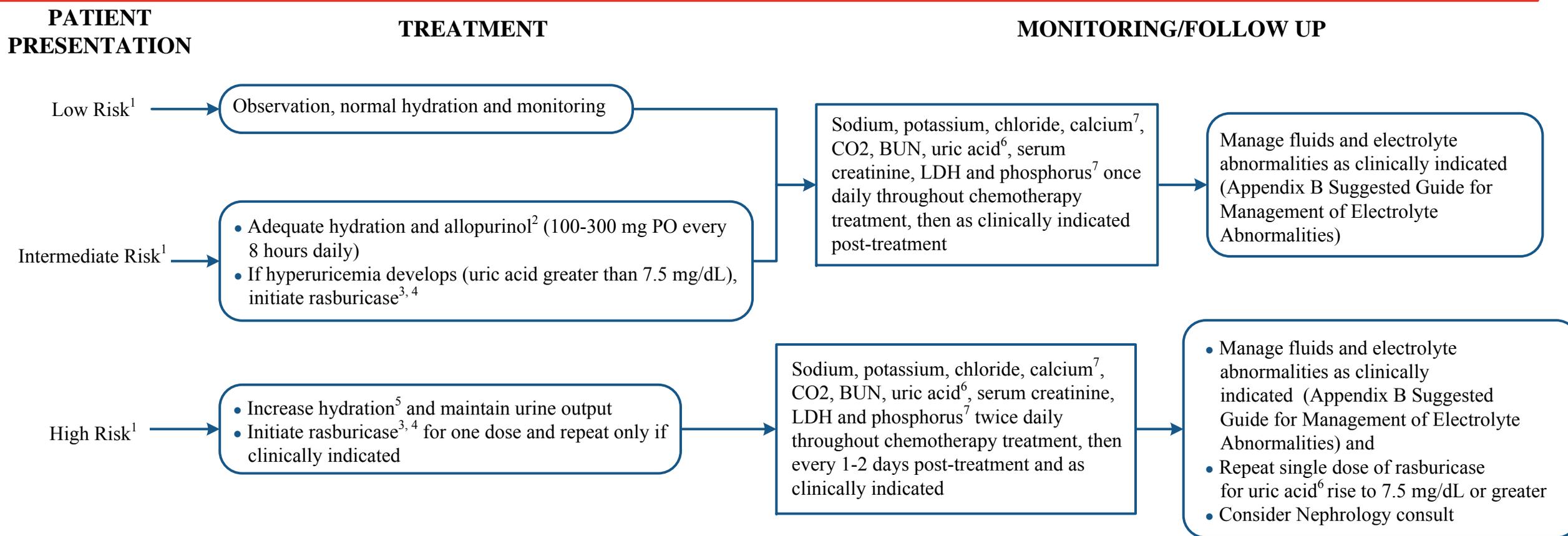


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NOTE: These patients should NOT be on electrolyte protocols. Use of sodium bicarbonate for alkalization of urine is currently not recommended for prevention and treatment of Tumor Lysis Syndrome (TLS).

<sup>1</sup> See Appendix A for stratification of risk factors

<sup>2</sup> Allopurinol dose needs to be adjusted in renal failure. Maximum daily dose of allopurinol is 800 mg/day. Dose adjustments may be necessary if allopurinol is used with other drugs (e. g. 6-mercaptopurine, azathioprine, cyclophosphamide, thiazide and loop diuretics, and warfarin – Refer to MD Anderson Cancer Center Pharmacy Formulary for a complete list of interactions. Allopurinol should be initiated 24-48 hours prior to chemotherapy when possible.

<sup>3</sup> Rasburicase must be given 4 hours prior to chemotherapy. Although, the FDA-approved dose for rasburicase is 0.2 mg/kg, efficacy has been demonstrated at lower doses such as 0.15 mg/kg. Additionally, many institutions are utilizing lower fixed dosages such as 3 mg or 6 mg versus weight-based dosing based on data from small studies or retrospective experience. If lower doses are prescribed, close monitoring of uric acid levels and renal function is recommended and if necessary the dose of rasburicase may be repeated.

<sup>4</sup> Rasburicase is contraindicated in glucose-6 phosphate dehydrogenase deficient patients, known hypersensitivity reactions, hemolytic anemia or methemoglobinemia. Allopurinol should be substituted in these patients.

<sup>5</sup> Patients with established TLS or high risk and/or renal insufficiency should be closely monitored and have access to renal team and ICU unit in case dialysis required.

<sup>6</sup> Blood specimens for uric acid levels should kept on ice after collection and prior to testing and processed immediately.

<sup>7</sup> If calcium-phosphorus product is greater than or equal to 50 mg<sup>2</sup>/dL<sup>2</sup>, ensure hydration is maintained and alkalization is discontinued. Consider consulting renal service, especially if the calcium-phosphorus product continues to rise above 60 mg<sup>2</sup>/dL<sup>2</sup>.

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## APPENDIX A: Tumor Lysis Risk Factors

### Low-Risk (less than 1% risk of tumor lysis):

- AML with WBC less than 25,000/mm<sup>3</sup> and serum LDH level less than two times the upper limit of normal
- CLL with a WBC less than 50,000/mm<sup>3</sup> and treated with only alkylating agents
- Multiple myeloma
- CML chronic-phase
- Adult intermediate-grade Non-Hodgkin's, Hodgkin, small lymphocytic, follicular, marginal zone B-cell, mantle cell (non-blastoid variant), and cutaneous T-cell lymphomas, and serum LDH level within normal limits
- Most solid tumors

### Intermediate-Risk (1-5% risk of tumor lysis):

- Adult intermediate grade Non-Hodgkin's lymphoma (adult T-cell, diffuse large B-cell, peripheral T-cell, transformed, or mantle cell lymphoma), non-bulky, with serum LDH level above the upper limit of normal
- Early stage Burkitt's lymphoma/leukemia and lymphoblastic lymphomas with serum LDH level less than two times the upper limit of normal
- ALL with WBC less than 100,000/mm<sup>3</sup> and serum LDH level less than two times the upper limit of normal
- AML with WBC greater than or equal to 25,000/mm<sup>3</sup> to less than 100,000/mm<sup>3</sup>
- AML with WBC less than 25,000/mm<sup>3</sup> and LDH greater than or equal to two times the upper limit of normal
- Early stage lymphoblastic lymphoma with serum LDH level less than two times the upper limit of normal
- CLL treated with targeted and biological therapies (fludarabine or rituximab) and/or those with high WBC (greater than or equal to 50,000/mm<sup>3</sup>)
- Patients with lymphoma/leukemia with low-risk disease with renal dysfunction and/or renal involvement
- Rare bulky solid tumors that are sensitive to chemotherapy (such as neuroblastoma, germ cell cancer)

### High-Risk (greater than 5% risk of tumor lysis):

- Advanced stage Burkitt's lymphoma/leukemia or early stage Burkitt's lymphoma/leukemia with serum LDH two or more times the upper limit of normal
- ALL with WBC greater than or equal to 100,000/mm<sup>3</sup> and/or serum LDH greater than or equal to two times the upper limit of normal
- AML with WBC greater than or equal to 100,000/mm<sup>3</sup>
- Stage III or IV lymphoblastic lymphoma or early stage lymphoblastic lymphoma with serum LDH level two or more times the upper limit of normal
- Any adult T-cell lymphoma, peripheral T-cell, transformed and mantle cell lymphoma with bulky tumor mass and serum LDH level above the upper limit of normal
- Stage III or IV diffuse large B-cell lymphoma with serum LDH level greater than or equal to two times the upper limit of normal
- Patients with intermediate risk disease with renal dysfunction and/or renal involvement, or uric acid, and either potassium or phosphate levels above the upper limit of normal

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## APPENDIX B: Suggested Guide for Management of Electrolyte Abnormalities

Abnormality	Management Recommendations
<b>Hyperphosphatemia</b>	
Moderate (greater than or equal to 6 mg/dL)	<ul style="list-style-type: none"> <li>• Restrict phosphorus intake (avoid IV and oral phosphorus; limit dietary sources)</li> <li>• Administer phosphate binder. Options below:               <ul style="list-style-type: none"> <li>--<i>Sevelamer (Renagel®, Renvela®)</i> 800 mg-1600 mg PO three times a day with meals-DRUG OF CHOICE IN PATIENTS WITH HYPERCALCEMIA</li> <li>--<i>Lanthanum carbonate (Fosrenol®)</i> 500-1000 mg PO three times a day with meals</li> <li>--<i>Calcium acetate(PhosLo®)</i> 1334 mg-2668 mg PO three times a day with meals-AVOID IN HYPERCALCEMIC PATIENTS</li> <li>--<i>Calcium carbonate</i> 1000 mg-2000 mg (elemental calcium) PO three times a day with meals-AVOID IN HYPERCALCEMIC PATIENTS</li> <li>--<i>Aluminum hydroxide</i> 300 mg - 600 mg PO three times a day with meals-AVOID IN PATIENTS WITH RENAL DYSFUNCTION</li> </ul> </li> </ul>
Severe	<ul style="list-style-type: none"> <li>• Dialysis may be needed in severe cases</li> </ul>
<b>Hypocalcemia</b> (calcium less than or equal to 7 mg/dL or ionized calcium less than or equal to 0.8 mmol/L)	
Asymptomatic	<ul style="list-style-type: none"> <li>• No therapy (to avoid calcium phosphate precipitation, asymptomatic patients with acute hypocalcemia with hyperphosphatemia should not be given calcium repletion until their phosphorous level has normalized).</li> </ul>
Symptomatic	<ul style="list-style-type: none"> <li>• Calcium gluconate 1 gram via slow IV infusion with EKG monitoring</li> </ul>

*Appendix B – continued on next page*

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## APPENDIX B: Suggested Guide for Management of Electrolyte Abnormalities

Abnormality	Management Recommendations
<b>Hyperkalemia</b>	
Moderate (greater than or equal to 6 mEq/L – 7 mEq/L) and asymptomatic	<ul style="list-style-type: none"> <li>• Restrict potassium intake (avoid IV and oral potassium; limit dietary intake)</li> <li>• EKG and cardiac rhythm monitoring</li> <li>• <i>Sodium polystyrene sulfonate (Kayexalate®)</i> 15-30 grams PO -repeat every 4 to 6 hours depending upon repeat potassium levels</li> </ul>
Severe (greater than 7 mEq/L) and/or symptomatic	<p>Same as moderate, plus:</p> <ul style="list-style-type: none"> <li>• For patients with EKG changes: Calcium gluconate 1 gram via slow IV infusion; may be repeated after 5-10 minutes if EKG changes persist</li> <li>• To temporarily shift potassium intracellularly</li> <li>• <i>IV insulin and dextrose</i>: 10 units of regular insulin in 500 mL of 10% dextrose (D10W) IV over 60 minutes-monitor blood glucose closely</li> <li>• <i>Sodium bicarbonate</i> 50 mEq via slow IV infusion-can be used if patient is acidemic (Sodium bicarbonate and calcium should not be administered through the same line)</li> <li>• <i>Albuterol</i> 10 mg-20 mg in 4 mL saline via nebulizer over 20 minutes or 10-20 puffs per MDI over 10-20 minutes-AVOID IN PATIENTS WITH ACUTE CORONARY DISEASE</li> </ul>
<b>Uremia (renal dysfunction)</b>	
	<ul style="list-style-type: none"> <li>• Fluid and electrolyte management</li> <li>• Uric acid and phosphate management</li> <li>• Adjust renally excreted drug doses</li> <li>• Dialysis</li> </ul>

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## SUGGESTED READINGS

Cairo, M. S., Coiffier, B., Reiter, A., & Younes, A. (2010). Recommendations for the evaluation of risk and prophylaxis of tumour lysis syndrome (TLS) in adults and children with malignant diseases: an expert TLS panel consensus. *Br J Haematol*, 149(4), 578-586. doi: 10.1111/j.1365-2141.2010.08143.x

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## DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of the Tumor Lysis work group, at the University of Texas M.D. Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following clinicians.

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