INTRAVENOUS FLUID THERAPY –

ALGORITHM 1. Assessment of Overall Fluid Status

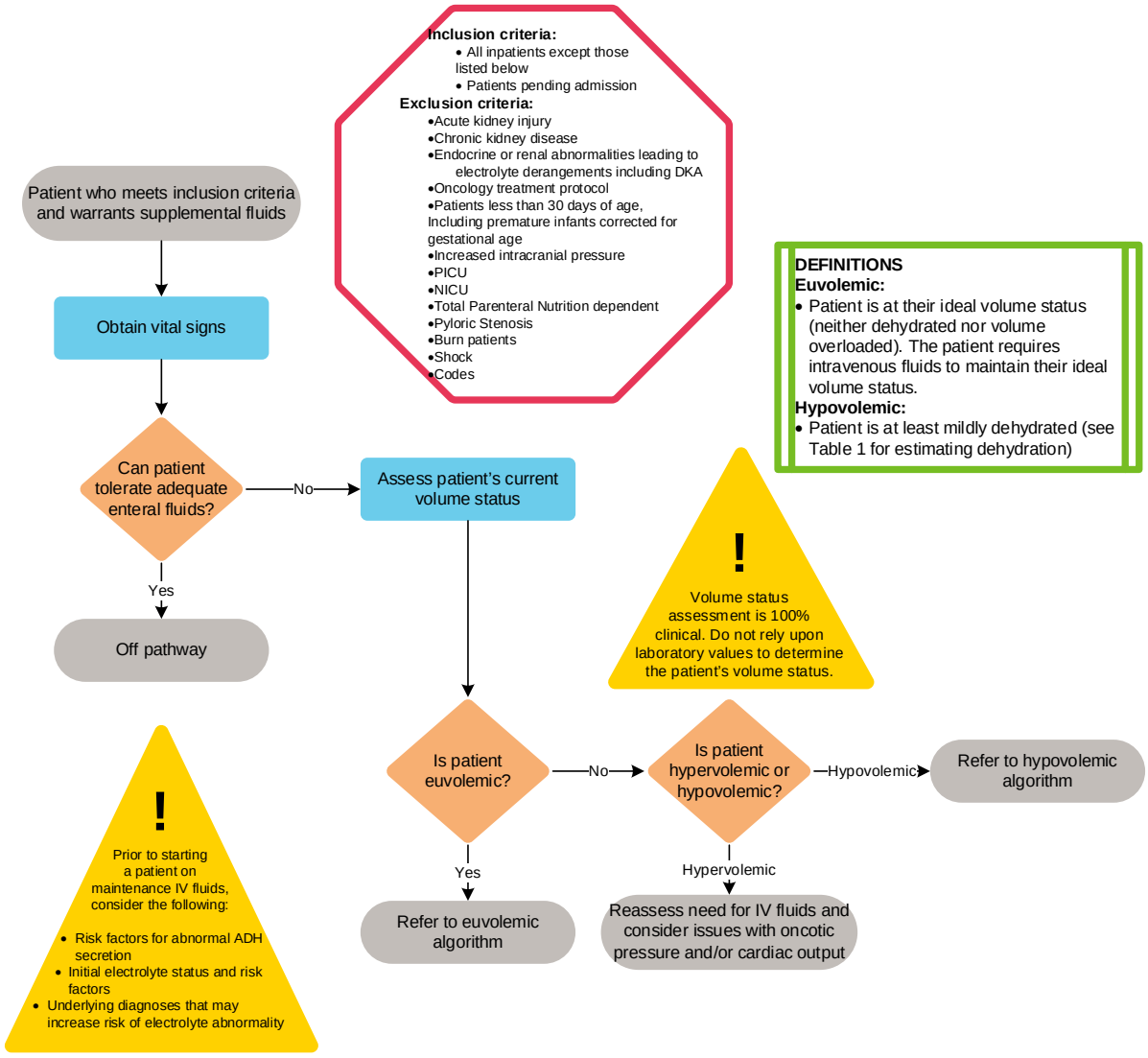


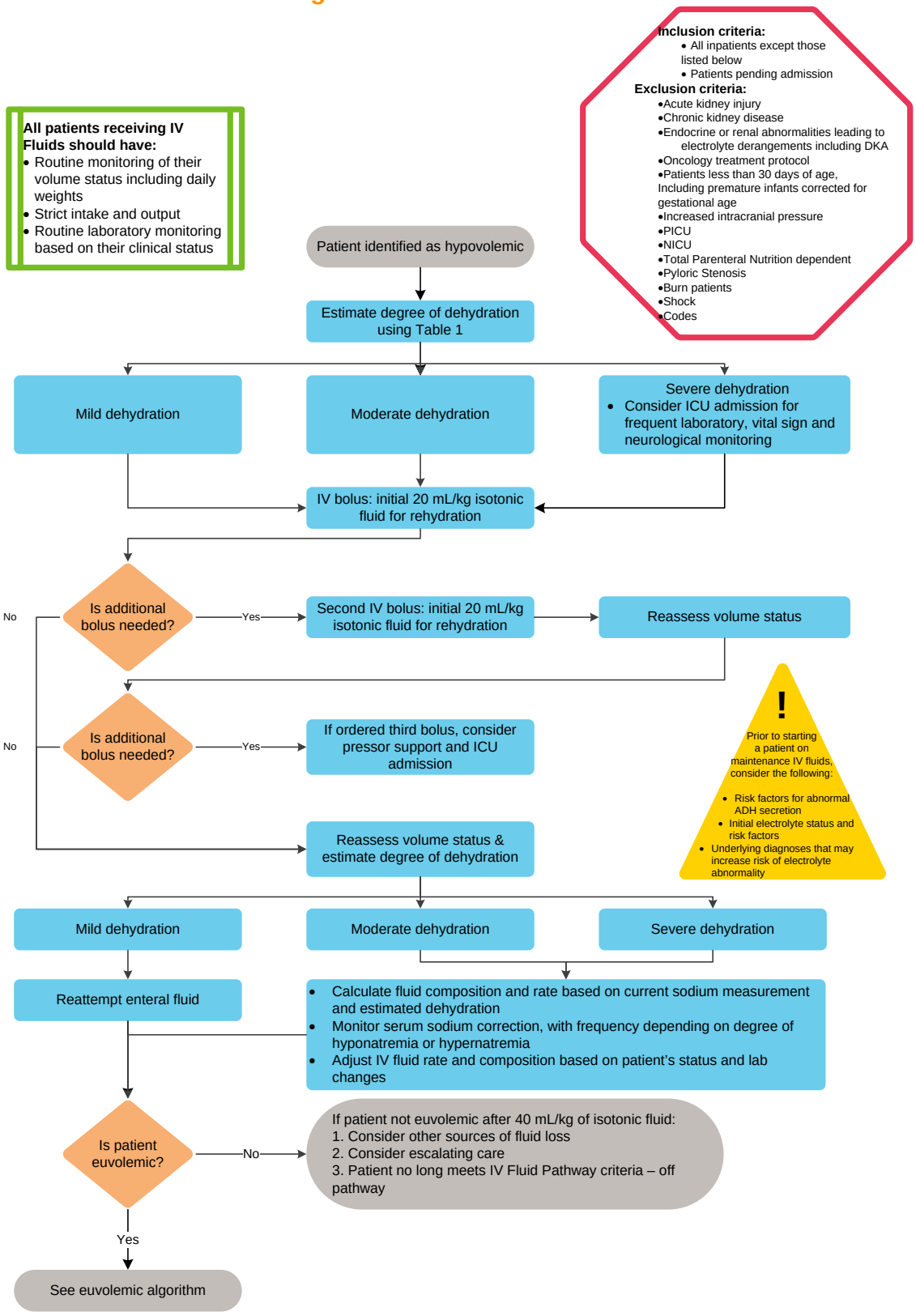
Table 1. Dehydration Status Estimation

Signs and Symptoms	Degree of Dehydration		
	None or Mild	Moderate	Severe
General Condition			
Infants	Thirsty; alert; restless	Lethargic or drowsy	Limp; cold, cyanotic extremities; may be comatose
Children	Thirsty; alert; restless	Alert; postural dizziness	Apprehensive; cold, cyanotic extremities; muscle cramps
Quality of radial pulse	Normal	Thready or weak	Feeble or impalpable
Quality of respiration	Normal	Deep	Deep and rapid
Skin elasticity	Pinch retracts immediately	Pinch retracts slowly	Pinch retracts very slowly (>2 sec)
Eyes	Normal	Sunken	Very sunken
Tears	Present	Absent	Absent
Mucous membranes	Moist	Dry	Very Dry
Urine output (by report of parent)	Normal	Reduced	None passed in many hours

Adapted from Gorelick MH, Shaw KN, Murphy KO. Validity and Reliability of Clinical Signs in the Diagnosis of Dehydration in Children. *Pediatrics*. 1995;99(5):1-6.

INTRAVENOUS FLUID THERAPY –

Algorithm 2. HYPOVOLEMIC Management



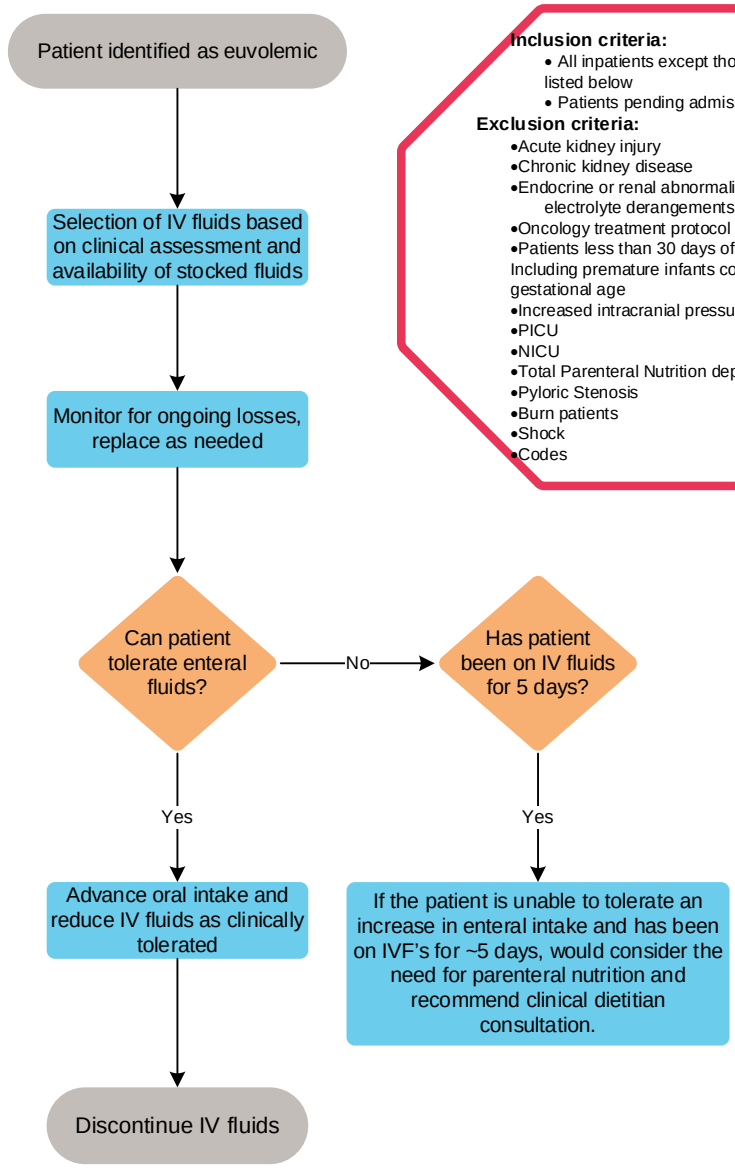
INTRAVENOUS FLUID THERAPY –

Algorithm 3. EUVOLEMIC Management

Stocked Fluids (D5LR, D5NS, or Plasmalyte)*
- Isotonic fluids are preferred
- Certain patients may benefit from Plasma-Lyte (if available) over LR. The use of Plasma-Lyte vs LR may be determined by the child's ability to maintain serum glucose with or without IV dextrose. Plasma-Lyte contains no dextrose. D5 and D10 LR are available.
- After determining stocked fluid of either D5LR, D5NS, or Plasmalyte, the rate can be calculated utilizing the Holliday-Segar method, also knows as "4-2-1", with a maximum suggested rate of 120 mL/hr.

*D5 1/2 NS + 20 KCl in children less than 1 year

All patients receiving IV Fluids should have:
- Routine monitoring of their volume status including daily weights
- Strict intake and output
- Routine laboratory monitoring based on their clinical status



Inclusion criteria:
- All inpatients except those listed below
- Patients pending admission

Exclusion criteria:
- Acute kidney injury
- Chronic kidney disease
- Endocrine or renal abnormalities leading to electrolyte derangements including DKA
- Oncology treatment protocol
- Patients less than 30 days of age, Including premature infants corrected for gestational age
- Increased intracranial pressure
- PICU
- NICU
- Total Parenteral Nutrition dependent
- Pyloric Stenosis
- Burn patients
- Shock
- Codes

!

Prior to starting a patient on maintenance IV fluids, consider the following:
- Risk factors for abnormal ADH secretion
- Initial electrolyte status and risk factors
- Underlying diagnoses that may increase risk of electrolyte abnormality

!

Ongoing assessment for signs of dehydration:
- Dry mouth and tongue
- Crying without tears
- Decreased urine output
- Delayed capillary refill
- Poor skin turgor
- Weight loss

INTRAVENOUS FLUID THERAPY CLINICAL PATHWAY

TABLE OF CONTENTS

TARGET POPULATION

Inclusion Criteria

- All inpatients except those listed below
- Patients pending admission

Exclusion Criteria

- Acute kidney injury
- Chronic renal failure
- Endocrine or renal abnormalities leading to electrolyte derangements including DKA
- Oncology treatment protocol
- Patients less than 30 days of age including premature infants corrected for gestational age
- Increased intracranial pressure
- PICU
- NICU
- Total parenteral nutrition dependent
- Pyloric stenosis
- Shock
- Codes
- Burn patients (Burn patients require increased fluid repletion and have separate IV Fluids protocol)

BACKGROUND | DEFINITIONS

Intravenous maintenance fluid therapy consists of water and electrolytes to replace daily losses in ill children in whom enteral fluids are insufficient. Based on the Holliday-Segar formula, hypotonic fluids have been widely used in pediatrics for several decades.[1] However, accumulating evidence shows that using hypotonic fluids may lead to an increased risk of hyponatremia.[2,3] Studies have been limited by a significant number of surgical patients and varying intravenous fluid (IVF) regimens including fluids containing less than ½ normal saline (NS). Besides the use of hypotonic fluids, many hospitalized children are felt to have non-osmotic stimuli for anti-diuretic secretion (e.g. post-surgical patients, respiratory infections, neurologic disease) which leads to a decrease in free water excretion and may contribute to hyponatremia.[1] Symptomatic hyponatremia manifests as central nervous system symptoms including lethargy, irritability, weakness, seizures, coma, and even death. These clinical care recommendations were developed with the aim of decreasing iatrogenic complications from intravenous fluids in hospitalized children.

Normal saline (0.9% sodium chloride), which has been a life-saving treatment over the past century, has been found to have downsides including increased mortality rates, increased acute kidney injury (AKI), metabolic acidosis, and coagulopathy.[6-12] This is thought to be attributed to the excess amount of chloride (154mmol/L) which is supraphysiologic compared to normal patient serum values. Growing evidence shows that elevated chloride values are associated with worse outcomes including AKI and mortality[13-15]. Due to this rising awareness, there has been development and increased use of balanced crystalloid solutions, such as lactated Ringer's (LR) and Plasma-Lyte. The electrolyte composition of these fluids is shown below:

Fluid Type	Patient Plasma	Lactated Ringer's (LR[17])	NS (0.9% sodium chloride[16])	½ NS (0.45% sodium chloride)	Plasma-Lyte[18]
Balanced vs Unbalanced crystalloid		Balanced	Unbalanced	Unbalanced	Balanced
Osmolality (mOsm/Kg)	275-295	273	308	154	295
pH	7.35-7.45	6.5	5	5	7.4
Sodium (mmol/L)	135-145	130	154	77	140
Potassium (mmol/L)	3.4-4.7	4	0	0	5
Chloride (mmol/L)	96-109	109	154	77	98
Magnesium (mEq/L)	1.3-2	0	0	0	3
Acetate (mmol/L)	0	0	0	0	27
Gluconate (mmol/L)	0	0	0	0	23
Lactate (mmol/L)	0	28	0	0	0
Calcium (mEq/L)	4.4-5.2	3	0	0	0
Bicarbonate (mmol/L)	23-30	0	0	0	0

What about the potassium? Clearly, both the balanced crystalloid solutions contain a small amount of potassium. **Somewhat counterintuitively, these crystalloids reduce the risk of hyperkalemia when compared to the use of 0.9% sodium chloride in patients with reduced kidney function[9, 19-23]**. Hyperchloremic acidosis from 0.9% sodium chloride leads to efflux of potassium out of the cells, predisposing to hyperkalemia. In contrast, the balanced electrolyte composition from LR and Plasma-Lyte allows the cell to maintain potassium buffering. There is a risk of hypokalemia with these fluids, which is mitigated by the potassium within the fluids.

What about the sodium? The amount of sodium should also be considered, which may be particularly relevant in some children: children with traumatic brain injury who are at risk of cerebral edema should not receive hyponatremic fluids such as lactated Ringer's or deD5W. Children at risk of syndrome of inappropriate antidiuretic hormone secretion (SIADH) should be monitored closely for the development of hyponatremia while receiving intravenous fluids. All children receiving intravenous fluids should undergo routine monitoring of their volume status via strict intake and output and daily weights.

What about the base anions? The balanced crystalloid solutions also contain different types of anions: acetate, gluconate, and lactate. In patients without severe liver dysfunction, lactate is converted to bicarbonate and glucose and should have no effect on patients' lactate values. Acetate and gluconate are also bicarbonate precursors and are metabolized both in the liver as well as other tissues[24].

Definitions

- Hyponatremia: serum sodium (Na) less than or equal to 135 mEq/L
- Hypotonic fluids: fluids with a lower osmotic pressure than blood (e.g. dextrose 5% in 0.45% sodium chloride [D5 ½ NS], dextrose 5% in 0.225% sodium chloride [D5 ¼ NS])[3]
- Isotonic fluids: fluids with osmotic pressure equal to blood (e.g. Plasma-Lyte, dextrose 5% in 0.9% sodium chloride [D5 NS])
- Balanced fluids: fluids with an electrolyte composition that more closely resembles human plasma (e.g., lactated Ringer's [LR], Plasma-Lyte, dextrose 5% in lactated Ringer's [D5 LR], dextrose 10% in lactated Ringer's [D10 LR])**Note: Plasma-Lyte does not contain dextrose and cannot be added to this fluid.
- Hypovolemia: The provider has assessed the patient's volume status (based on history and physical exam findings) and determined that the patient is at least mildly dehydrated (see Table 1 for estimating degree of dehydration).
- Euvolemia: The provider has assessed the patient's volume status (based on history and physical exam findings) and determined that the patient is at their ideal volume status (neither dehydrated nor volume overloaded). The patient, therefore, requires intravenous fluids to *maintain* their ideal volume status rather than for repletion purposes.

CLINICAL ASSESSMENT

- Vital signs on admission
- Prior to implementing either the euvolemic or hypovolemic IVF algorithm, the provider must first assess: 1) whether the patient may be able to attempt enteral hydration and 2) the patient's current volume status.
- Evaluate hydration status clinically. **NOTE: Volume status assessment is 100% clinical. Do not rely upon laboratory values to determine the patient's volume status.**
- Patients who have certain renal, endocrinological, neurological, and cardiac pathology may not be appropriate candidates for the algorithm and provider discretion should be used.
- Reassess hydration needs regularly and re-evaluate the need for IV fluids with any clinical change; this includes, but is not limited to:
    - Loss of intravenous access
    - Liberalization of enteral intake
    - Time-limited NPO status (e.g. pre-anesthesia)
    - Change in urine output (polyuria or oliguria) or stool output
    - Change in weight
- Consider alternative assessments of urine output (e.g. bladder scan) prior to IV fluid boluses when patients otherwise appear euvolemic.

CLINICAL MANAGEMENT

- After determining that the patient is unable to tolerate enteral hydration, the patient's hydration status should be assessed clinically to determine whether the euvolemic or hypovolemic IVF algorithm is appropriate.
- Hypovolemic patients requiring IVF's:
    - For hypovolemic (dehydrated) patients, their degree of dehydration should first be estimated by the provider via the history and physical exam.

- Most mildly dehydrated patients will respond well to a bolus (10-20 mL/kg) of crystalloid (LR or NS), following standard bolus procedures.
- Moderately and severely dehydrated patients will require calculation of fluid composition and rate based on their current serum sodium measurement and % estimated dehydration.
    - Providers should utilize resources such as Harriet Lane. **Regardless of the resource utilized, all initial fluid calculations are estimations only and frequent laboratory monitoring and clinical judgement must be utilized to adjust the fluid prescription appropriately and in a timely fashion**.
    - Appropriate monitoring of serum sodium correction must be monitored, with frequency depending on the severity of dehydration and degree of hyponatremia or hypernatremia. The IVF rate and composition must be adjusted based on the patient's status and laboratory changes.
    - Severely dehydrated patients will benefit from ICU admission for frequent laboratory, vital sign, and neurological monitoring.

- Euvolemic patients requiring IVF's:
    - For euvolemic patients who qualify for the pathway, isotonic fluids such as lactated Ringer's (LR) or Plasma-lyte are preferred over normal saline.
        - The use of LR versus Plasma-Lyte may be determined by whether the child is able to maintain their serum glucose with dextrose in the fluids. (Plasma-Lyte does not include dextrose, whereas LR can be ordered as D5 LR or D10 LR.)
    - After determining the composition of the balanced crystalloid, the rate can be calculated utilizing the Holliday-Segar method, also known as "4-2-1," with a maximum suggested rate of 120 mL/hr.

Per Kilogram of weight	Fluid Rate
1-10 kg	4 mL/kg/hr
11-20 kg	2 mL/kg/hr
Greater than 20 kg	1 mL/kg/hr

Example: A 22 kg patient's rate would be 62 mL/hr (40 mL/hr + 20 mL/hr + 2 mL/hr)

- *NOTE*: Patients who have increased insensible losses and/or increased ongoing losses from other sources (e.g. urinary, stool, ostomy output) will require more than the estimated Holliday-Segar rate. Replacements should not be included in the "maintenance" calculation and should be replaced with an appropriate fluid composition on an as-needed basis.

Table 1. Dehydration Status Estimation[27]

Signs and Symptoms	Degree of Dehydration		
	None or Mild	Moderate	Severe
General Condition			
Infants	Thirsty; alert; restless	Lethargic or drowsy	Limp; cold, cyanotic extremities; may be comatose
Children	Thirsty; alert; restless	Alert; postural dizziness	Apprehensive; cold, cyanotic extremities; muscle cramps
Quality of radial pulse	Normal	Thready or weak	Feeble or impalpable
Quality of respiration	Normal	Deep	Deep and rapid
Skin elasticity	Pinch retracts immediately	Pinch retracts slowly	Pinch retracts very slowly (>2 sec)
Eyes	Normal	Sunken	Very sunken
Tears	Present	Absent	Absent
Mucous membranes	Moist	Dry	Very Dry
Urine output (by report of parent)	Normal	Reduced	None passed in many hours

- Regardless of the algorithm, all children receiving IVF's should have routine monitoring of their volume status, including daily weights, strict intake and output, and routine laboratory monitoring based on their clinical status.

MONITORING

- Vital signs per provider order
- Document strict intake and output
- Document daily weight
- Ongoing assessment for signs of dehydration
  - Dry mouth and tongue
  - Crying without tears
  - Tachycardia
  - Decreased urine output
  - Delayed capillary refill
  - Poor skin turgor
  - Weight loss
- Observe for clinical signs of hyponatremia
  - Lethargy
  - Irritability
  - Weakness
  - Seizures

FLUIDS, ELECTROLYTES, NUTRITION

- Consider enteral fluids (oral, nasogastric [NG]) before administering IV fluids. In some cases, an NG may be preferable to IV fluids, but this decision should be based upon the provider's clinical assessment.
- NG feeds have been safely used in infants hospitalized with bronchiolitis.[4]
- **Selection of Intravenous Fluids**
  - Balanced fluids (those most closely resembling the electrolyte composition of plasma) should be used preferentially over hypotonic or isotonic fluids for routine fluid maintenance therapy.
    - Lactated Ringer's is the preferred option, but consideration must be given to the presence of calcium in LR, which may interact with other medications which are being administered to the patient (e.g. ceftriaxone). LR can be ordered to contain dextrose in patients who may not otherwise be able to maintain their serum glucose.
    - Plasma-Lyte, when available, is another option used preferentially in higher risk children who may benefit from a more physiologic intravenous fluid due to its close approximation to serum electrolyte composition and osmolality. Because Plasma-Lyte does not contain glucose, however, consideration must be given to the patient's ability to maintain their serum glucose.
    - Hypotonic saline (those containing D5 ½ NS) can be considered as another alternative to normal saline (NS), however patients may be at higher risk for developing hyponatremia. Patients on the hypovolemic pathway will likely require hypotonic fluid repletion in order to correct their deficits in addition to their ongoing maintenance requirement. Careful attention should be paid to these calculations, and close monitoring of the patient's response to therapy and clinical status is recommended.

        - *NOTE:* The use of fluids containing less than ½ NS should not be used to provide routine fluid maintenance therapy. There are rare clinical instances where the use of these fluids (e.g. D5 ¼ NS or D5W) is warranted.
        - *NOTE:* The use of plain ½ NS without dextrose as routine fluid maintenance therapy **is discouraged due to the low osmolality** (154 mOsm/kg) and increased risk for hemolysis, convulsions, pulmonary edema, and water intoxication.[25,26] Consider LR or ¾ NS (0.675% sodium chloride) if non-dextrose containing fluids with a lower sodium content are indicated.
    - Normal saline (NS), an unbalanced isotonic solution, remains widely available. Patients should be monitored for the development of hyperchloremic metabolic acidosis, acute kidney injury, fluid overload and hypertension.
  - **Addition of dextrose to IVF is optional**, but is recommended for patients who are undernourished or less than 12 months of age.
  - The addition of 10-20 mEq/L of potassium to unbalanced crystalloids (e.g. NS) may be warranted. Balanced crystalloids generally do not require additional potassium supplementation (LR contains 4 mEq/L of potassium and Plasma-lyte contains 5 mEq/L of potassium).
- Advance oral intake and reduce IVF as clinically tolerated.
- For euvolemic patients with anticipated discontinuation of IVF in the morning, consider stopping IV fluids overnight (e.g. 4:00am).
- If the patient is unable to increase enteral intake and has been on IVF's for 5 days, consideration for parenteral nutrition is warranted.

LABORATORY STUDIES | IMAGING

- Electrolyte testing may be necessary for patients on prolonged maintenance IV fluids. The need for testing and frequency of testing should be determined by assessing the risk of significant electrolyte abnormality, changes in clinical status, volume status, and the possibility that the patient will remain on IV fluids for a prolonged time period.
- Initial testing for electrolytes can help assess this baseline risk of electrolyte abnormality through understanding kidney function and initial serum electrolyte levels. A careful evaluation for any history or signs and symptoms that may increase risk of electrolyte abnormality is important. Certain conditions such as SIADH, diabetes insipidus, traumatic brain injury, adrenal insufficiency, recent surgery, or the use of chronic medications with high risk of electrolyte abnormality such as diuretics or mineralocorticoids may place a patient into a higher-risk category, which may require more frequent checking of serum electrolytes.
- In the absence of these risk factors, a low-risk, non-complex patient on balanced crystalloid or isotonic solutions for maintenance IV fluids, checking electrolytes **no more** than every 2 days will provide adequate information for monitoring the impact on a patient's overall status. In addition, daily weights, strict intake and output, and physical exams to assess for signs/symptoms of fluid retention are easy methods to evaluate a patient's overall fluid status.
- Discontinuing maintenance IV fluids as soon as clinically indicated is one method to further reduce any risk of hyponatremia or hypernatremia or other electrolyte abnormalities. Since higher volumes of fluid are generally associated with higher risks of electrolyte abnormality, reducing the dose volume of maintenance fluids to only what is necessary through the use of Total Fluid Orders and conservative dosing rates can further reduce the risk of electrolyte abnormality.
- If serum Na is less than 130 mEq/L or greater than 150 mEq/L, obtain repeat electrolytes based on the acuity of the abnormality and the patient's' clinical status until corrected.

REFERENCES

1. Cavari Y, Pitfield AF, Kissoon N. Intravenous maintenance fluids revisited. Pediatr Emerg Care 2013;29:1225-8; quiz 9-31.
2. Carandang F, Anglemyer A, Longhurst CA, et al. Association between maintenance fluid tonicity and hospital-acquired hyponatremia. J Pediatr 2013;163:1646-51.
3. Wang J, Xu E, Xiao Y. Isotonic versus hypotonic maintenance IV fluids in hospitalized children: a meta-analysis. Pediatrics 2014;133:105-13.
4. Kugelman A, Raibin K, Dabbah H, et al. Intravenous fluids versus gastric-tube feeding in hospitalized infants with viral bronchiolitis: a randomized, prospective pilot study. J Pediatr 2013;162:640-2 e1.
5. Freidman J BC, DeGroot J, et al. Maintenance Intravenous Fluid in Hospitalized Children: A Randomized, Double Blind, Controlled Trial of 0.9% NaCl/Dextrose 5% vs. 0.45% NaCl/Dextrose 5%. In: Pediatric Academic Societies Annual meeting; 2013; Washington DC; 2013.
6. Semler MW, Self WH, Rice TW. Balanced Crystalloids versus Saline in Critically Ill Adults. N Engl J Med. 2018;378(20):1951
7. Emrath ET, Fortenberry JD, Travers C, McCracken CE, Hebbar KB. Resuscitation With Balanced Fluids Is Associated With Improved Survival in Pediatric Severe Sepsis. Crit Care Med. 2017;45(7):1177-83.
8. Chowdhury AH, Cox EF, Francis ST, Lobo DN. A randomized, controlled, double-blind crossover study on the effects of 2-L infusions of 0.9% saline and plasma-lyte(R) 148 on renal blood flow velocity and renal cortical tissue perfusion in healthy volunteers. Ann Surg. 2012;256(1):18-24.
9. Hayes W. Ab-normal saline in abnormal kidney function: risks and alternatives. Pediatr Nephrol. 2018.
10. Li H, Sun SR, Yap JQ, Chen JH, Qian Q. 0.9% saline is neither normal nor physiological. Journal of Zhejiang University Science B. 2016;17(3):181-7.
11. Raghunathan K, Shaw A, Nathanson B, Sturmer T, Brookhart A, Stefan MS, et al. Association between the choice of IV crystalloid and in-hospital mortality among critically ill adults with sepsis*. Crit Care Med. 2014;42(7):1585-91.
12. Martin G, Bennett-Guerrero E, Wakeling H, Mythen MG, el-Moalem H, Robertson K, et al. A prospective, randomized comparison of thromboelastographic coagulation profile in patients receiving lactated Ringer's solution, 6% hetastarch in a balanced-saline vehicle, or 6% hetastarch in saline during major surgery. J Cardiothorac Vasc Anesth. 2002;16(4):441-6.
13. Stenson E, al. e. Hyperchloremia is associated with acute kidney injury in pediatric patients with septic shock. Intensive Care Med. 2018.
14. Stenson EK, Cvijanovich NZ, Anas N, Allen GL, Thomas NJ, Bigham MT, et al. Hyperchloremia Is Associated With Complicated Course and Mortality in Pediatric Patients With Septic Shock. Pediatr Crit Care Med. 2018;19(2):155-60.
15. Barhight MF, Lusk J, Brinton J, Stidham T, Soranno DE, Faubel S, et al. Hyperchloremia is independently associated with mortality in critically ill children who ultimately require continuous renal replacement therapy. Pediatr Nephrol. 2018;33(6):1079-85.
16. Baxter Ecatalog: 0.9% sodium chloride [Available from: https://ecatalog.baxter.com/ecatalog/loadproduct.html?cid=20016&lid=10001&hid=20001&pid=822455.
17. Baxter Ecatalog: Lactated Ringers [Available from: https://ecatalog.baxter.com/ecatalog/loadproduct.html?pid=821872&cid=20016&lid=10001&hid=20001.
18. Baxter Ecatalog: Plasma-Lyte [Available from: https://ecatalog.baxter.com/ecatalog/loadproduct.html?cid=20016&lid=10001&hid=20001&pid=821874.
19. O'Malley CM, Frumento RJ, Hardy MA, Benvenisty AI, Brentjens TE, Mercer JS, et al. A randomized, double-blind comparison of lactated Ringer's solution and 0.9% NaCl during renal transplantation. Anesth Analg. 2005;100(5):1518-24, table of contents.
20. Khajavi MR, Etezadi F, Moharari RS, Imani F, Meysamie AP, Khashayar P, et al. Effects of normal saline vs. lactated ringer's during renal transplantation. Ren Fail. 2008;30(5):535-9.
21. Modi MP, Vora KS, Parikh GP, Shah VR. A comparative study of impact of infusion of Ringer's Lactate solution versus normal saline on acid-base balance and serum electrolytes during live related renal transplantation. Saudi J Kidney Dis Transpl. 2012;23(1):135-7.
22. Adwaney A, Randall DW, Blunden MJ, Prowle JR, Kirwan CJ. Perioperative Plasma-Lyte use reduces the incidence of renal replacement therapy and hyperkalaemia following renal transplantation when compared with 0.9% saline: a retrospective cohort study. Clinical kidney journal. 2017;10(6):838-44.
23. Weinberg L, Harris L, Bellomo R, Ierino FL, Story D, Eastwood G, et al. Effects of intraoperative and early postoperative normal saline or Plasma-Lyte 148(R) on hyperkalaemia in deceased donor renal transplantation: a double-blind randomized trial. Br J Anaesth. 2017;119(4):606-15.

24. Mathes DD, Morell RC, Rohr MS. Dilutional acidosis: is it a real clinical entity? Anesthesiology. 1997;86(2):501-3.
25. Hoorn EJ. Intravenous fluids: balancing solutions. *J Nephrol*. 2017;30(4):485–492. doi:10.1007/s40620-016-0363-9
26. McNab S, Duke T, South M, Babl FE, Lee KJ, Arnup SJ, et al. 140 mmol/L of sodium versus 77 mmol/L of sodium in maintenance intravenous fluid therapy for childrens in hospital (PIMS): a randomised controlled double-blind trial. Lancet. 2015;385(9974):1190-7.
27. Gorelick MH, Shaw KN, Murphy KO. Validity and Reliability of Clinical Signs in the Diagnosis of Dehydration in Children. *Pediatrics*. 1995;99(5):1-6.

CLINICAL IMPROVEMENT TEAM MEMBERS

Danielle Soranno, MD | Nephrology
Michael Tchou, MD | Hospital Medicine
Alex Ahearn, MD | Hospital Medicine
Lori Hull, MD | Hospital Medicine
Justin Lockwood, MD | Hospital Medicine
Jason Woods, MD | Emergency Medicine
Erin Stenson, MD | Pediatric Intensive Care Unit
Katja Gist, DO | Cardiology
Magda Nowinski, PharmD | Pharmacy
Sharisse Arnold-Rehring, MD | Kaiser Permanente
Westley Lighthall, MPH | Clinical Effectiveness
Elizabeth Ficco | Clinical Effectiveness

APPROVED BY

Pharmacy and Therapeutics Committee - August 2019
Clinical Pathways and Measures Committee - November 2019

MANUAL/DEPARTMENT	Clinical Pathways/Quality
ORIGINATION DATE	November 20, 2014
LAST DATE OF REVIEW OR REVISION	February 10, 2020
COLORADO SPRINGS REVIEW BY	 Michael DiStefano, MD Chief Medical Officer, Colorado Springs
APPROVED BY	 Lalit Bajaj, MD, MPH Medical Director, Clinical Effectiveness

REVIEW/REVISION SCHEDULE

Scheduled for full review on February 10, 2024

Discrimination is Against the Law. Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex. Children's Hospital Colorado does not exclude people or treat them differently because of race, color, national origin, age, disability, or sex.

Children's Hospital Colorado provides free aids and services to people with disabilities to communicate effectively with us, such as: Qualified sign language interpreters, written information in other formats (large print, audio, accessible electronic formats, other formats). Children's Hospital Colorado provides free language services to people whose primary language is not English, such as: Qualified interpreters, information written in other languages.

If you need these services, contact the Medical Interpreters Department at 720.777.9800.

If you believe that Children's Hospital Colorado has failed to provide these services or discriminated in another way on the basis of race, color, national origin, age, disability, or sex, you can file a grievance with: Corporate Compliance Officer, 13123 E 16th Avenue, B450, Aurora, Colorado 80045, Phone: 720.777.1234, Fax: 720.777.7257, corporate.compliance@childrenscolorado.org. You can file a grievance in person or by mail, fax, or email. If you need help filing a grievance, the Corporate Compliance Officer is available to help you.

You can also file a civil rights complaint with the U.S. Department of Health and Human Services, Office for Civil Rights, electronically through the Office for Civil Rights Complaint Portal, available at ocrportal.hhs.gov/ocr/portal/lobby.jsf, or by mail or phone at: U.S. Department of Health and Human Services 200 Independence Avenue, SW Room 509F, HHH Building Washington, D.C. 20201 1-800-368-1019, 800-537-7697 (TDD) Complaint forms are available at www.hhs.gov/ocr/office/file/index.html.

Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex.

ATENCIÓN: si habla español, tiene a su disposición servicios gratuitos de asistencia lingüística. Llame al 1-720-777-9800.

CHÚ Ý: Nếu bạn nói Tiếng Việt, có các dịch vụ hỗ trợ ngôn ngữ miễn phí dành cho bạn. Gọi số 1-720-777-9800.

주의: 한국어를 사용하시는 경우, 언어 지원 서비스를 무료로 이용하실 수 있습니다. 1-720-777-9800 번으로 전화해 주십시오

注意：如果您使用繁體中文，您可以免費獲得語言援助服務。請致電1-720-777-9800。

ВНИМАНИЕ: Если вы говорите на русском языке, то вам доступны бесплатные услуги перевода. Звоните 1-720-777-9800.

ማስታወሻ: የሚናገሩት ቋንቋ አማርኛ ከሆነ የትርጉም እርዳታ ድርጅቶች፣ በነጻ ሊያግዝዎት ተዘጋጀተዋል፡ ወደ ሚከተለው ቁጥር ይደውሉ 1-720-777-9800 (መስማት ለተሳናቸው.

ملحوظة: إذا كنت تتحدث اذكر اللغة، فإن خدمات المساعدة اللغوية تتوافر لك بالمجان. اتصل برقم 1-720-777-9800 (رقم

ACHTUNG: Wenn Sie Deutsch sprechen, stehen Ihnen kostenlos sprachliche Hilfsdienstleistungen zur Verfügung. Rufnummer: 1-720-777-9800.

ATTENTION : Si vous parlez français, des services d'aide linguistique vous sont proposés gratuitement. Appelez le 1-720-777-9800.

ध्यान दनु होस्तपाइले नेपाल बोल्नहन्छ भन तपाइको निम्त भाषा सहायता सवाहरू नःशल्क रूपमा उपलब्ध छ । फोन गनु होसर् 1-720-777-9800 ।

PAUNAWA: Kung nagsasalita ka ng Tagalog, maaari kang gumamit ng mga serbisyo ng tulong sa wika nang walang bayad. Tumawag sa 1-720-777-9800.

注意事項：日本語を話される場合、無料の言語支援をご利用いただけます。1-720-777-9800 まで、お電話にてご連絡ください。

Ntị: Ọ bụrụ na asụ Ibo, asụsụ aka ọasụ n'efu, defu, aka. Call 1-720-777-9800.