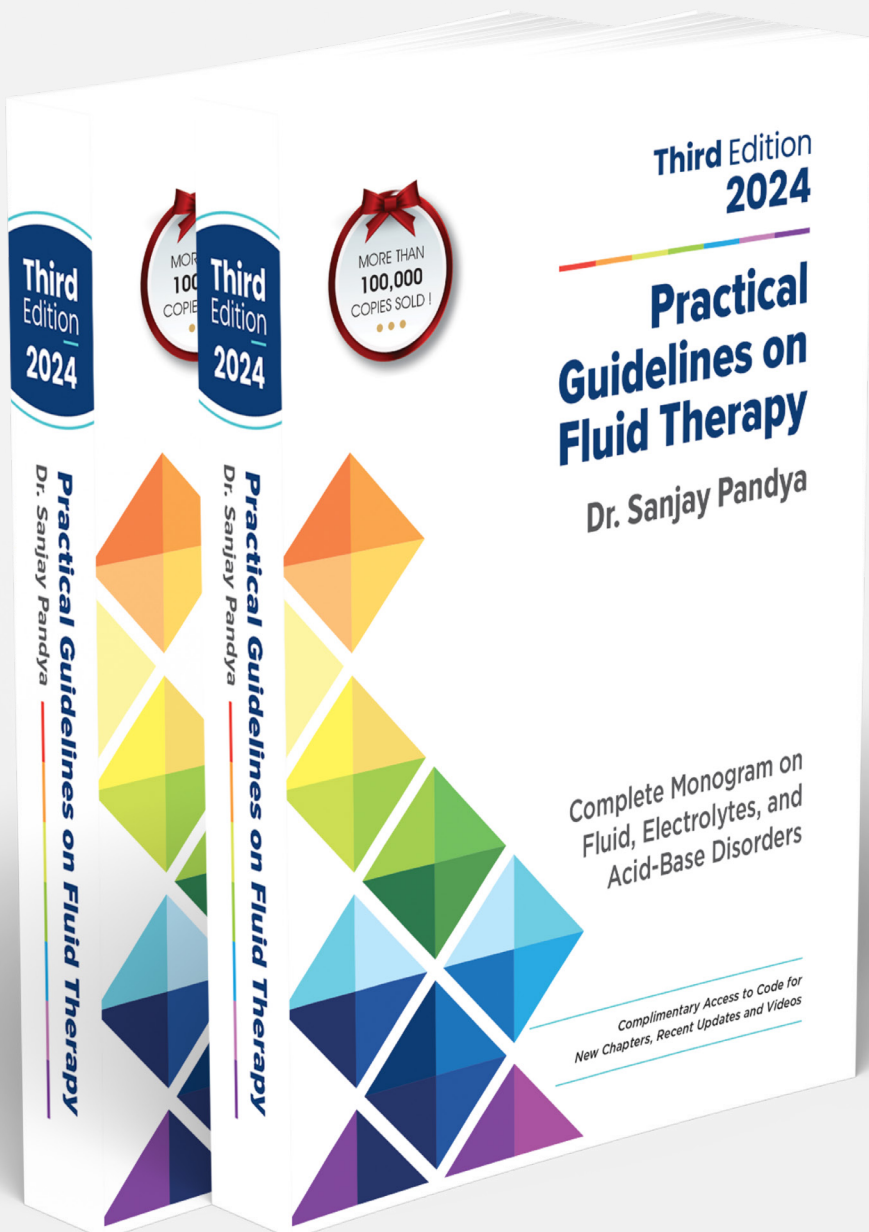




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## Chapter 3:

# Dextrose and Sodium Chloride Solutions



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# 3

## Dextrose and Sodium Chloride Solutions

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Crystalloids are solutions in sterile water which contain varying concentrations of electrolytes and dextrose. Dextrose and sodium chloride containing crystalloid solutions are discussed (Summarized in Table 3.1).

### 5% DEXTROSE (D5W)

#### Composition

One liter of fluid contains:

Dextrose	50 gm
Osmolality	252 mOsm/L
Caloric value	170 kcal/L
pH	4.3 (3.2 to 6.5)

Each 100 ml contains: Hydrous Dextrose USP 5 gm

#### Pharmacological basis

5% dextrose (usually abbreviated as D5W) provides free water with glucose without electrolytes. D5W is selected when there is a need for water but not electrolytes.

When a patient requires pure water, we administer intravenous 5% dextrose. Intravenous administration of free water is avoided due to its potential to cause hemolysis of red blood cells. However, the addition of dextrose renders the fluid near isotonic (252 mOsm/L) and does not result in hemolysis within the body.

5% dextrose packed in the bag is an isotonic solution, but once infused becomes a hypotonic solution in the body

as dextrose is consumed rapidly, and the remaining plain water is hypotonic [1].

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### REFERENCES

1. Sweeney RM, McKendry RA, Bedi A. Perioperative intravenous fluid therapy for adults. *Ulster Med J* 2013;82(3):171–178.
2. Asim M, M Alkadi MM, Asim H, et al. Dehydration and volume depletion: how to handle the misconceptions. *World J Nephrol.* 2019;8(1):23–32.
3. Popescu M. Albumin therapy in critically ill patients. *Cleveland clinic pharmacotherapy Update 2009; Volume XII, No. V.*
4. Zornow MH, Prough DS. Fluid management in patients with traumatic brain injury. *New Horiz.* 1995;3(3):488–98.
5. Ali Z, Prabhakar H. Fluid management during neurosurgical procedures. *J Neuroanaesthesiol Crit Care* 2016;3:S35–S40.
6. Jauch EC, Saver JL, Adams Jr HP, et al. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke.* 2013;44(3):870–947.
7. National Clinical Guideline Centre (UK). Intravenous fluid therapy: Intravenous fluid therapy in adults in hospital [Internet]. London: Royal College of Physicians (UK); 2013 Dec. (NICE Clinical Guidelines, No. 174.) 7, Intravenous Fluid Therapy for Fluid Resuscitation. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK333097/>.
8. Ryden SE, Oberman HA. Compatibility of common intravenous solutions with CPD blood. *Transfusion.* 1975;15(3):250–5.
9. Gahart BL, Nazareno AR, Ortega M. Gahart's 2019 Intravenous Medications: A handbook for nurses and health professionals. 2019 35th Edition.
10. Myburgh JA, Mythen MG. Resuscitation Fluids. *N Engl J Med.* 2013;369:1243–51.
11. Yartsev A. Response to 1L of Hartmann's compound sodium lactate. *Deranged physiology* June 25, 2015 (<https://derangedphysiology.com/main/core-topics-intensive-care/manipulation-fluids-and-electrolytes/Chapter%202.3.4/response-11-hartmanns-compound-sodium-lactate>).
12. Semler MW, Rice TW. Saline is not the first choice for crystalloid resuscitation fluids. *Crit Care Med.* 2016;44(8):1541–4.
13. Hoorn EJ. Intravenous fluids: balancing solutions. *J Nephrol* 2017;30:485–492.
14. Lobo DN, Awad S. Should chloride-rich crystalloids remain the mainstay of fluid resuscitation to prevent “pre-renal” acute kidney injury? *con. Kidney International.* 2014;86(6):1096–1105.
15. Li H, Sun SR, Yap JQ, et al. 0.9% saline is neither normal nor physiological. *J Zhejiang Univ Sci B.* 2016;17(3):181–187.
16. Yunos NM, Bellomo R, Glassford N, et al. Chloride-liberal vs. Chloride-restrictive intravenous fluid administration and acute kidney injury: an extended analysis. *Intensive Care Med* 2015;41:257–64
17. Nickson C. Chloride in critical illness. LITFL. reviewed and revised 21 March 2017 <https://litfl.com/chloride-in-critical-illness/> Accessed on 12 May 2019.
18. Rhodes A, Evans LE, Alhazzani W, et al. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock: 2016. *Crit Care Med* 2017;45(3):486–552.
19. Sahay M, Sahay R. Hyponatremia: A practical approach. *Indian J Endocrinol Metab.* 2014;18(6):760–771.
20. Finfer S, Bellomo R, Boyce N, et al. A comparison of albumin and saline for fluid resuscitation in the intensive care unit. (SAFE Study) *N Engl J Med* 2004;350:2247–56.
21. Haddad SH, Arabi YM. Critical care management of severe traumatic brain injury in adults. *scandinavian journal of trauma, resuscitation and emergency medicine.* 2012;20:12.
22. Ertmer C, Van Aken H. Fluid therapy in patients with brain injury: what does physiology tell us? *Crit Care.* 2014;18(2):119.
23. Feld LG, Neuspiel DR, Foster BA, et al. Clinical

- practice guideline: maintenance intravenous fluids in children. *Pediatrics* 2018;142(6):e20183083.
24. Wright C. Perioperative Intravenous Fluids prescription and monitoring in children 3 months to 16 years. *NHSClinical Guideline*. 2017.
  25. Andersen C, Afshari A. Impact of perioperative hyponatremia in children: a narrative review. *World J Crit Care Med*. 2014;3(4):95–101.
  26. Gosmanov AR, Gosmanova EO, Dillard-Cannon E. Management of adult diabetic ketoacidosis. diabetes, metabolic syndrome and obesity: targets and therapy. 2014;7:255–64.
  27. Ding X, Cheng Z, Qian Q. Intravenous fluids and acute kidney injury. *Blood Purif* 2017;43:163–172.
  28. Khajavi MR, Etezadi F, Moharari RS, et al. Effects of normal saline vs. lactated ringer's during renal transplantation. *Ren Fail*. 2008;30(5):535–9.
  29. Farkas, J. Myth-busting: lactated ringers is safe in hyperkalemia, and is superior to NS. *PulmCrit.org (EMCrit)* 2014 (<https://emcrit.org/pulmcrit/myth-busting-lactated-ringers-is-safe-in-hyperkalemia-and-is-superior-to-ns/>).
  30. Weinberg L, Harris L, Bellomo R, et al. Effects of intraoperative and early postoperative normal saline or PlasmaLyte148® on hyperkalaemia in deceased donor renal transplantation: a double-blind randomized trial. *Br J Anaesth*. 2017;119(4):606–615.
  31. McGuire LC, Cruickshank AM, Munro PT. Alcoholic ketoacidosis. *Emerg Med J*. 2006;23(6):417–20.
  32. Bowden SA, Henry R. Pediatric renal insufficiency: diagnosis, management, and new therapies. *International Journal of Pediatrics* Volume 2018;110(20):1504–1516.
  33. Sterns RH, Emmett M, Forman JP. Maintenance and replacement fluid therapy in adults. *UptoDate* (accessed 19.05.2019).
  34. Reynolds RM, Padfield PL, Seckl JR. Disorders of sodium balance. *BMJ*. 2006;332:702.
  35. Anigilaje EA. Management of diarrhoeal dehydration in childhood: a review for clinicians in developing countries. *Frontiers in Pediatrics* 2018;6:28.
  36. Kitabchi AE, Umpierrez GE, Miles JM, et al. Hyperglycemic crises in adult patients with diabetes. *Diabetes Care*. 2009;32(7):1335–43.
  37. Basnet S, Venepalli PK, Andoh J, et al. Effect of normal saline and half normal saline on serum electrolytes during recovery phase of diabetic ketoacidosis. *J Intensive Care Med*. 2014;29(1):38–42.
  38. Goguen J, Gilbert J. Hyperglycemic emergencies in adults. 2018 clinical practice guidelines. *Diabetes Canada clinical practice guidelines expert committee*. *Can J Diabetes* 2018;42:S109–S114.
  39. Jivan D. Management of diabetic ketoacidosis. *Journal of Endocrinology, Metabolism and Diabetes of South Africa* 2011;16(1):10–14.
  40. Perilli G, Saraceni C, Daniels MN, et al. Diabetic ketoacidosis: a review and update. *Curr Emerg Hosp Med Rep* 2013;1:10–17.
  41. Hirsh I, Emmett M, Nathan DM, et al. Diabetic ketoacidosis and hyperosmolar hyperglycaemic state in adults: treatment. *UptoDate* (accessed 19.05.2019).
  42. Kitabchi A, Wall BM. Management of diabetic ketoacidosis. *Am Fam Physician*. 1999;60(2):455–464.
  43. Siparsky N, Cochran A, Sterns RH. Overview of postoperative fluid therapy in adults. *UptoDate* (accessed 19.05.2019).

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