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AN AUDIT OF INTRAVENOUS MAINTENANCE FLUIDS PROTOCOLS AGAINST THE NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE GUIDELINE NG29

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Abstract:

This project aimed to determine adherence to NG29, in pediatric patients, receiving at least 24 hours of IV maintenance fluids in the Gujranwala Medical College Teaching Hospital. The main goal is to present a current 2023 perspective on GMC &current practice of prescribing and treating pediatric fluids. The purpose of this audit is to determine whether giving IV fluids to minors (those aged over 16 years old and those aged over 4 weeks) is safe and meets quality standards.

Result: Hypotonic fluids are now not prescribed in children undergoing post-operative paediatric IV maintenance fluids, though they are still being given suboptimal surveillance. In the future, it will be important to monitor children more closely
utilizing fluids.

INTRODUCTION

In 2015, a trial study was conducted in which the risk of hyponatremia, which causes morbidity and mortality in children, is raised when hypotonic IV fluids are used for maintenance needs. Limited clinical trial evidence exists for paediatric hospitalized children who are not in intensive care units, comparing isotonic vs hypotonic maintenance fluids. The results of their investigation corroborate their conclusion that giving isotonic maintenance fluid to paediatric patients is generally safe and may avoid hyponatremia.(1)

Another study in 2018 concluded the guidelines for the ideal sodium content of maintenance IVFs are given using an evidence-based methodology in order to avoid hyponatremia and the associated acute or chronic neurologic damage. No recommendations are given about the best rate for fluid therapy, whether potassium should be added to maintenance fluids, or whether to use an isotonic buffered crystalloid solution instead of saline.(2)

It took a number of years,but in 2015 the National Institute for Health and Care Excellence (NICE) published guideline NG29, "Intravenous fluid therapy in children and young people inhospital" To the authors' knowledge there have notbeen any audits published against this guideline, and the current

practice of prescribing and monitoring paediatricIV fluids in the UK is unknown.

Primary recommendations

1*. Health and Social Care Trusts (HSCTs) must ensure that patients are identified on fluid balance charts, using at least their name, date of birth and hospital identification number.

6*. HSCTs must ensure that cumulative totaling of fluid input and output, with the Calculation of a 24 hour balance figure is performed daily.

9*. Blood glucose monitoring must be performed on all children as recommended in the Paediatric Wall chart**.

10*. Confirmed hypoglycemia must be treated and a record made of the treatment.

Further recommendations

2*. Every child on intravenous fluids should have a DFBC, preferably a single daily chart which moves with them on their patient's journey. All fluids administered must be both prescribed and their administration recorded on the DFBCs.

3*. Fluid calculations for bolus, maintenance, deficit and on-going loss replacement must be made and documented, preferably on the DFBC and with a coded indication for the fluid administration.

4*. HSCTs should use Oral Rehydration Solutions whenever possible when treating dehydration deficits by the gastric route.

7*. An Electrolyte and Urea (E&U) must be taken for every 24 hour period while receiving IV fluids, including the last day of an infusion – as per Paediatric Wallchart.

8*. E&U monitoring must be more frequent if there is hyponatraemia and if the child is ill –as per Paediatric Wallchart.

11*. HSCTs must enforce the practice of 12 hourly reassessments when children are receiving IV fluids.

Areas of good practice

5*. HSCTs should continue to adhere to the recommendations of the latest Paediatric Wallchart, especially regarding the prescription of IV fluids to those deemed to be at particular risk of developing hyponatraemia.

12. Young people being cared for in an adult ward appear to have received the same standard of care as children being cared for in pediatrics wards.

13. The prescription and administration of fluids, including those deemed to be at particular risk of developing hyponatraemia, was found to be appropriate and safe.

Indications/ Reasons for Prescribing IV Fluids:

1. Volume Resuscitation;

In the event that a patient exhibits any of the following symptoms: hypovolaemic shock (poor perfusion, tachycardia, drowsiness, tachypnea, poor urine output, hypotension, hypotonic), an intravenous or intraosseous bolus of ISOTONIC, NON-GLUCOSE CONTAINING fluid (20 ml/kg).

Fluid dosages for trauma patients should be 10 milliliters per kilogram and administered in smaller doses. The goals for these patients should be to stop the bleeding and replace the blood and clotting factors. Guidelines for APLS, resuscitation, and escalation address this.

2. Maintenance fluids;

As first line maintenance, no kid older than the newborn stage should be given hypotonic fluid.

Although certain patient subgroups are known to have particular fluid needs, the majority of youngsters receiving maintenance fluids (fasting or vomiting) won't require "special" fluid formulas.DKA, neurosurgical patients (pre- and post-op), and neonatal surgical patients are among them. Patients, some difficult medical and surgical patients, and ventilated critical care patients. As mentioned above, these demands are covered in other guidelines.

Use the Holliday Segar formula to determine the average amount of fluid required (for newborns see the table later).

Use of any other formula could result in overprescribing, particularly for children who are heavier.

- Body weight under 10 kg: 100 ml/kg per day;
- Body weight between 10 and 20 kg: 1000 ml, plus 50 ml/kg for each kg over 10 kg per day;
- Body weight over 20 kg: 1500 ml, plus 20 ml/kg for each kg over 20 kg per day. For males, up to 2500 ml per day, and for females, up to 2000 ml per day.

3. Rehydration fluids;

Try, if at all feasible, to rehydrate a child who is mildly or moderately dehydrated with oral fluids, following the guidelines for diarrhea and vomiting (Medical Guideline Book Ref 1.12).

When receiving IV rehydration, try to maintain oral fluid intake as well. Don't forget to account for this when calculating your fluid balance.

Keep in mind that while some patients may exhibit both indicators of shock and dehydration, not all patients will.

Dehydration that is clinically serious might include:

- arid mucosal surfaces
- a decrease in skin turgor
- decreased urination
- Dimmed eyes
- Modified responsiveness (agitated, sluggish)
- These kids might have normal blood circulation without shock, but their heart and breathing rates would be elevated.

Fluid calculations in dehydration

Deficit (replace over 4 hours) + maintenance (give over 24 hours)

Deficit: Mild to moderate dehydration; 50 ml/kg + maintenance

Severe dehydration; 100 ml/kg + maintenance

Do not include resuscitation boluses in ongoing fluid requirement calculations.

Maintenance is calculated as per the Holliday Segar formula above.

e.g. A 15 kg child who shows clinical signs of moderate dehydration would require:

- Deficit= 50mls/kg over 4 hours = 750 mls (187.5mls/hour for the first 4 hours)
- Maintenance= (1000ml) + (5□50) = 1250mls over 24 hours or 52mls/hour
- Therefore 239.5mls/hour for the first 4 hours then 52mls/hour
- Decrease to maintenance fluids if no signs of dehydration
- This may seem initially like a lot of fluid to give but remember this is a patient who is significantly dehydrated and showing clinical signs.
- Ongoing monitoring is key in all these patients.

Aims

This project aimed to determine adherence to NG29, in paediatric patients, receiving at least 24 hours of IV maintenance fluids in the Gujranwala Medical College Teaching Hospital. The main goal is to present a current 2023 perspective on GMC's current practice of prescribing and treating pediatric fluids.

The purpose of this audit is to determine whether giving IV fluids to minors (those older than 16 years old and those older than 4 weeks) is safe and satisfies quality requirements. Additionally, it is made to guarantee that data from children receiving care in wards usually utilized by adults is collected.

Objectives

1. To audit the prescription of IV Fluids
2. To audit the administration of IV Fluids
3. To audit the recording of IV Fluids
4. To audit the monitoring of IV Fluids

Method:

The audit used a prospective cohort study design, collecting data between August 2023 and October 2023 across two consecutive months. Total 110 patients were admitted during this period in pediatric wards GMC and they were monitored for 72 hours, or until their IV fluids were stopped, whichever came first.

The administration of fluids, together with the tracking of electrolytes, blood sugar, and fluid equilibrium, underwent an audit in compliance with NG29. Fluids were anticipated to not be hypotonic in accordance with the guidelines. Measurements of blood glucose and electrolytes were supposed to be taken at the beginning of fluid administration and then at least every 24 hours after that. Every twelve hours, when fluids were administered and subtotaled, an evaluation of fluid balance was anticipated. Data was collected from patient records stored on paper and in electronic format.

Sample

- All inpatient pediatric (>4 weeks and <14 years) patients who were receiving intravenous fluids at some point during the study period and do not meet the exclusion criteria.
- Study period August, 2023 and September, 2023.

Exclusion criteria

The audit excluded children treated with IV fluid for the following conditions:

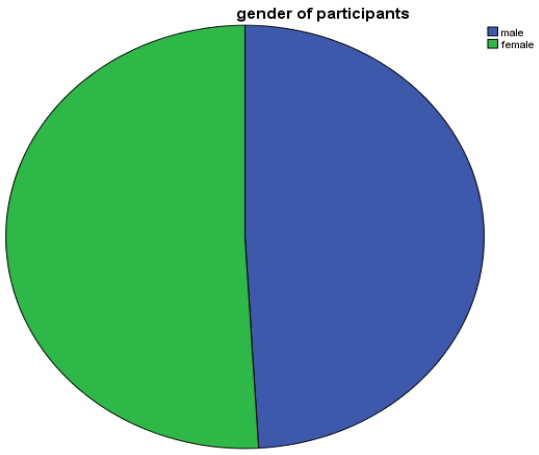
- Diabetic ketoacidosis (DKA);
- Burns;
- Renal, Liver, Cardiac - use own specialist charts;
- Any child on a fluid protocol (for example, for chemotherapy);
- Children treated in Intensive Care (ICU);
- Elective patients receiving IV Fluid for less than 4 hours;
- Theatre IV Fluid prescription and administration;
- Maternity unit admission;
- Children under 4 weeks old or 16 years and over

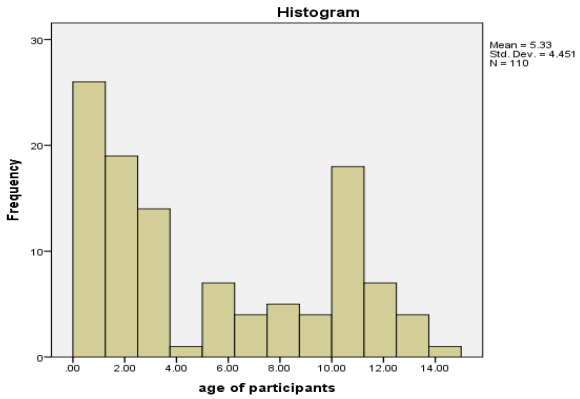
Results

Of a total of 110 patients, 54 (49.1%) males and 56 (50.9%) were females. Age ranged from one month to 14 years with mean value of 5.33±4.45 and weight with the mean value of 13.85±8.61 respectively. Fluid charts of only 5% patients were maintained. Electrolyte monitoring was followed in 13 patients (11.8%) only. Fluid balance status was monitored in 16(14.5%) patients. Fluid balance charts were in regular use for all patients, however not all of them fully complied with NICE guidance and only 5% had complete fluid balancecharts. 104 (94.6%) patients were prescribed isotonic fluids, but only 5% patients taken hypotonic fluids.

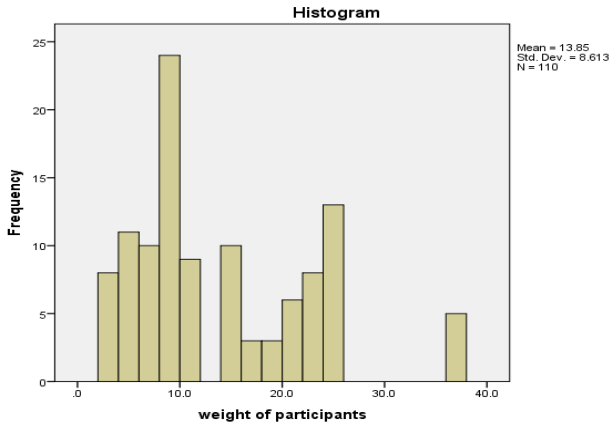
gender of participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	54	49.1	49.1	49.1
	female	56	50.9	50.9	100.0
	Total	110	100.0	100.0	





Diagnosis	Number
RTI	17
Allergy	13
Bronchiolitis, Chest infection, Pneumonia, Asthma	12
Scarlet fever, other fevers, infections, Sepsis	12
Tonsillitis	11
Viral illness	4
Abdominal Pain	3
Tonsillectomy	2
UTI	6
Nephrotic Syndrome	9
Surgical abdomen, postop abdominal surgery	5
Pyloric stenosis	4
Meningitis	2
Seizures, Neurosurgical	5
Trauma - minor	2
SAM	2
Miscellaneous	1
Regional Total	**110**

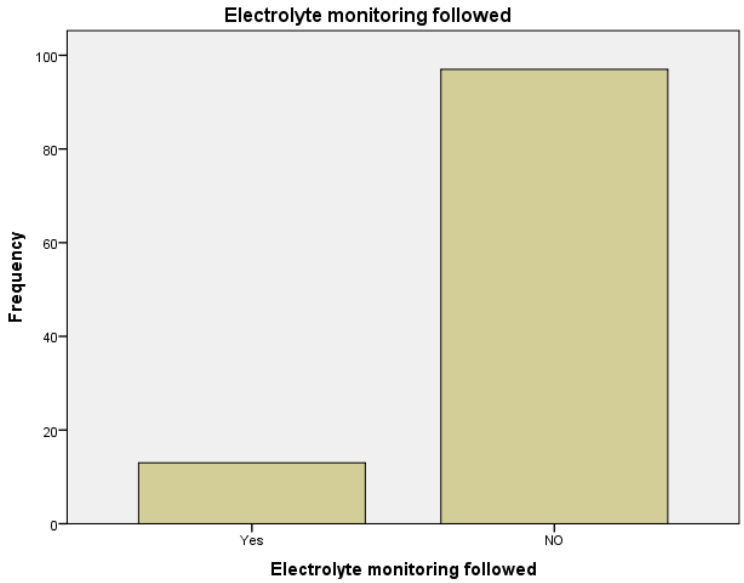


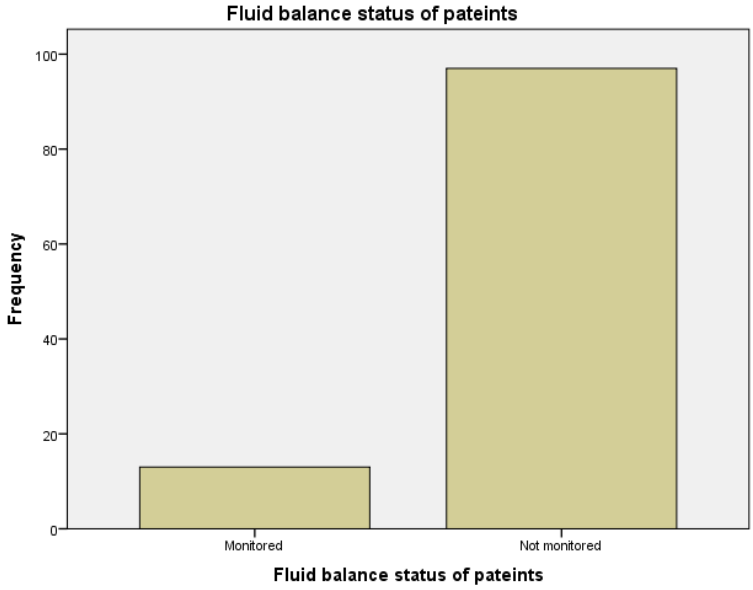
Electrolyte monitoring followed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	13	11.8	11.8	11.8
	NO	97	88.2	88.2	100.0
	Total	110	100.0	100.0	

Fluid balance status of patients

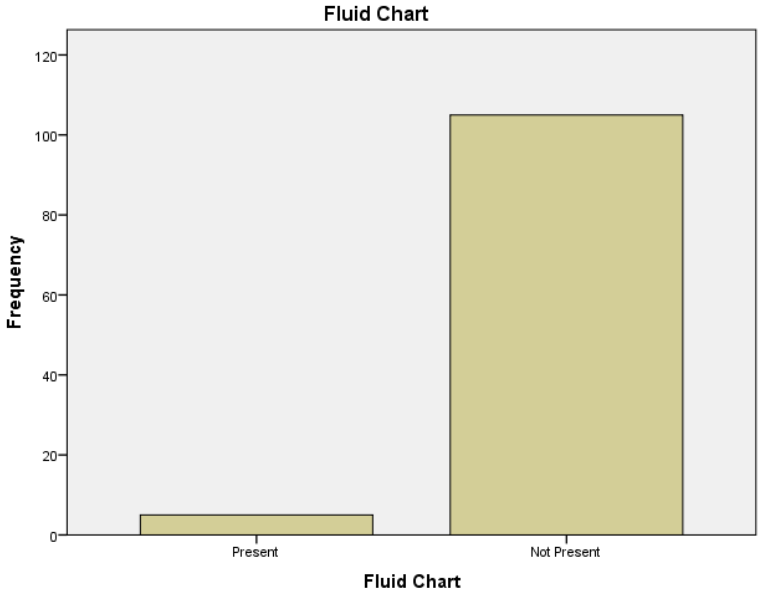
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Monitored	16	14.5	14.5	14.5
	Not monitored	94	85.5	85.5	100.0
	Total	110	100.0	100.0	





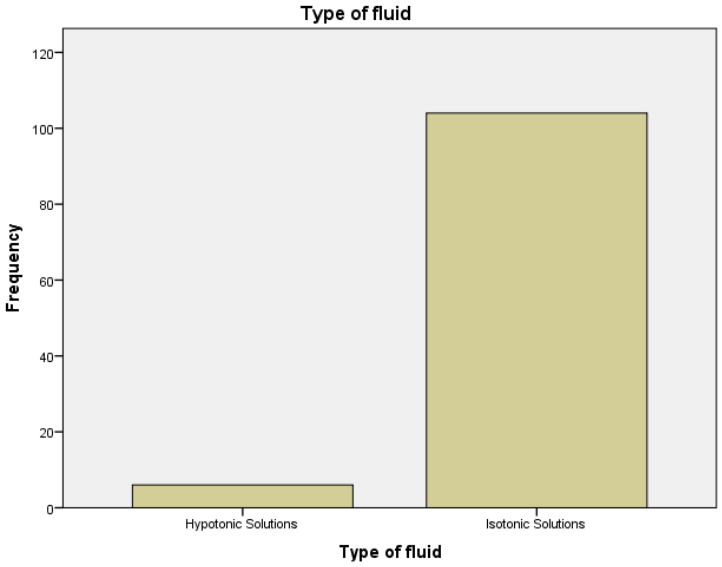
Fluid Chart

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Present	5	4.5	4.5	4.5
	Not Present	105	95.5	95.5	100.0
	Total	110	100.0	100.0	



Type of fluid

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hypotonic Solutions	6	5.5	5.5	5.5
	Isotonic Solutions	104	94.5	94.5	100.0
	Total	110	100.0	100.0	



Discussion

It is encouraging to hear that children are no longer offered hypotonic fluids, given the potential for hyponatraemia3 and mortality. Nonetheless, given the duration of the patients' fluid administration, the absence of monitoring is alarming. This may make it possible for irregularities in glucose and electrolyte levels to go overlooked, leading to doctors failing to react appropriately and inadvertently administering the wrong fluids.

Fluid balance charts frequently only showed inputs, which meant that it was impossible to compute an accurate fluid balance from the data they provided. In light of the audit's findings, medical staff at the

Gujranwala Medical College Teaching Hospital ought to receive training on how to enhance their procedures in order to comply with NICE guidelines. Additionally, other trusts ought to carry out comparable audits to determine whether the problems persist.

Conclusions

Hypotonic fluids are no longer prescribed for children receiving pediatrics IV maintenance fluids, although they are still receiving monitoring. Moving forward, it will be necessary to keep a closer eye on kids using fluids.

Limitations of the audit

1. Case note unavailability interfered with sequential case note auditing in some Trusts.
2. If there was doubt about the risk categorisation of a clinical condition – the child was allocated to the group considered to be at high risk of hyponatraemia to err on the side of caution. The audit may therefore have overestimated the proportion of children in the higher risk group.
3. Prescribed bags of intravenous fluids may run across successive daily fluid balance sheets and consequently prescriptions can erroneously appear to be missing from the beginning of some fluid balance sheets while staff wait for a bag from the previous sheet to finish.
4. There were no definitive published standards for some of the criteria audited against (e.g. 4 hour timing of E&U when fluids are commenced) and a consensus standard of clinical best practice by experts was agreed. The lack of this precise guidance can be the cause of any variance detected by the audit.
5. Some children were in theatre during the audited episode and there was a likely interruption in their ward fluid balance record when theatre recording systems/charts take over. This would lead to an audit return of incomplete data on the daily fluid balance chart.
6. There was not a standardized daily fluid balance chart in use across Northern Ireland at the time of the audit. Variations in the information prompted by the different fluid balance charts in use may bias the performance of some of the results between Trusts
7. Glucose testing is generally a bedside point of care test and results are not retrospectively computer traceable as in a laboratory based test. If it is not documented into a record once performed, or if recorded in an undiscovered document, its frequency of testing will be underestimated. This could be the cause of any variance detected by the audit.
8. It is recognised that the standards are derived from guidelines while in some cases sound clinical treatment involves a skilled interpretation of a wide variety of complex interacting variables existing at the time of decision making. This may not be apparent to an auditor some weeks or months later during a retrospective case note audit.

REFERENCES

1. Friedman JN, Beck CE, DeGroot J, Geary DF, Sklansky DJ, Freedman SB. Comparison of isotonic and hypotonic intravenous maintenance fluids: a randomized clinical trial. JAMA pediatrics. 2015;169(5):445-51.
2. Feld LG, Neuspiel DR, Foster BA, Leu MG, Garber MD, Austin K, et al. Clinical practice guideline: maintenance intravenous fluids in children. Pediatrics. 2018;142(6).