity, we have deleted the previous recommendation 1.3.3 (12) on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Association of Paediatric Anaesthetists of Great Britain and Northern Ireland	NICE	28	Picture	This is a lovely diagram: maybe a calculator could be developed based upon it in the future?	Thank you for your comment. We have passed your comment to the NICE implementation support team to inform their support activities for this guideline.
Association of Paediatric Emergency Medicine	Full	General		Clarification of volume of fluid bolus given during resuscitation in DKA may be beneficial (though reference is made to the NICE Guidance on diabetes in children).	Thank you for your comment. It is outside the scope of the guideline to provide recommendations for the treatment of children who have DKA specifically; however, recommendations on fluid resuscitation for these children can be found in NICE clinical guideline Diabetes in Children and Young people, due for publication in August 2015.
Association of Paediatric Emergency Medicine	Full	General		Clarification on the role of blood in resuscitation of the hypovolemic child following haemorrhage. Again reference is made to a future guideline on major trauma but the role of blood could be more strongly alluded to.	Thank you for your comment. The use of blood products was outside the scope of the guideline. Recommendations on the use of the use of blood products in adults, children and young people will be included in the NICE clinical guideline Transfusion, due for publication in November 2015 and the NICE clinical guideline Major Trauma, due for publication in February 2016. A cross-reference to these guidelines has been

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					included in the 'Linking evidence to recommendations' section of the full guideline. For clarity, we have deleted recommendation 12 on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Association of Paediatric Emergency Medicine	Full	General		While there is a long discussion on calculation of fluid requirements, no advice on choice of APLS or Resus council calculations for estimated weight. Does this need to be addressed? With one calculation giving a weight of 18kg for a 6 year old, and the other 25kg there is considerable scope for error.	Thank you for your comment. It is outside the scope of the guideline to recommend the use of a specific calculation for estimated weight; however, we have highlighted in the Linking evidence to recommendations in Section 5.1.1.6 of the full guideline some examples of calculations which may be used.
Association of Paediatric Emergency Medicine	Full	General		The advice seems to suggest that for children outside the neonatal period initial (maintenance) fluids should not contain dextrose (in the context of a normal blood glucose) and the decision to add dextrose should be based on subsequent blood sugar levels performed at least every 24 hours. We are concerned that this is not clearly supported by the evidence and may come with associated risk of hypoglycaemia	Thank you for your comment. No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is usual practice for infants and young children to receive glucose-containing IV fluids, and that these may also be required by older children and

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				in infants and younger children.	the GDG felt this should continue.
British Association for Paediatric Nephrology Nottingham Childrens Hospital	Full	General	General	No mention of nephrogenic DI that I can find??	Thank you for your comment. It was outside the remit of the guideline to consider the intravenous fluid requirements of children with specific conditions.
British Association for Paediatric Nephrology Nottingham Childrens Hospital	Full	General	General	I am anxious about repeated hypertonic saline being given - I think there needs to be a mention of appropriate care setting ie HDU/PICU with input from nephrologist and or intensivist. Should we be restricting hypertonic saline to fitting children with hyponatraemia and those at risk of coning?? I just felt that you wouldn't give repeated 2.7% saline just for lethargy and sodium of 123. I've seen well intentioned junior doctors do this in past in oncology and the consequence was rapid diuresis, hypernatraemia and death in a situation that probably was salvageable with 0.9% saline and careful management.	Thank you for your comment. However, we feel that acute symptomatic hyponatraemia is a medical emergency and requires immediate treatment. The GDG have amended recommendation 1.7.3 (34) to clarify that expert advice should be sought, for example from the paediatric intensive care team.
Department of Health	Full	General	General	Thank you for the opportunity to comment on the draft for the above clinical guideline.	Thank you for your comment.

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				I wish to confirm that the Department of Health has no substantive comments to make, regarding this consultation.	
Department of Health Social Services and Public Safety Northern Ireland	Full	General	General	The draft guideline is consistent with local guidance/materials on fluid replacement in children, as modified in response to CG 174. We are therefore content with guidelines as drafted	Thank you for your comment.
Faculty of Intensive Care Medicine	Full	General	General	The Faculty of Intensive Care Medicine felt that the document was very comprehensive with no obvious omissions and the guideline board was very reputable. The only concern was that, for a clinical occasionally involved in treating very sick children, it is not terribly easy to navigate however, this could be addressed when a revision is contemplated.	Thank you for your comment. Recommendations can be found in the full and NICE versions of the guideline, as well as an algorithm to ease navigation of the recommendations.
Neonatal and Paediatric	Full	Gener	Gene	We welcome the development of	Thank you for your comment.

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Pharmacists Group		al	ral	this clinical guideline and are pleased to see that despite the paucity of evidence in the field, NICE has been able to make sensible and measured recommendations. It is laid out and presented well, and decisions made have been well justified. We welcome the use of easy to follow algorithms.	
Neonatal and Paediatric Pharmacists Group	Full	General	General	Where you have suggested assessment recording on "fluid balance and prescription chart" we would like to point out that many centres will have separate fluid balance and fluid prescription charts. Does NICE recommend the merging of these into a single document, or does NICE propose either/or documentation? Will any good practice examples be available?	Thank you for your comment. The Guideline Development Group did not wish to prescribe what format the fluid balance and prescription chart takes, only the key components to be recorded. A research recommendation has been made on the effectiveness of using a national standardised fluid balance chart
Neonatal and Paediatric Pharmacists Group	Full	General	General	We would urge that GDG strongly recommend the use of licensed, premixed, standard strength bags of fluids, especially those containing potassium, rather than encouraging additions to bags at ward level, which would be unlicensed specials preparations. This is particularly important in	Thank you for your comment. The evidence for premixed fluids versus additions to bags was not considered; however, the recommendations do not encourage any additions. We believe that it is now current practice to use premixed potassium- containing IV fluids following the NPSA alert. This was also stated in the 'economic considerations' of the Linking evidence

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				view of the NPSA Alert which restricts addition of potassium to IV fluid bags on general wards. We also consider that NICE should advocate the use of the most cost-effective IV fluids for the NHS.	to recommendations section for recommendation 1.5.3 (27): "The GDG also noted that current UK practice is to use commercially prepared, premixed isotonic 0.9% sodium chloride with different potassium concentrations, tailored to the child's needs, as the first-line option for replacement. There was no reason to believe that changing this practice would be justified on clinical or economic grounds. This practice also adheres to the NPSA guidelines that recommend the use of commercially prepared, premixed IV fluids, where available, to reduce errors during preparation and the risk of infections. Preparation errors and infections are costly events; therefore the use of commercially prepared, premixed isotonic sodium chloride (0.9% solution) with potassium is likely to be the most cost-effective option."
Neonatal and Paediatric Pharmacists Group	Full	General	General	We are disappointed that the Guideline Development Group (GDG) has been unable to develop recommendations or guidance on the optimal glucose concentration for use in children. The use of glucose/sodium chloride premixed bags with additional potassium represents an enormous cost and governance challenge for the NHS.	Thank you for your comment**.** No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. The evidence for premixed fluids versus additions to bags was not considered; however, the recommendations do not encourage any additions. We believe that it is now current practice to use premixed, potassium-containing IV

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					fluids following the NPSA alert. We appreciate that the move to using premixed IV fluids might have a cost impact for some hospitals that have not already moved to using these fluids following the NPSA alert. However, this is necessary for ensuring the safe use of IV fluids in children. Preventing errors and their associated downstream costs is likely to offset the increased cost that might result from the use of premixed fluids. This was also explained in the 'economic considerations' of the Linking evidence to recommendations section for recommendation 1.6.1 (29): "The GDG also noted that current UK practice is to use commercially prepared, premixed isotonic 0.9% sodium chloride with different potassium concentrations, tailored to the child's needs, as the first-line option for replacement. There was no reason to believe that changing this practice would be justified on clinical or economic grounds. This practice also adheres to the NPSA guidelines that recommend the use of commercially prepared, premixed IV fluids, where available, to reduce errors during preparation and the risk of infections. Preparation errors and infections are costly events; therefore the use of commercially prepared, premixed isotonic sodium chloride (0.9% solution) with potassium is likely to be the most cost-effective option."
Neonatal and Paediatric Pharmacists Group	Full	General	General	We appreciate the difficulty the GDG have had in coming to	Thank you for your comment. The GDG chose to develop recommendations using informal

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				conclusions and making recommendations but we note that in some contentious areas (e.g. cost effectiveness of fluids in hypo/hypernatraemia) where there is no evidence the GDG have been happy to make recommendations on the basis of consensus. Yet in others (e.g. glucose concentration in maintenance fluids) the GDG has declined to make a recommendation and instead posed a research question.	consensus where limited or no evidence was available. The GDG also prioritised 5 areas where further research would be a priority, for example to help inform future updates or develop key recommendations. The GDG considered that as it is currently usual practice to give IV fluids with glucose this would continue, but were aware that there are differing opinions regarding the use of glucose and the limited evidence found indicated that adding glucose provided no benefit. The GDG therefore agreed that this was a clinically important question to answer rather than making a consensus recommendation on a topic where opinion is currently divided. Further information on how the GDG prioritise and develop research recommendations can be found in 'Developing NICE Guidelines: the manual' (http://www.nice.org.uk/article/pmg20/chapter/1%20Introduction%20and%20overview).
Neonatal and Paediatric Pharmacists Group	Full	General	General	We would have liked to see clarification of other circumstances where fluid restriction may be appropriate, e.g. ascites, liver failure, some cardiac conditions.	Thank you for your comment. It was outside the scope of the guideline to provide recommendations on specific clinical conditions. We have, however, added that clinicians need to take into account pre-existing conditions where smaller volumes of fluid may be required.
Neonatal and Paediatric Pharmacists Group	Full	12	30-31	The guideline does not provide recommendations for adults aged	Thank you for your comment. NICE clinical guideline 174 Intravenous fluid therapy in adults in

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				16 or over. The intravenous fluid therapy in adults in hospital quality standards do not provide a definition for an adult. The standard definition of an adult is someone over 18 years. Clarification is needed on recommendations for young people aged 16-18 years, even if this is simply to follow the adult guidance.	hospital defines an adult as 16 years and over, and provides recommendations for this population. The current guideline on Intravenous fluids in children and young people provides recommendations for children and young people up to their 16th birthday.
Neonatal and Paediatric Pharmacists Group	Full	12	30-31	We welcome inclusion of what the guidelines does not cover. Could these two lines be included in the short version as clarification?	Thank you for your comment. The NICE guideline includes the recommendations from the full guideline only and does not include details of the scope of the guideline.
Neonatal and Paediatric Pharmacists Group	Full & NICE	35 23	Algorithm 2 Algorithm 2	Resuscitation. There is no mention here of cardiac patients. We would expect these patients to be resuscitated with 5-10ml/kg (as per neonates) as their response to fluid correction is very different. Resuscitating a non-neonatal cardiac patient with 20ml/kg would present unacceptable risks.	Thank you for your comment. It was outside the remit of the guideline to consider the intravenous fluid requirements of children with specific conditions. We have, however, added that clinicians need to take into account pre-existing conditions where smaller volumes of fluid may be required.
Neonatal and Paediatric Pharmacists Group	Full & NICE	35 23	Algorithm 2 Algorithm 2	Where you suggest “expert advice” for fluid bolus requirements in excess of 40ml/kg we suggest stating “critical care” as 40-60ml/kg of	Thank you for your comment. We agree and have clarified what the GDG consider to be expert advice in these instances.

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				fluid resuscitation would necessitate critical care intervention. "Expert advice" is too vague. However, we do note the definition of 'expert' in Short guideline p12, line 10. Does this definition need to be included in the full guideline too?	
Neonatal and Paediatric Pharmacists Group	Full & NICE	36 24	Algorithm 3 Algorithm 3	How do you recommend practitioners calculate body surface area (BSA)? (see comment #20)	Thank you for your comment. It was outside the scope of the guideline to recommend the use of a specific calculation of body surface area; however, we have highlighted in the Linking evidence to recommendations in Section 5.1.1.6 some examples of calculations which may be used.
Neonatal and Paediatric Pharmacists Group	Full & NICE	38 26	Algorithm 5 Algorithm 5	At the point in the flow diagram where we reach "hypernatraemia worsening or unresponsive" if answering "Yes" the user will find themselves in a feedback loop. There needs to be another level at this point recommending whom to refer to (endocrine/nephrology?)	Thank you for your comment. We have amended Algorithm 5 for clarity. However, it was outside the scope of the guideline to provide advice on who to refer to and this should be decided locally.
Neonatal and Paediatric Pharmacists Group	Full & NICE	39 27	Algorithm 6 Algorithm 6	"If hypervolaemic or at risk…restrict maintenance IV fluids" – to what? Usually we would recommend 50-80%.	Thank you for your comment. We have amended recommendation 1.7.1 (32) to clarify what restrictions should be made to fluids in this scenario. We have also amended 1.4.9 (23) to reflect these changes.

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Neonatal and Paediatric Pharmacists Group	Full & NICE	39 27	Algorithm 6 Algorithm 6	Whilst still in the common parlance, saline is an obsolete term without scientific basis. Where “saline” is printed this should be written “sodium chloride”	Thank you for your comment. We agree and this has been amended throughout.
Neonatal and Paediatric Pharmacists Group	Full & NICE	40 28	Figure 3 -	This diagram does not include losses from chest trains or losses from external ventricular drainage (EVD). Chest drains can result in significant sodium loss. In practice, neurosurgical patients with EVD in place usually have losses replace ml for ml with sodium chloride 0.9%.	Thank you for your comment. The diagram was not intended to be exhaustive and represents the most common causes of losses.
Neonatal and Paediatric Pharmacists Group	Full & NICE	41, 42, 44, 45, 46, 89, 111, 125 5 10, 16, 17, 19	Footnotes 9 Footnotes	The guideline recommends that informed consent should be obtained and documented when using unlicensed or off-label therapies for children. This may be unrealistic, and is at odds with the current guidance from the RCPCH/NPPG Standing Committee on Medicines, which states that “Health professionals respect the right of children and their parents to participate in decisions on the health care of the child, and seek to ensure that those decisions	Thank you for your comment. This is a standard statement included in all NICE guidelines where unlicensed or off-label therapies are recommended for children.

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				are properly informed. In normal paediatric practice no additional steps, beyond those taken when prescribing licensed medicines, are required to obtain the consent of patients and parents / carers for the use of unlicensed medicines." http://www.nppg.scot.nhs.uk/RCPCH%20Revised%20Statement%20on%20Unlicensed%20Medicines%20October%202010%20FINAL.pdf	
Neonatal and Paediatric Pharmacists Group	Full & NICE	41-2 16	38-2 1-19	Fluid resuscitation: There has been no recommendation regarding colloids for resuscitation throughout this document. Do we presume that NICE have elected not to make recommendations beyond 60ml/kg initial resuscitation volume because of the paucity of evidence and thus decisions made after then are at the clinicians discretion?	Thank you for your comment. The GDG chose to recommend the use of glucose-free crystalloids for fluid resuscitation in neonates and children (see recommendations 1.3.1 – 1.3.2; [10-11]). The GDG did not recommend colloids for fluid resuscitation in these populations. The 'Linking evidence to recommendations' section of the full guideline outlines the discussion relating to this decision. Recommendation 1.3.5 (14) highlights that where 40-60 ml/kg or more of IV fluid is required as part of the initial fluid resuscitation, expert advice from a paediatric intensive care team should be sought on a case-by-case basis.
Neonatal and Paediatric Pharmacists Group	Full &	42	3-11	Routine maintenance: You only recommend the use of glucose	Thank you for your comment. No evidence was identified to allow the GDG to develop a

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	NICE	16-18	20-9	containing solutions for neonates. This is contrary to established practice across the UK with glucose-containing maintenance fluids being used in children up to adolescence. Clinicians would appreciate guidance on the optimal ages for glucose supplementation. The use of pre-mixed glucose-containing intravenous fluids has a massive cost impact.	recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is usual practice for infants and young children to receive glucose-containing IV fluids, and that these may also be required by older children and the GDG felt this should continue. The costs of different IV fluids, including those containing glucose, were presented to the GDG. It was noted that fluids containing glucose cost more than those not containing glucose, however these costs were still considered to be quite low. Improved safety from avoiding pre-mixing at ward level was believed to offset costs. The cost impact of this recommendation will also be considered by the NICE implementation team who will develop tools to assist local adoption of the recommendation.
Neonatal and Paediatric Pharmacists Group	Full & NICE	42 19	19-20 23	Managing hyponatraemia: "restrict maintenance IV fluids in children…"to what? Usually we would recommend 50-80%. (see comment #13)	Thank you for your comment. Recommendation 1.7.1 (32) has been amended to clarify the restriction.
Neonatal and Paediatric Pharmacists Group	Full &	43	21	Assessment and monitoring: Please make recommendations	Thank you for your comment. It was outside the scope of the guideline to recommend the use of a

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	NICE	13	12-15	on how Body Surface Area (BSA) is to be calculated. There are many different formulas – would the tables at the back of the BNF for Children, based on the Boyd formula, be appropriate? Why BSA rather than Ideal Body Weight (IBW) either based on height and weight calculations, or the APLS formula, or using the 50th centile on the growth charts?	specific calculation of body surface area; however, we have highlighted in the Linking evidence to recommendations in Section 5.1.1.6 some examples of calculations which may be used.
Neonatal and Paediatric Pharmacists Group	Full & NICE	46 47 129 20	37 & 38 2 Rec. 36 15, 18 & 22	Whilst still in the common parlance, saline is an obsolete term without scientific basis. Where “saline” is printed this should be written “sodium chloride”	Thank you for your comment. We agree and this has been amended throughout.
Neonatal and Paediatric Pharmacists Group	Full & NICE	47 29	16-17 20-21	We welcome the research recommendations highlighted in this guideline, especially the need to investigate the most appropriate glucose concentration in IV fluids for children and young people at different ages.	Thank you for your comment.
Neonatal and Paediatric Pharmacists Group	Full & NICE	50 12-13	- -	Recommendations: You have not specified MAXIMUM fluid volumes to be administered per	Thank you for your comment. We agree and have amended recommendation

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				24hrs. May we suggest 2000ml for males and 2500ml for females.	1.4.1 (15) to include a limit for the maximum fluid volume that should be given to male and female children and young people over a 24 hour period.
Neonatal and Paediatric Pharmacists Group	Full	61	7	Point of Care Testing: You have compared handheld systems with laboratories, but what about benchtop blood gas analysers (e.g. Radiometer®) which are in common practice throughout the NHS and may have different economic impacts.	Thank you for the comment. The evidence review was not restricted by point-of-care device. No evidence was found for any device and the recommendation is not specific for any particular device, just one which can provide instant results. We have taken into account blood gas analysers as a possible testing strategy. This has been reported in the footnote of table 12, section 5.2.2.4.2 where we state that "Another test is also available, blood gas analyser, however the GDG advised that every intensive care unit (ICU) unit will already have the equipment available for this test". As clarified in this statement, there is no additional cost anticipated if the blood gas analyser is used, as it is available in every ICU.
Neonatal and Paediatric Pharmacists Group	Full & NICE	89 16	10 18	Recommendation 15: Replace vague term "expert advice" with "refer to critical care". Or include the definition of 'expert' from short guideline p12, line 10	Thank you for your comment. We agree and have clarified what the GDG consider to be expert advice in these instances.
Neonatal and Paediatric Pharmacists Group	Full	93 96 98 98 103	Table 30 Table 31 Table	The commonly used term "dextrose" is incorrect and outdated in this context. These IV fluids contain glucose not dextrose. We would suggest	Thank you for your comment. We have amended this throughout but retained the terminology used in studies where appropriate.

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		103 104 113 115	32 Table 33 Table 37 12, 14, 17 & 19 2, 6, 9, 13 - 41	replacing the term “dextrose” with “glucose”. We appreciate that the term “dextrose” is used in the literature and in particular is the term used in the USA. However, we would urge NICE to set the example and use the correct UK terminology of “glucose”.	
Neonatal and Paediatric Pharmacists Group	Full	103	Table 37	The omission of sodium chloride and glucose premixed bags WITH potassium chloride has a profound impact on your economic analysis. Standard practice in England is to use 0.45% or 0.9% sodium chloride with 5% glucose and 10 or 20mmol potassium per 500ml bag. Because of NPSA’s potassium alert, the addition of potassium chloride at ward level is prohibited, thus these products are purchased as unlicensed specials. 0.45% sodium chloride, 5% glucose and 10 or 20mmol potassium chloride 500ml bags	Thank you for your comment. We have updated the table to include the cost of premixed bags of sodium chloride and glucose with potassium using the same source that was used for the other costs, which should also reflect the negotiated prices. We acknowledge that some variations between hospitals are likely to occur but we do not expect prices to be significantly different.

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				cost £4.50 per bag. 0.9% sodium chloride, 5% glucose with 10 or 20mmol potassium chloride 500ml bags cost £7.50 per bag. We are concerned that with the recommendations that have been made there will be a move to a much more expensive IV fluid.	
Neonatal and Paediatric Pharmacists Group	Full	103	7	The GDG have not offered guidance on potassium supplementation with IV fluids. Did the guideline consider what the impact of balanced versus unbalanced crystalloids was on potassium homeostasis and whether or not a balanced crystalloid would reduce the need for supplemental potassium chloride in maintenance fluids?	Thank you for your comment. The protocol for the review on the optimum routine maintenance fluid did consider balanced solutions versus 0.9% sodium chloride. The literature search did consider potassium-containing fluids (and all maintenance fluids), but no studies were found. The GDG therefore decided to make a recommendation which allowed all isotonic fluids as this mirrored the adult guideline and there was no contradictory evidence.
Neonatal and Paediatric Pharmacists Group	Full	128	Table 49	Hypertonic crystalloids now include 3% sodium chloride. This is an unlicensed product in the UK. Previous tables have included 2.7% sodium chloride. Is this a typo? What about other strengths of strong sodium chloride – 1.8%, 5% - all of which are available as licensed medicines. Our understanding of the correction of hyponatraemia	Thank you for your comment. We have added 2.7% sodium chloride to the table, as well as the other concentrations mentioned in your comment.

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				is that the % concentration of the sodium solution being used is largely unimportant, but it's the rate at which it is delivered (2-5ml/kg)	
Neonatal and Paediatric Pharmacists Group	Full	128	Table 49	Unit cost – could the GDG clarify how these costs are calculated? Is this administration of glucose to a concentrated solution? We're unsure how relevant that is for comparison. We have not been able to review the economic model.	Thank you for your comment. The cost of the addition of glucose has now been removed from the table as according to current practice premixed bags are used.
Neonatal and Paediatric Pharmacists Group	Full	141	-	Could definitions for Ringer's lactate solution, Hartmann's solution and Plasma-Lyte be included? It would be useful to include the difference between the composition of these three crystalloids.	Thank you for your comment. Definitions of Ringer's lactate solution and Plasma-Lyte can be found in the glossary of the full guideline. We have added a definition of Hartmann's solution.
Neonatal and Paediatric Pharmacists Group	Full	General	General	The economic impact of the monitoring and recording of IV fluid balance should not be under estimated. As mentioned in the Economic plan and Cost Sensitivity Analysis (Appendix M) measurements are not documented consistently in current practice and the additional NHS staff time could be substantial. Implementation	Thank you for your comment. We agree that resources should be made available for the safe implementation of this recommendation. This is an investment that is likely to be off-set in the longer-term through the prevention of major complications that can lead to even more time and resource use down the line. o

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				without resource could increase the time taken by Junior Doctors to perform tasks associated with IV therapy and increase risks in other areas.	
NHS England	Full	General	General	Thank you for the opportunity to comment on the above Clinical Guideline. I wish to confirm that NHS England has no substantive comments to make regarding this consultation.	Thank you for your comment.
NHSCT	Full	42	6	Reference to checking bloods 'when starting' IV Fluids is too imprecise. The intention is that the bloods should be checked at the very start of the process and not just as part of the process.	Thank you for your comment. Recommendation 1.4.4 (19) highlights that measurements of plasma electrolytes should be made when starting IV fluids and at least every 24 hours thereafter. Recommendations 1.2.4, 1.2.5 and 1.4.4 (6, 7, 18) highlight that measurements of plasma electrolytes and blood glucose should be made when starting IV fluids and at least every 24 hours thereafter.
Northern Health and Social Care Trust	Full	19	22 - 23	Of those isotonic solutions identified in the document that are commonly used in the NHS and listed in the BNF the lowest Na concentration is 131mmol/L. Why then does the document throughout refer to use of crystalloid colloids containing	Thank you for your comment. We agree and have amended to 131-154 mmol/litre throughout.

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				sodium in the range **130**-154 mmol/l; should it not be 131 – 154 mmol/L?	
Northern Health and Social Care Trust	Full	34	Algorithm	As this algorithm is relating to assessment and monitoring it should include an indication of the need to check electrolytes **at the start** of the process when the problem is not an elective one. Currently the algorithm only mentions measuring U&E every 24 hours. That could be mistakenly interpreted as meaning anytime in the subsequent 24hrs period e.g checking the first and only set of electrolytes at 20hrs would comply.	Thank you for your comment. Recommendations 1.2.4, 1.2.5 and 1.4.4 (6, 7, 18) highlight that measurements of plasma electrolytes and blood glucose should be made when starting IV fluids and at least every 24 hours thereafter.
Northern Health and Social Care Trust	Full	34	Algorithm	Regarding hypoglycaemia. There should be an indication of which children should be considered to be at most risk of hypoglycaemia somewhere in the guidance and this linked in the algorithm e.g.age groups and conditions	Thank you for your comment. It was outside the scope of the guideline to provide guidance on which groups of children are at risk of hypoglycaemia.
Northern Health and Social Care Trust	Full	35	Algorithm	See previous reference in respect of specifying sodium 130mmol/L for lower limit of range crystalloids in BNF	Thank you for your comment. We agree and have amended to 131-154 mmol/litre throughout.
Northern Health and Social Care Trust	Full	36	Algorithm	The recommendation to measure electrolytes 'when starting' IV	Thank you for your comment. Recommendations 1.2.4, 1.2.5 and 1.4.4 (6, 7, 18) highlight that

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				fluids may not be interpreted as meaning to do the blood test around the time of commencement of IV Fluids and should be clarified.	measurements of plasma electrolytes and blood glucose should be made when starting IV fluids and at least every 24 hours thereafter.
Northern Health and Social Care Trust	Full	36	Algorithm	There is guidance to add urinary output to insensible losses to calculate IV needs when using Surface Area but no indication of how that is implemented when commencing fluids for the first time when there probably won't be a record of previous urinary output available.	Thank you for your comment. This will be achieved on an hourly calculation where the last hour's urine output will be added to the hourly insensible loss.
Northern Health and Social Care Trust	Full	36	Algorithm	Advising 20 ml/kg/ day for the 'remaining weight' invites the risk of administering excess fluid as it is not qualified with a maximum value of weight to use or upper limit of maintenance fluid volume to prescribe.	Thank you for your comment. We agree and have amended recommendation 1.4.1 (15) to include a limit for the maximum fluid volume that should be given to male and female children and young people over a 24-hour period.
Northern Health and Social Care Trust	Full	37	Algorithm	There is discussion in the text on how to recognise dehydration but no useful guidance in this algorithm (or any other one) on how to assess the degree or how much to correct it with and how quickly to do so (other than 48 hrs if hypernatraemic)..	Thank you for your comment. It was outside the scope of the current guideline to provide recommendations on assessing the severity of dehydration and how to correct this.
Northern Health and Social Care Trust	Full	37	Algorithm	It would be better when referring to solutions 'containing	Thank you for your comment. The evidence for premixed fluids versus additions to bags was not

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				potassium' to use a word such as 'pre-added' instead or other indication that adding K at ward level is not desirable and that having available a range of pre-prepared commercial solutions is to be encouraged instead	considered; however, the recommendations do not encourage any additions. We believe that it is now current practice to use premixed, potassium- containing IV fluids following the NPSA alert. This was also clarified in the 'economic considerations' of the Linking evidence to recommendations section for recommendation 1.6.1 (29): "The GDG also noted that current UK practice is to use commercially prepared, premixed isotonic 0.9% sodium chloride with different potassium concentrations, tailored to the child's needs, as the first-line option for replacement. There was no reason to believe that changing this practice would be justified on clinical or economic grounds. This practice also adheres to the NPSA guidelines that recommend the use of commercially prepared, premixed IV fluids, where available, to reduce errors during preparation and the risk of infections. Preparation errors and infections are costly events; therefore the use of commercially prepared, premixed isotonic sodium chloride (0.9% solution) with potassium is likely to be the most cost-effective option."
Northern Health and Social Care Trust	Full	39	Algorithm	As the definition in the text for 'hyponatraemia' is less than 135mmol/l it would be helpful to include that value in the title	Thank you for your comment, this has been added to Algorithm 5 and 6.
Northern Health and Social Care Trust	Full	39	Algorithm	The column advising on the management of hyponataemic	Thank you for your comment. As outlined in Section 3.4 of the full guideline, the GDG chose to

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				symptoms should be strengthened to change the word 'consider' to the word 'give'	reflect the quality and availability of the evidence when agreeing the strength of the recommendation. Given the lack of available evidence relating to the management of hyponatraemia, the GDG chose to base the recommendation upon consensus of the group, and as such felt that it was appropriate to develop a weaker 'consider' recommendation.
Northern Health and Social Care Trust	Full	39	Algorithm	Advising that the rate of increase of plasma sodium 'does not exceed' a value of 12mmol/L is a sentence structure encouraging conservatism that may not be in the patient's best interests. It would be better to advise aiming to achieve a rise of e.g. 10 – 12 mmol/L in 24hrs. The current DHSSPS N.I algorithm consensus Is for a maximum rise of 20mmol/L in 48hrs with a maximum target of 135mmol/L and probably based on the same limited evidence.	Thank you for your comment. We think that the current wording is clear and have chosen to retain this.
Northern Health and Social Care Trust	Full	40	Diagram	Very useful	Thank you for your comment.
Northern Health and Social Care Trust	Full	41	35	There is reference to 12 hourly recording of potassium requirements which is contradicted by the advice that blood testing may only be required 24 hourly	Thank you for your comment. We agree and have amended recommendation 1.2.3 (5) to remove 'potassium requirements'.

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Northern Health and Social Care Trust	Full	41	35	The document recognises that there is a risk of hypoglycaemia (though hasn't specified the highest risk situations) and we advise that there should be also be a record recorded for blood glucose every 12 hour period	Thank you for your comment. The GDG felt that a minimum of 24 hour blood glucose measurement was appropriate for the majority of children and chose to reflect this in their recommendation, as it was felt that recommending more frequent testing would be impractical. However, for children at risk of developing hypoglycaemia, more frequent testing should be carried out. The GDG felt that clinical judgement should be used in identifying the frequency of blood glucose measurement for these children.
Northern Health and Social Care Trust	Full	41	39	Lower value reference of sodium 130mmol/l previously commented on (relevant throughout the document).	Thank you for your comment. This has been amended throughout.
Northern Health and Social Care Trust	Full	42	21-32	There is no reference to management of the symptomatic acute hyponatraemia in this section of the paragraph while there is reference to managing asymptomatic hyponatraemia in the section above. An oversight?	Thank you for your comment. Recommendation 1.7.3 (34) provides guidance on the management of acute symptomatic hyponatraemia. Section 4.3 outlines the key priorities for implementation – 11 recommendations that the GDG selected as priorities for implementation based upon the criteria outlined in the NICE Guidelines manual. The GDG identified the management of asymptomatic hyponatraemia as a key priority for implementation, and recommendation 1.7.1 (32) is included in Section 4.3.
Northern Health and Social Care Trust	Full	43	23	There should be a consensus on the maximum volume of maintenance fluid to use based	Thank you for your comment. We agree and have amended recommendation 1.4.1 (15) to include a limit for the maximum fluid volume that should be

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				on weight calculations (the BSPED DKA guidelines do so if one uses the calculator)	given to male and female children and young people over a 24-hour period.
Northern Health and Social Care Trust	Full	43	32	While there is reference to assessing fluid status here (and a table on page 70 describing potential associated clinical features) there is no guidance on how to calculate this out and little in the algorithms on managing dehydration or alternatively a statement to indicate that NICE is actually advising that active volume deficit management is not required if the patient is not shocked and any on-going losses are being addressed.	Thank you for your comment. It was outside the scope of the guideline to provide guidance on how to calculate fluid status.
Northern Health and Social Care Trust	Full	44	3	It is not clear what is meant by 'fluid limits'	Thank you for your comment. We have removed this from recommendation 1.2.3 (5).
Northern Health and Social Care Trust	Full	44	16,17	There should be some guidance given on the greatest hypoglycaemic risk, given that there is an argument to be made that all patients on IV Fluids are at risk. We advise recommending 12 hourly glucose checks as the minimum standard.	Thank you for your comment. It was outside the scope of the guideline to identify the groups at greatest risk of developing hypoglycaemia. The GDG felt that a minimum of 24 hour blood glucose measurement was appropriate for the majority of children and chose to reflect this in their recommendation, as it was felt that recommending more frequent testing would be impractical. However, for children at risk of developing hypoglycaemia, more frequent testing should be carried out. The GDG felt that clinical

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					judgement should be used in identifying the frequency of blood glucose measurement for these children.
Northern Health and Social Care Trust	Full	45	4	We are concerned that advising 20ml/kg/day 'for any remaining weight' adds to the risk of over administration and advise including the upper limit to be normally anticipated	Thank you for your comment. We agree and have amended recommendation 1.4.1 (15) to include a limit for the maximum fluid volume that should be given to male and female children and young people over a 24-hour period.
Northern Health and Social Care Trust	Full	45	34-37	We would like to see a recommendation in respect of over what time period fluid deficits should be corrected. We are also concerned that the advice outlined to add replacement and deficit to maintenance needs could facilitate unsafe practice and documentation problem if things go wrong. We consider that these elements should be calculated and recorded separately and also prescribed separately (though not necessarily administered separately).	Thank you for your comment. We have amended the wording of recommendation 1.5.1 (25) to clarify that this would be in addition to maintenance needs. The GDG felt that the time over which fluids should be replaced would be dependent upon clinical need, and therefore could not be specified.
Northern Health and Social Care Trust	Full	47	7,8	This advice needs clarification. Which baseline value of sodium is used in determining the maximum rise of 12mmol/L. Is it the first measured sodium when	Thank you for your comment. It is the first measured sodium at which the patient was recognised to have acute symptomatic hyponatraemia before treatment occurred.

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				the patient was recognised to have symptomatic hyponatraemia or is it the sodium checked before a third bolus of 2.7% saline or some other value?	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General	General	Two members commented that there is potential for confusion with the label 'neonate'. In the introduction, there is a statement that the guideline doesn't cover premature neonates but this could easily be missed (indeed our NLS lead has made several comments about fluids in prematurity). It may be better to use the label 'term neonate' throughout for clarity. RC(UK) uses 'newly born' or 'resuscitation at birth' for this special circumstance and neonate for an 'infant' in the 1st 28 days of life.	Thank you for your comment. We agree and have amended throughout to 'term neonates'.
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General	General	Looking at the algorithms there is confusion about "isotonic" fluids. Fluids with a sodium content of 130-150 mmol/litre are isotonic but when 5 or 10% dextrose is added, it will be hypertonic unless all the dextrose is metabolised. That is not necessarily the case, especially in sick neonates.	Thank you for your comment. Our assumption is that these solutions are isotonic with respect to the cell membrane and that the glucose is metabolised. Additionally, Table 6 outlines the types of fluids available in each category defined within the guideline and includes details of the tonicity and osmolality of each.

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Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	41	4.3	Putting all these figures on the fluid balance and prescription chart will necessitate a big change for most. It should merely be recorded.	The Guideline Development Group did not wish to prescribe what format the fluid balance and prescription chart takes, only the key components to be recorded. .
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	46	Point 36	I do not think there is any evidence base or common practice to suggest this in neonates.	Thank you for your comment. We agree that there is no evidence in this population and this recommendation was based upon consensus of the GDG who felt that, although the development of acute symptomatic hyponatraemia developing during intravenous fluid administration in neonates was a rare occurrence, management would reflect that in children and young people.
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	91	Line 1	The comment about current practice may not be completely accurate. The current ERC and RC(UK) and NLS manual guidance is *'If there has been suspected blood loss or the infant appears to be in shock (pale, poor perfusion, weak pulse) and has not responded adequately to other resuscitative measures then consider giving fluid. This is a rare event. In the absence of suitable blood (i.e. irradiated and leucocyte-depleted group O Rh-negative blood), isotonic crystalloid rather than albumin is the solution of choice*	Thank you for your comment. The statement was based upon informal consensus and experience of the GDG. We have amended page 122 to highlight that this was considered appropriate practice by the GDG.

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				for restoring intravascular volume. Give a bolus of 10 ml kg−1 initially. If successful it may need to be repeated to maintain an improvement.'	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General		It is important to be consistent in the way fluids are referenced. In Algorithm 3, page 36 the reference is to "isotonic crystalloids that contain sodium in the range 13-154 mmol/l" but then in Algorithm 4, page 37, Hartman's is specified. I assume the former is trying to avoid referring to specific branded fluids. But if that's the case the latter should have a similar label as Plasma-Lyte 148 would also be appropriate. It would be useful to have a list of available fluids that meet the first description – If this is in the document I have missed it!	Thank you for your comment. For consistency, we have amended recommendation 1.5.2 (26) to reflect that an isotonic crystalloid containing sodium in the range 131-154 mmol/litre should be used for redistribution, including perioperative redistribution losses. Additionally, Table 6 outlines the types of fluids available in each category defined within the guideline.
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	39		The left had column of algorithm for hyponatraemia on page 39 (no symptoms) assumes that if there is hyponatraemia present then the child must be on hypotonic fluids. Whilst one would have to agree this is likely, it is not necessarily the case and	Thank you for your comment. The wording of the algorithm has been amended and should clarify that in situations where the child is on a hypotonic fluid, the fluid should be changed to an isotonic fluid prior to fluid restriction**.**

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				someone trying to use the algorithm without a detailed knowledge might switch a child to normal saline from a more appropriate isotonic fluid.	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	111		Recommendation 22 is for neonates to have an isotonic crystalloid for routine maintenance with sodium 130 - 154 mmol/l. The next recommendation goes onto to mention low sodium concentration fluids until postanatal diuresis and weight loss has occurred. I found it a bit confusing mentioning fluid requirement for later in neonatal course before early management and thought some might just see point 22 and treat with isotonic from birth	Thank you for your comments. You have correctly highlighted that recommendation 1.4.7 (22) suggests that neonates should receive an isotonic crystalloid fluid containing glucose as the initial maintenance fluid. This would apply to the majority of neonates. However recommendation 1.4.8 (23) applies only to sick neonates in a critical postnatal adaptation phase (for example, term neonates with respiratory distress syndrome, meconium aspiration, hypoxic ischaemic encephalopathy); in these babies a fluid with no or minimal sodium would be used until postnatal diuresis with weight loss occurs.
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	125		Recommendation 32 says to not let sodium fall faster than 12 mmol/24 hours but then says to measure levels 4 to 6 hourly..... this would seem a long time if you are trying to prevent fast changes as it may have already happened by the time you measure the next level,	Thank you for your comment. The GDG felt that the measurement of serum sodium every 4-6 hours should identify changes in sodium and was likely to be appropriate in the majority of children. However, this should be adjusted on the basis of clinical need.

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				particularly if you choose to leave it 6 hours.	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General		On the subject of prehospital care. There seems to have been no prehospital representation on the GDG and they have left out this thorny issue. They say that fluid administration should not delay children getting to hospital and generally I am sure this is right. However there are times where fluids are indeed needed urgently - e.g. severe haemorrhage, profound dehydration or serious sepsis, in children with long journey times of >an hour. There are hardly any prehospital practitioners who are experts in child fluid balance - a paramedic sees about 3 ill (not necessarily shocked) children per year only and most of the doctors are from an adult background. The (JRCALC paramedic) guidelines say they can / should give fluids under certain circumstances yet NICE suggest that they shouldn't in TA74, (referred to in this current document) . TA74 is for	Thank you for your comment. It is outside the scope of the guideline to develop recommendations on prehospital care. Recommendations on prehospital care can be found in NICE Technology appraisal 74 and NICE clinical guideline Major trauma, due for publication in February 2016.

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				adults and “older children” in trauma only, in whom it has been decided that the presence of the radial pulse correlates with an adequate blood pressure to sustain life. At what age should this cut off be introduced (expert consensus needed, as evidence lacking)? I certainly don’t know! And what about medical conditions? I am upset that an expert group such as NICE abrogate their responsibilities towards these highly vulnerable children whose carers, in general, are amongst those who most need expert advice.	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General		The statement saying give 20ml/kg fluid boluses to children and YP appears to have no caveats for children with heart disease or renal problems (in particular oliguric/ anuric renal failure at risk of sudden life threatening pulmonary oedema). I think it is always wise to be more cautious with these groups and give 10 ml/kg boluses (which can be repeated of course). Doing it this way simply ensures that the person giving the fluids	Thank you for your comment. It was outside the remit of the guideline to consider the intravenous fluid requirements of children with specific conditions. We have however added that clinicians need to take into account pre-existing conditions where smaller volumes of fluid may be required.

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				reassesses the patient more intensively. I know that we should be constantly assessing any intervention, but I suspect that junior doctors/nurses may be like other less experienced people (where we often say give 10ml/kg repeatedly to ensure they do reassess) and this may not come instinctively. It might also be worth discussing stopping the fluid administration if the patient suddenly deteriorates and get more senior help.	
Resuscitation Council (UK) including the EPLS and NLS course and manual editors and ambulance service representation	Full	General		Throughout the document the term “acute kidney injury” is used but particularly with reference to measuring BSA. Thought should be given to children with significant pre existing renal compromise e.g. anuric or oliguric renal failure. A more accurate description would be “significant renal compromise”. “Acute kidney injury” is a specific description suggesting an acute insult and this may occur to both healthy and compromised kidneys - and chronic underlying renal failure may be just as dangerous without an additional	Thank you for your comment. We have amended recommendation 1.2.2 (4) to include the example ‘children with known chronic kidney disease’.

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				insult. Further discussion about injudicious use of potassium without knowing an initial result is also needed, if renal compromise is suspected.	
Royal Bolton Hospital	NICE	Algorithm 2		I am concerned that the guidance does not recommend seeking senior advice or moving away from crystalloid boluses in hypovolaemia due to blood loss until 40-60 ml/kg. This is against APLS and major trauma guidance where it is recommended to consider using blood after the first 10ml/kg.	Thank you for your comment. It is outside the remit of this guideline to consider the use of blood and blood products. Where we have identified that recommendations in the NICE clinical guideline Major Trauma may relate to the recommendations within the guideline, we have cross- referred to the guideline in the 'Linking evidence to recommendations' section of the full guideline (for example, Chapter 6, Section 6.1.2.5). For clarity, we have deleted them previous recommendation 1.3.3 (12) on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Royal Bolton Hospital	NICE	11 18 19 Algorithm 4	5 16 4	The guidance does not mention whether glucose containing fluid should be used for maintenance and suggests 0.9% saline as the recommended fluid. Our trust has had experience of implementing this approach and would be willing to submit	Thank you for your comment. No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is

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				its experiences to the NICE shared learning database. We recommended 0.9% saline without glucose for children over 2 until recently. Using this, we found that children with poor fluid intake due to illness were ketotic and their ketosis was not switched off as they were not provided with glucose. We had a significant number of patients who carried on being ketotic and continued to vomit whilst on IV fluids secondary to on-going ketosis, with several becoming significantly acidotic. Metabolic investigations for these children were normal and the children were not hypoglycaemic at any time. We changed our guideline at the last review to recommend using 0.9% saline with 5% glucose and we do not seem to be experiencing the same problem now.	usual practice for infants and young children to receive glucose-containing IV fluids, and that these may also be required by older children and the GDG felt this should continue.

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Royal Bolton Hospital	Full	General		It may need to be clearer in which situations the guidance for hypo and hypernatraemia should be used as it is not clear as to whether it should be used for those who are found to have abnormal electrolytes at presentation or those who have **asymptomatic** hyponatraemia, and if it is not to be used in these cases some advice on how to manage these situations would be beneficial.	Thank you for your comment. The guideline addresses only those children who develop hyponatraemia and hypernatraemia during intravenous fluid administration and it is outside the scope of the guideline to provide recommendations on the management of hyponatraemia and hypernatraemia resulting from other causes.
Royal College of Anaesthetists	Implementation comment			Better education for all disciplines – Embed in training programmes at all levels. ?? web resources. Review/revise eLf-learning on IV fluids in children? There is a need for wider availability of near patient testing which is particularly appropriate in babies and children as sample size is small and therefore potentially	Thank you for your comment. The GDG agreed that in emergency situations where results are required immediately point of care testing may save lives, but that for the majority of situations laboratory tests would be adequate and had increased accuracy

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				less stressful/traumatic for paediatric population in whom venepuncture is known to be more challenging. Whilst there may be concerns about quality control, these should not be insurmountable and involvement of Clinical pathologists in implementation should be encouraged. There is no doubt that gaining consensus on the development of a wider range of approved IV fluids for babies and children is long overdue – professionals and manufacturers need to be open to this	
Royal College of Anaesthetists	Full	9 13	Line 9/10/11 19/20/21	How practical is it to provide daily weights in children particularly if sick/physiologically unstable, in pain and/or non ambulant? Are there suitable cot and bed scales? If not this should be recommended development/initiative made	Thank you for your comment. We acknowledge that providing daily weights in children might require some adjustments, and possibly costs, in some hospitals. However, the GDG believed that this frequency should allow close monitoring and prevent complications. Hospitals will need to ensure they are equipped to implement this recommendation. We have passed your comment to the NICE implementation

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				explicit within document.	support team who will consider the cost impact of this recommendation and will develop tools to assist local adoption of the recommendation.
Royal College of Anaesthetists	NICE	Page 11		The guidance could usefully give a few examples of situations where there is risk of water retention associated with non-osmotic ADH secretion.	Thank you for your comment. It is outside of our scope to provide guidance on these situations.
Royal College of Anaesthetists	NICE	12	Line 7	Consideration should be given to extending the guidance to all neonates including pre-terms as this group are at increased risk of hyponatraemia and more susceptible to its adverse effects.	Thank you for your comment. It is outside the scope of the guideline to consider babies born prematurely whose corrected age is less than term and therefore we are unable to develop recommendations relating to this population.
Royal College of Anaesthetists	NICE	14	Line 11	What is meant by in terms of Assessment and documentation by “Fluid limits”? This needs to be defined.	Thank you for your comment. We have amended recommendation 1.2.3 (5) to remove ‘fluid limits’.
Royal College of Anaesthetists	NICE	14	Line 25	States that measurement of Blood glucose should be at least 24 hourly and more frequently if “at risk”. Whilst patient groups at higher risk of	Thank you for your comment. We have added a cross referral to the Information for the Public in the ‘Linking evidence to recommendations’ section on page 64.

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				hypoglycaemia are noted in FAQs it should also be noted here. Suggest as a minimum signpost to FAQ section.	
Royal College of Anaesthetists	NICE	16	Line 12	Should there be reference here to peri-operative fluids in Diabetic children?	Thank you for your comment. Recommendations on the management of diabetic children can be found in NICE clinical guideline Diabetes in children and young people (due for publication August 2015).
Royal College of Anaesthetists	NICE	17	Lines 14-17	This guidance suggests that baseline U and E will not be measured in the majority of surgical patients pre-operatively. Should this practice differ if post-operative IV fluids are *anticipated*? Was this current recommendation fully considered by the GDG?	Thank you for your comment. We believe this is covered by recommendation 1.4.5 (19). If post-operative IV fluids are anticipated, this would be identified based upon the child's medical condition or the type of surgery.
Royal College of Anaesthetists	NICE	19	Line 3 & 11	A suggested concentration of glucose should be included in the guidance.	Thank you for your comment. No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is

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					usual practice for infants and young children to receive glucose-containing IV fluids, and that these may also be required by older children and the GDG felt this should continue.
Royal College of Anaesthetists	NICE	19 20		The guidance is not explicit enough in emphasising that acute hypernatraemia and hyponatraemia are medical emergencies and should be managed in a high dependency environment.	Thank you for your comment. We agree that acute hypernatraemia and hyponatraemia are acute medical emergencies, however it was outside the scope of the guideline to provide recommendations on where these conditions should be treated and this should be determined locally.
Royal College of Anaesthetists	NICE	20		What is the recommended route of administration of hypertonic saline?	Thank you for your comment. It was outside the scope of the guideline to provide recommendations on the preferred route of fluid administration.
Royal College of Anaesthetists	NICE	20	Line 15	The guidance only states 'consider' giving hypertonic saline in symptomatic hyponatraemia – this doesn't seem strong enough – would 'should' be the more appropriate level of recommendation here?	Thank you for your comment. As outlined in Section 3.4 of the full guideline, the GDG chose to reflect the quality and availability of the evidence when agreeing the strength of the recommendation. Given the lack of available evidence relating to the management of hyponatraemia, the GDG chose to base the recommendation upon consensus of the group, and as such felt that it was appropriate to develop a weaker 'consider' recommendation.
Royal College of Anaesthetists	NICE	23	Algorithm 2	Page 23 Algorithm 2 (Fluid Resuscitation) If hypovolaemia is as a result of blood loss why is there no reference to the point in a resuscitation at	Thank you for your comment. It was outside the scope of the guideline to provide recommendations on the use of blood or blood products. For clarity, we have deleted the previous recommendation 1.3.3 (12) on neonates,

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				which blood might be commenced?	children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Royal College of Anaesthetists	NICE	29	Line 27	Research recs: Agree that there is an urgent need to provide stronger evidence for the ideal peri-operative maintenance IV fluid, and in particular the amount of glucose which should be added. Could this message be stronger and raised at an earlier point than this in the guideline? Should the need be mentioned in summary/conclusions?	Thank you for your comments. We have included the recommendations for further research in the full guideline (page 47), the NICE guideline (page 29) and the appendices of the full guideline (Appendix N).
Royal College of Anaesthetists	NICE	30	Section 2.3	We would agree that IV fluids should be prescribed with as much care and subject to the same scrutiny/checking and peer review as IV drugs. There is still a lack of understanding of the hazards, as opposed to the benefits, of fluid therapy. The hazards need to be spelled out, for each age group, each clinical	Thank you for your comment. We have passed your comment to the NICE implementation support team to inform their support activities for this guideline.

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				situation and each intravenous fluid, so that fluid prescribing is approached more rigorously than it sometimes is at present.	
Royal College of Anaesthetists			Appendices	The fluid resuscitation diagram recommends use of an isotonic fluid with which we would agree but this does not take into account the changing trend in massive blood loss/trauma situations where early administration of blood products is recommended. Although we appreciate that this NICE guideline did not include the use of blood products a footnote to acknowledge that blood products may be the first choice should be included.	Thank you for your comment. The use of blood products was outside the scope of the guideline. Recommendations on the use of the use of blood products in adults, children and young people will be included in the NICE clinical guideline Transfusion, due for publication in November 2015 and the NICE clinical guideline Major Trauma, due for publication in February 2016. A cross reference to these guidelines has been included in the 'Linking evidence to recommendations' section of the full guideline. For clarity, we have deleted recommendation 12, on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Royal College of Anaesthetists	NICE	General		A research priority must be to find evidence for the ideal perioperative maintenance fluid and the amount of glucose that should be added and that this should be given	Thank you for your comment. The GDG chose 5 areas for further research and these recommendations are outlined in full in Appendix N of the full guideline. These priorities include a research recommendation on 'What is the most appropriate glucose concentration in IV fluids for children and young people of different ages?'

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				greater emphasis. We could also encourage the pharmaceutical industry to work more closely with clinicians here to provide a more suitable range of fluid preparations than are currently available. For example a Hartmanns solution with 1-2% glucose would potentially be a suitable preparation for a large longitudinal cohort study along the lines mentioned in the guidance.	
Royal College of Nursing	Full	General	General	This is to inform you that the Royal College of Nursing have no comments to submit to inform on the above draft guideline consultation at this time. Thank you for the opportunity to participate.	Thank you for your comment.
Royal College of Paediatrics and Child Health	Full	General	General	The Guideline Development Group should be congratulated on producing such a large and comprehensive document in a very short space of time. The one hugely important and commendable recommendation we have been informed of is that	Thank you for your comment.

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				isotonic crystalloids should be the default IV maintenance fluid for children: This will lead to a significant improvement in the quality of care delivered to children and has been a long time coming. Many in the 2007 NPSA working party would have recommended this, but it was considered to be too great a change given usual clinical practice at the time.	
Royal College of Paediatrics and Child Health	Full	34 onwards	All	We am aware of the methodology used in the creation of the NICE guidelines, but would hope the Guideline Development Group are able to stand back and look at their recommendations from perspective of the clinicians, of varying degrees of experience, looking for clear advice on the shop floor. We have therefore based comments primarily on Section 4; the Guideline summary, and the algorithms contained therein.	Thank you for your comment.
Royal College of Paediatrics and Child	Full	34	Algorithm1	'*Patient with acute kidney injury*' The criteria used to assess acute	Thank you for your comment. It is outside the scope of the guideline to provide

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Health				kidney injury (AKI) depend on the pRIFLE score, based on estimated glomerular filtration rate (eGFR) using the Schwartz formula, which states: $\mathrm{GFR}\left(\mathrm{mL/min/1.73m^2}\right) = \frac{0.4}{\mathrm{Seru}}$ A significant proportion of sick children will be suffering from acute kidney injury at the point of admission but it will not be possible for clinicians to diagnose this without the results of blood tests and without having monitored urine output for a significant period of time. '*Patient has complex fluid or electrolyte replacement or abnormal distribution issues*' We do not understand the meaning of the term 'abnormal distribution issues'; this is not a term in common clinical use: If an experienced Consultant Paediatric Intensivist does not understand the term I would	recommendations on the assessment and diagnosis of acute kidney injury. Recommendations on the prevention, detection and management of acute kidney injury can be found in NICE clinical guideline 169 Acute kidney injury. We have defined the term 'redistribution' in the glossary of the full guideline and amended recommendation 1.5.1 (25) to include an example, for clarity.

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				suggest that **it needs to be redefined**.	
Royal College of Paediatrics and Child Health	Full	35	Algorithm 2	'*Use glucose-free crystalloids containing sodium in the range of 130-154 mmol/l, with a bolus of 20 ml/kg over less than 10 minutes*' There should be a list of appropriate fluids, available in the clinical setting, which meet this definition as part of this algorithm, so that inexperienced staff know immediately which fluids are safe to use, ideally listed in order of preference. The majority of staff caring for children would not be able to list which fluids contain 'sodium in the range of 130-154 mmol/l' without doing further research. In the past there have been serious problems associated with children's IV fluid guidelines which require the clinician to conduct calculations or further research in order to identify the most appropriate fluid to administer. **The guideline needs to be more explicit in**	Thank you for your comment. We have added Table 6, which outlines examples of isotonic fluids, both with and without glucose. When developing the recommendation on the preferred fluid for fluid resuscitation, we considered the use of balanced electrolyte solutions versus sodium chloride. However, no evidence was identified to suggest that balanced electrolyte solutions were preferable to sodium chloride and the GDG chose to recommend the use of sodium chloride in this situation using consensus. No evidence was identified on volume and rate for resuscitation in children, and therefore the GDG developed the recommendation using consensus. This was based on current practice to administer 20 ml/kg over less than 10 minutes The guideline contains recommendations about general principles for managing intravenous fluids in children and young people and applies to a range of conditions and different settings. It does not include recommendations relating to specific conditions.

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				naming specific fluids in this algorithm. Rapid administration of 0.9% sodium chloride boluses is known to cause post-resuscitation hyperchloraemic acidosis (1) and has been associated with increased vascular permeability (2) increases in extra-vascular water, reduced kidney perfusion (3), significantly increased AKI in animal models (4), increased oxidative stress, increased inflammatory gene transcription and greater release of glycocalyx degradation products (5,6). A larger volume of 0.9% sodium chloride is required to meet targeted resuscitation goals compared to balanced electrolyte solutions. There is a weight of evidence suggesting that balanced electrolyte solutions are superior to 0.9% sodium chloride for initial fluid resuscitation and whilst 0.9% sodium chloride remains an acceptable choice (at the current time), **balanced electrolyte**	

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				solutions should be recommended as preferred choice for initial fluid resuscitation. The suggested algorithm is inconsistent with the latest international guidelines from the Surviving Sepsis Campaign, published in 2012, which advocate 'pushing boluses of 20 ml/kg of isotonic saline or colloid up to and over 60 ml/kg until perfusion improves or unless rales or hepatomegaly develop' within **15 minutes** of presentation (7).	
Royal College of Paediatrics and Child Health	Full	36	Algorithm 3	See comments above regarding fluids contain 'sodium in the range of 130-154 mmol/l' Whilst the recommendation regarding the default choice of using isotonic crystalloids is excellent, there is no mention of using fluids which contain glucose for 'routine maintenance'. Current practice is to use a fluid containing dextrose (usually 5%). Is the proposed guideline	Thank you for your comment. We agree and have amended to 131-154 mmol/litre throughout. No evidence was identified to allow the GDG to develop a recommendation on a specific concentration of glucose for children of different ages, and as such chose to develop a recommendation for further research in this area. We have added a statement to the Linking evidence to recommendations section in Section 7.1.2.5 of the full guideline to highlight that it is usual practice for infants and young children to

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				advocating the use of glucose-free maintenance fluids as the default choice? Many sick children will become hypoglycaemic with glucose-free maintenance fluids. As McNab's recent paper suggests, **Plasma-Lyte 148 with 5% dextrose is the most physiological choice currently available for routine IV fluid maintenance in children** (8). Furthermore, 0.9% sodium chloride administration has been associated with more hyperkalaemia than balanced electrolyte solutions, even in anephric patients due to the associated hyperchloraemic acidosis (9). Retrospective analyses of databases of many thousands of adult patients has demonstrated that the use of a balanced electrolyte solution instead of 0.9% sodium chloride is associated with reduced need for blood gas analysis, dialysis support and reduced mortality	receive glucose-containing IV fluids, and that these may also be required by older children and the GDG felt this should continue. One low quality study compared sodium chloride to Ringer's lactate solution for routine maintenance was identified which suggested a benefit of sodium chloride. As such, the GDG chose to recommend the use of isotonic fluids containing sodium in the range 131-154 mmol/litre as the initial maintenance fluid using consensus of the group. In reaching this consensus, the GDG took into account the benefit-harm balance and the likelihood of occurrence of costly adverse events. This supported an overall benefit for sodium chloride. Given the small differences in the acquisition costs, the GDG considered isotonic crystalloids to be the most cost effective intervention for children who require IV fluids for maintenance. This has been explained in the "linking evidence to recommendation-economic considerations" section accompanying the recommendation which states that "Given the overall benefits seen with isotonic fluids and their low acquisition costs, the GDG considered them to be the most cost effective intervention for children who require IV fluids for maintenance". We have amended recommendation 1.4.1 (15) to include a limit for the maximum fluid volume that

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				(10,11). In another prospective but unblinded, pragmatic study, Yunos and colleagues demonstrated that the removal of 'chloride-rich' intravenous fluids (such as 0.9% sodium chloride) from an adult tertiary Intensive Care Unit, and increased use of balanced electrolyte solutions was associated with a reduction in the incidence of AKI and the need for renal replacement therapy (12). **Balanced electrolyte solutions should be recommended as preferred choice for routine IV fluid maintenance.** **The algorithm is missing a maximum daily routine IV fluid maintenance allowance volumes; as far as I am aware this remains a maximum of 2500ml/ day in males and 2000ml/day in females** (13).	should be given to male and female children and young people over a 24-hour period.
Royal College of Paediatrics and Child Health	Full	37	Algorithm 4	'*Replacement and Redistribution*' The term 'Redistribution' is not a term in common clinical use; I am uncertain which clinical situations	Thank you for your comment. The term 'redistribution' was used previously in NICE clinical guideline 174 Intravenous fluid therapy in adults in hospital and the GDG continued to use this term in the IV fluids in children guideline for

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				are being referred to in this term, and it should be reworded. Similarly we have not heard the term 'Perioperative redistribution losses' used in a clinical setting and am unsure what is included in this definition. We do not understand why 0.9% sodium chloride is suggested as an appropriate fluid for the replacement of 'Non-Perioperative redistribution losses': 0.9% sodium chloride has been associated with significant harm as described above. **A balanced electrolyte solution should be recommended instead of 0.9% sodium chloride**. With regard to 'Perioperative redistribution losses' it is appropriate to suggest the administration of a balanced electrolyte solution, but it is inappropriate to specify the use of Hartmann's solution when there are other balanced electrolyte solutions which are	consistency and as it was felt that it was used in a clinical context. Page 113 of the full guideline defines the term 'redistribution' and a definition of redistribution has also been included in the glossary. For clarity, we have also amended recommendation 1.5.1. (25) to include an example of abnormal distribution. One very low quality study was identified to support the use of a specific fluid for the replacement of ongoing losses. As such, the GDG developed their recommendation using informal consensus and chose to recommend the use of 0.9% sodium chloride as it is available in pre-made solutions with different concentrations of potassium, which will meet the individual patient requirements and reduce fluid errors. Also, no cost-benefit analysis was conducted on this topic area. Following consultation with stakeholders and for consistency within the guideline, recommendation 1.5.2 (26) has been amended to clarify that healthcare professionals should consider the use of an isotonic crystalloid containing sodium in the range of 131-154 mmol/litre for redistribution, thus no longer specifying 0.9% sodium chloride or any one particular solution.

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				available. Plasma-Lyte 148 is increasingly used in children's hospitals in the UK and has the advantage of being buffered with acetate instead of lactate. Considerable data is available to suggest that acetate-buffered solution such as Plasma-Lyte 148 or Acetated Ringer's Solution have advantages over lactate-buffered solutions such as Hartmann's Solution. Lactate as a buffer has several potential drawbacks including a slower hepatic mediated metabolism, increased aerobic demand, associated hyperglycaemia, rebound-alkalosis, rendering the lactate level an reliable marker of tissue hypoxia, increased apoptosis gene expressing and neutrophil activation through oxygen free radical release via the D-lactate component of racaemic Hartmann's Solution. **It is internally inconsistent for this draft document to suggest a range of fluids with a sodium concentration in the range of**	

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				130-154 mmol/l, and yet name only one of a range of balanced electrolyte solutions which are available and currently in use in the UK, such as Plasma-Lyte 148. Hofmann-Kiefer and colleagues have demonstrated biochemical benefits in using an acetate-buffered balanced electrolyte solution in women undergoing Gynaecological surgery (14); and when used in the management of the acutely burnt patient Gille and colleagues have demonstrated in the VolTRAB Study that the use of Ringer's acetate solution, in comparison to Ringer's lactate solution, was associated with lower SOFA-scores due to improved haemodynamics (15). '*Need to replace ongoing losses*' As your helpful 'Diagram of ongoing losses' clearly demonstrates (with the singular exception of pyloric stenosis) fluid lost from the GI tract will not have as much chloride content as 0.9% sodium chloride. The	

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				administration of 0.9% sodium chloride in this suggested algorithm will lead to hyperchloraemic acidosis and other electrolyte disturbances, associated with harm (see above). **Your own data demonstrates that ongoing losses are best replaced with a balanced electrolyte solution**, preferable one buffered with acetate. Please also note that the use of 0.9% sodium chloride in the patient undergoing surgery has been associated with increased abdominal pain and increased anastamotic breakdown; whilst balanced electrolyte solutions have been shown to both decrease the time spent on IV fluids post-operatively and reduce the number of blood tests required. **This last point has significant cost implications, which do not appear to have been included in your cost-benefit analysis**.	
Royal College of	Full	38	Algori	*Calculate the free water deficit*	Thank you for your comment. No evidence was

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Paediatrics and Child Health			thm 5	*and replace it over 48 hours, initially with 0.9% sodium chloride*' The administration of 0.9% sodium chloride is associated with harm (see above), and **dehydration losses are best replaced with a balanced electrolyte solution**, preferable one buffered with acetate.	identified on the management of hypernatraemia, and as such the GDG used consensus to develop a recommendation based upon their practice. The GDG have recommended regular monitoring and change to a hypotonic solution if necessary.
Royal College of Paediatrics and Child Health	Full	39	Algori thm 6	*If hyponatraemia develops 'change from a hypotonic to an isotonic fluid (e.g. sodium chloride)'* ***According to the proposed guidelines children should not have been receiving a hypotonic fluid in the first place, unless hypernatraemia has developed, and I would suggest that*** *fluid restriction should be the first intervention in this scenario****, following an assessment of fluid status. The most common cause for this scenario would be the action of ADH, even if isotonic fluids***	Thank you for your comment. The wording of the algorithm has been amended and should clarify that in situations where the child is on a hypotonic fluid, the fluid should be changed to an isotonic fluid prior to fluid restriction.

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				had been administered as per your recommendation.	
Royal College of Paediatrics and Child Health	Full	General	General	Whilst we realise why you have deferred to the NICE guidance on the management of children with DKA it would be helpful to acknowledge that the repeated administration of 0.9% sodium chloride in this setting has been associated hyperchloraemic acidosis and that several adult DKA clinical guidelines now advocate balanced electrolyte solutions instead of 0.9% sodium chloride (as acknowledged in the latest adult DKA guidelines) (16,17). Our commenter would welcome the opportunity to discuss these issues with the Guideline Development Group if this were possible.	Thank you for your comment. It is outside the scope of the guideline to provide recommendations for the treatment of children who have DKA specifically; however, recommendations on fluid resuscitation for these children can be found in NICE clinical guideline Diabetes in Children and Young people, due for publication in August 2015.
Royal College of Paediatrics and Child Health	Full	103	7.1.1.3.2 Unit costs	In the financial calculations regarding maintenance fluids an inappropriate comparison is being made with incorrect figures. For the many children who require an isotonic fluid, with	Thank you for your comment. We have added the costs of the additional IV fluids mentioned in your comment to the guideline. We have updated and reported the costs from the same source which should also reflect the negotiated prices. We acknowledge that some variations between hospitals are likely to occur but we do not expect

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				potassium and dextrose; our previous stock fluid was **0.9% sodium chloride in 5% glucose with 10mml/l KCl**, which is not priced in your document, and which we have been informed costs approximately £5.50 per litre. This is the fluid that has been replaced by Plasma-Lyte 148 with 5% glucose in our PICU for the last 3-4 years, and is saving in excess of £10,000 each year. The financial calculations fail to specify Plasma-Lyte 148 with 5% glucose (which should be the default choice for children) and the prices quoted are not accurate for the NHS: Plasma-Lyte does not cost £1.59, as suggested in the BNF66, but is price-matched with Hartmann's at 70p a litre. Essentially: 1. Plasma-Lyte 148 with 5% glucose should be included in the list, as it is the only isotonic, low-chloride fluid with pre-added dextrose and	prices to be significantly different. These updated prices did not alter the conclusions made regarding the trade-off between net health effects and cost. Hence, no changes were made to the recommendations.

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				potassium commercially available (to my knowledge) and having read the draft recommendations, is the only logical choice for a default IV maintenance fluid for children, and the cost to the NHS is not £1.59, but 70p. 2. Included in the comparison should be the isotonic fluid with pre-added dextrose and potassium that people have historically used, which is 0.9% sodium chloride in 5% glucose with 10mml/l KCl. 3. The same cost error exists in Table 28 for 'Unit costs of IV fluid therapy for resuscitation' the BNF cost listed for Plasma-Lyte 148 is not what we pay in the real world.	
Royal College of Paediatrics and Child Health	Full	35		The IV fluid therapy guideline is good overall. We have a couple of comments on page 35: • The fluid therapy for	Thank you for your comment. The guideline contains recommendations about general principles for managing intravenous fluids and applies to a range of conditions and different settings. This recommendation was to allow for a range of neonatal resuscitation needs, including,

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				neonate is unclear, and gives a big range 10-20ml per kg. It should be 10 ml per kg, and reassess after that if needed repeat 10ml/kg.	for example, resuscitation in the labour ward and the resuscitation of older neonates with septic shock.
Royal College of Paediatrics and Child Health	Full	39		Measuring plasma sodium concentration at least hourly is practically impossible.	Thank you for your comment. The GDG considered the frequency of monitoring necessary to prevent complications. This could be carried out by point of care testing rather than laboratory testing which would enable immediate results and the GDG thought this was achievable.,
Royal College of Pathologists	NICE	16	21-24	We are concerned that no upper limit is stated. In very obese young people this may give rise to excessive volumes of intravenous fluids being used.	Thank you for your comment. We agree and have amended recommendation 1.4.1 (15) to include a limit for the maximum fluid volume that should be given to male and female children and young people over a 24-hour period.
Royal College of Pathologists	NICE	17	19-25	We are concerned that management is recommended without any recommendation about assessing the cause of the hyponatraemia and assessment of serum osmolality and urinary electrolyes and osmolality. In our opinion, appropriate investigations are an essential component of the appropriate assessment and management of asymptomatic hyponatraemia.	Thank you for your comment. The guideline provides recommendations only on the management of hyponatraemia developing during intravenous fluid administration.

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Royal College of Pathologists	NICE	27		The absence of any recommendations relating to assessment of serum osmolality and urinary sodium / osmolality are a major deficit in this algorithm. We believe that these investigations are an essential component of the management of hyponatraemia.	Thank you for your comment. The guideline provides recommendations only on the management of hyponatraemia developing during intravenous fluid administration.
Royal College of Pathologists	Full	General		While the guidelines are internally consistent, we are concerned about the lack of consistency with CG174 (Intravenous fluid therapy in adults in hospital). CG174 recommends the use of low sodium fluids for routine maintenance, mainly based on concerns about risk of hyperchloraemic acidosis when higher sodium fluids are used. The current guideline recommends higher sodium fluids for routine maintenance, mainly to avoid risk of hyponatraemia. This gives rise to a situation when transition from young person to adult is associated with a complete switch in choice of routine maintenance fluid, which seems to make little physiological sense. We regret the fact the the	Thank you for your comment. For the purposes of the current guideline, we have focused on evidence in the paediatric population, where the greatest cause for concern was considered by the GDG to be mortality due to acute hyponatraemia. Evidence for hyperchloraemic acidosis was also considered, however no evidence in our population was identified. When transitioning to adult services, changes in treatment should be determined by clinical judgement. A statement highlighting considerations to be made during transition between paediatric and adult services can be found on page 10 of the full guideline. Further information on considerations to be made during transition between child and adult services can be found on the NICE website and links to this will be provided within the NICE versions of the guidance.

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				guidelines are not more integrated, and believe that this may give rise to confusion for clinicians who manage intravenous fluid replacement in both young people and adults.	
Royal College of Surgeons of England	Full	General	General	The members of the Children's Surgical forum have reviewed this guideline and have no amendments. They were positive about the content and felt this would support a good change in practice.	Thank you for your comment.
Sheffield Childrens Hospital	NICE	General	General	One clinician felt that "there should be a point in to 'review fluid prescription 12 hrly' at least."	Thank you for your comment. We agree and this is stated in recommendation 1.2.3 (5).
Sheffield Childrens Hospital	NICE	10	10-15	We feel that you need to clarify that this applies to 'non-trauma' resuscitation	Thank you for your comment. The guideline contains recommendations about general principles for managing intravenous fluids in children and young people and applies to a range of conditions and different settings. It does not include recommendations relating to specific conditions. We have clarified in the full version the purpose of the guideline and retained the terminology for consistency with NICE guideline 174 Intravenous fluid therapy in adults in hospital.
Sheffield Childrens Hospital	NICE	16	8-11	Should the scope of this be widened to include other	Thank you for your comment. It is outside of the scope of the guideline to consider different causes

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				traumatic causes of shock e.g. neurogenic where boluses of 10ml/kg are also advised in other guidelines? We feel that advising this approach only when there is blood loss is misleading.	of trauma. Recommendations on the management of major trauma can be found in NICE clinical guideline Major trauma (due for publication February 2016). For clarity, we have deleted the previous recommendation 1.3.3 (12) on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.
Sheffield Childrens Hospital	NICE	General	General	Is this guideline going to overlap with the NICE guideline for managing trauma in children?	Thank you for your comment. Where we have identified that recommendations in the NICE clinical guideline Major Trauma may relate to the recommendations within the guideline, we have cross- referred to the guideline in the 'Linking evidence to recommendations' section of the full guideline (for example, Chapter 6, Section 6.1.2.5). For clarity, we have deleted the previous recommendation 1.3.3 (12) on neonates, children and young people needing intravenous fluids who have hypovolaemic shock due to blood loss.

<u>These orgnaisations were approached but did not respond:</u>

3M Health Care UK

5 Borough's Partnership NHS Foundation Trust

Action for Sick Children

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Addenbrookes Hospital

Alder Hey Children's NHS Foundation Trust

Allocate Software PLC

American Medical Systems Inc.

AngioDynamics

Association of Ambulance Chief Executives

Association of Anaesthetists of Great Britain and Ireland

Association of Paediatric Anaesthetists of Great Britain and Ireland

Association of Paediatric Emergency Medicine

Barnsley Hospital NHS Foundation Trust

Baxter Healthcare

Baxter Healthcare Ltd

Becton Dickinson

Belfast Health and Social Care Trust

Birmingham Women's NHS Foundation Trust

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Birmingham Women's Hospital NFT

British Association For Paediatric Nephrology

British Association for Parenteral & Enteral Nutrition

British Association of Paediatric Endoscopic Surgeons

British Association of Paediatric Nephrology

British Dietetic Association

British Medical Association

British Medical Journal

British National Formulary

British Nuclear Cardiology Society

British Paediatric Respiratory Society

British Pharmaceutical Nutrition Group

British Pharmacological Society

British Psychological Society

British Red Cross

British Society of Paediatric Gastroenterology Hepatology and Nutrition

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British Specialist Nutrition Association

British Thoracic Society

Caplond Services

Capsulation PPS

Care Quality Commission

Carefusion

Central London Community Health Care NHS Trust

Childhood Eye Cancer Trust

Children's Liver Disease Foundation

Clementine Churchill Hospital

Covidien Ltd.

Critical Care National Network Nurse Lead Forum

Croydon Council

Croydon Health Services NHS Trust

Croydon University Hospital

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Cumbria Partnership NHS Foundation Trust

CWHHE Collaborative CCGs

Deltex Medical

East and North Hertfordshire NHS Trust

East Kent Hospitals University NHS Foundation Trust

Ethical Medicines Industry Group

Faculty of Intensive Care Medicine

Five Boroughs Partnership NHS Trust

Flashback Technologies

Gloucestershire Hospitals NHS Foundation Trust

GP update / Red Whale

Guidelines and Audit Implementation Network

Guy's and St Thomas' NHS Foundation Trust

Health and Care Professions Council

Health and Social Care Information Centre

Healthcare Improvement Scotland

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Healthcare Infection Society

Healthcare Quality Improvement Partnership

Healthwatch East Sussex

Herts Valleys Clinical Commissioning Group

Humber NHS Foundation Trust

Infection Prevention Society

Joint Royal Colleges Ambulance Liaison Committee

King Fahd Military Medical Complex

Kingston University and St Georges, University of London

Leeds North Clinical Commisioning Group

Leicester Royal Infirmary

Liverpool University

Local Government Association

London North West Healthcare NHS Trust

Luton and Dunstable Hospital NHS Trust

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Marie Curie Cancer Care

Masimo Corporation

Mastercall Healthcare

Medical Directorate Services

Medicines and Healthcare Products Regulatory Agency

Meningitis Research Foundation

Mid Cheshire Hospitals NHS Trust

Ministry of Defence

National Association of Medical Device Educators and Trainers

National Childbirth Trust

National Clinical Guideline Centre

National Collaborating Centre for Cancer

National Collaborating Centre for Mental Health

National Collaborating Centre for Women's and Children's Health

National Deaf Children's Society

National Institute for Health Research Health Technology Assessment Programme

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National Institute for Health Research

National Outreach Forum

National Patient Safety Agency

Neonatal & Paediatric Pharmacists Group

Newcastle upon Tyne Hospitals NHS Foundation Trust

NHS Barnsley Clinical Commissioning Group

NHS Bolton CCG

NHS Choices

NHS Chorley and South Ribble CCG

NHS Connecting for Health

NHS Cumbria Clinical Commissioning Group

NHS Hardwick CCG

NHS Health at Work

NHS Improvement

NHS Medway Clinical Commissioning Group

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NHS North East Lincolnshire CCG

NHS North Somerset CCG

NHS Plus

NHS Sheffield

NHS Somerset CCG

NHS South Cheshire CCG

NHS Wakefield CCG

NHS Warwickshire North CCG

NHS West Cheshire CCG

Nordic Pharma

North and East London Commissioning Support Unit

North of England Commissioning Support

North West London Perinatal Network

Nottingham City Council

Nursing and Midwifery Council

Oxfordshire Clinical Commissioning Group

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Paediatric Intensive Care Society

Primary Care Pharmacists Association

Public Health England

Public Health Wales

Public Health Wales

Rett UK

Royal Brompton Hospital & Harefield NHS Trust

Royal College of Emergency Medicine

Royal College of General Practitioners

Royal College of General Practitioners in Wales

Royal College of Midwives

Royal College of Obstetricians and Gynaecologists

Royal College of Physicians

Royal College of Psychiatrists

Royal College of Radiologists

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Royal College of Speech and Language Therapists

Royal College of Surgeons of Edinburgh

Royal Cornwall Hospitals NHS Trust

Royal Free Hospital NHS Foundation Trust

Sandoz Ltd

Scottish Intercollegiate Guidelines Network

Sheffield Children's NHS Trust

Sheffield Teaching Hospitals NHS Foundation Trust

Sirona Care & Health CIC

Social Care Institute for Excellence

South Eastern Health and Social Care Trust

South West Yorkshire Partnership NHS Foundation Trust

Southern Health & Social Care Trust

Staffordshire and Stoke on Trent Partnership NHS Trust

Stockport Clinical Commissioning Group

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Stockport NHS Foundation Trust

Suffolk County Council

The African Eye Trust

The Association for Safe Aseptic Practice

The Neonatal Society

The Portland Hospital for Women and Children

Trauma Audit & Research Network

UK Clinical Pharmacy Association

UK Renal Pharmacy Group

University Hospital Birmingham NHS Foundation Trust

University Hospitals Bristol NHS Foundation Trust

University of Leicester

Welsh Ambulance Services NHS Trust

Welsh Government

Welsh Intensive Care Society

Welsh Scientific Advisory Committee

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Western Health and Social Care Trust

Wigan Borough Clinical Commissioning Group

Wrightington, Wigan and Leigh NHS Foundation Trust

York Hospitals NHS Foundation Trust

Yorkshire and Humber Strategic Clinical Network