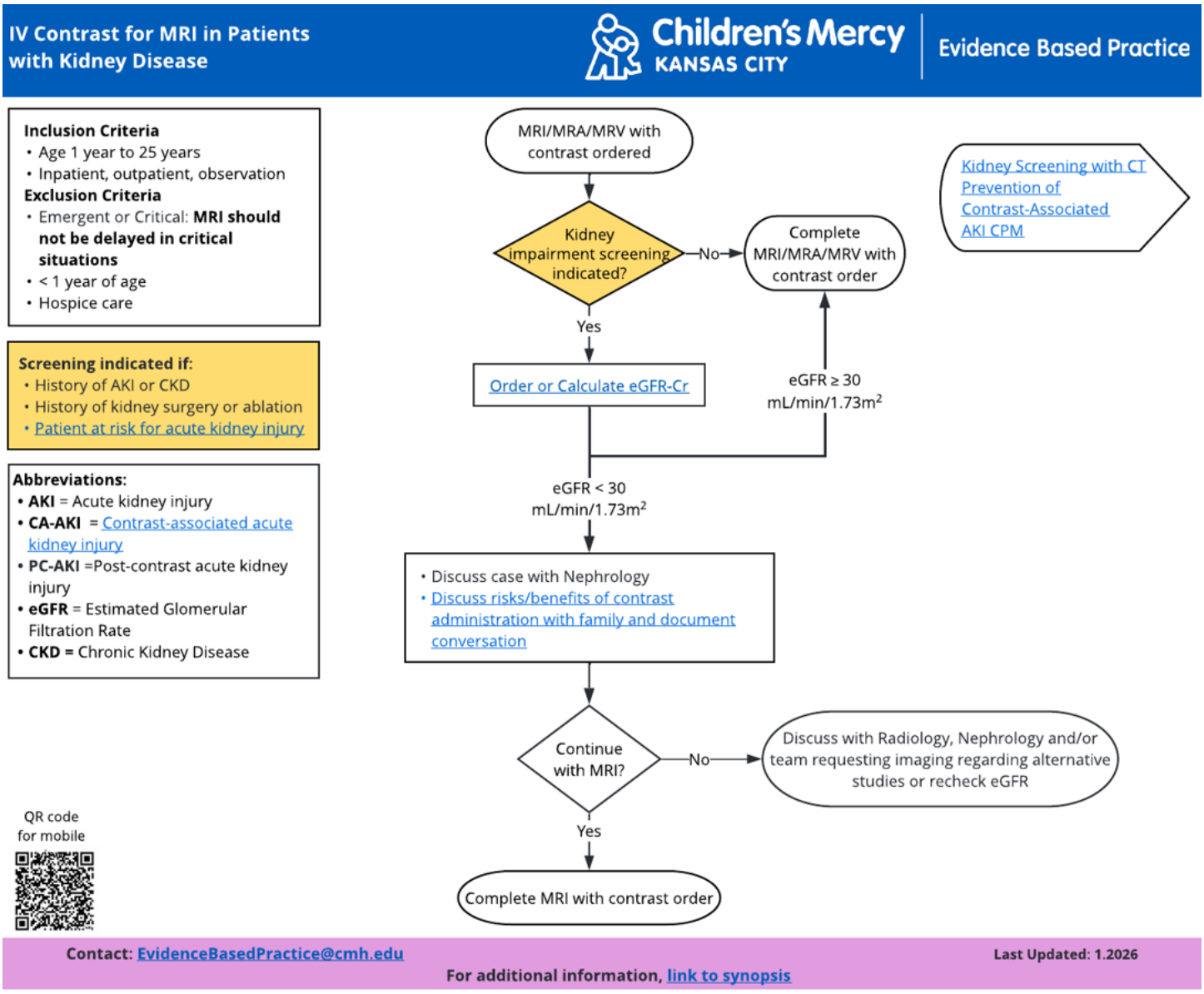
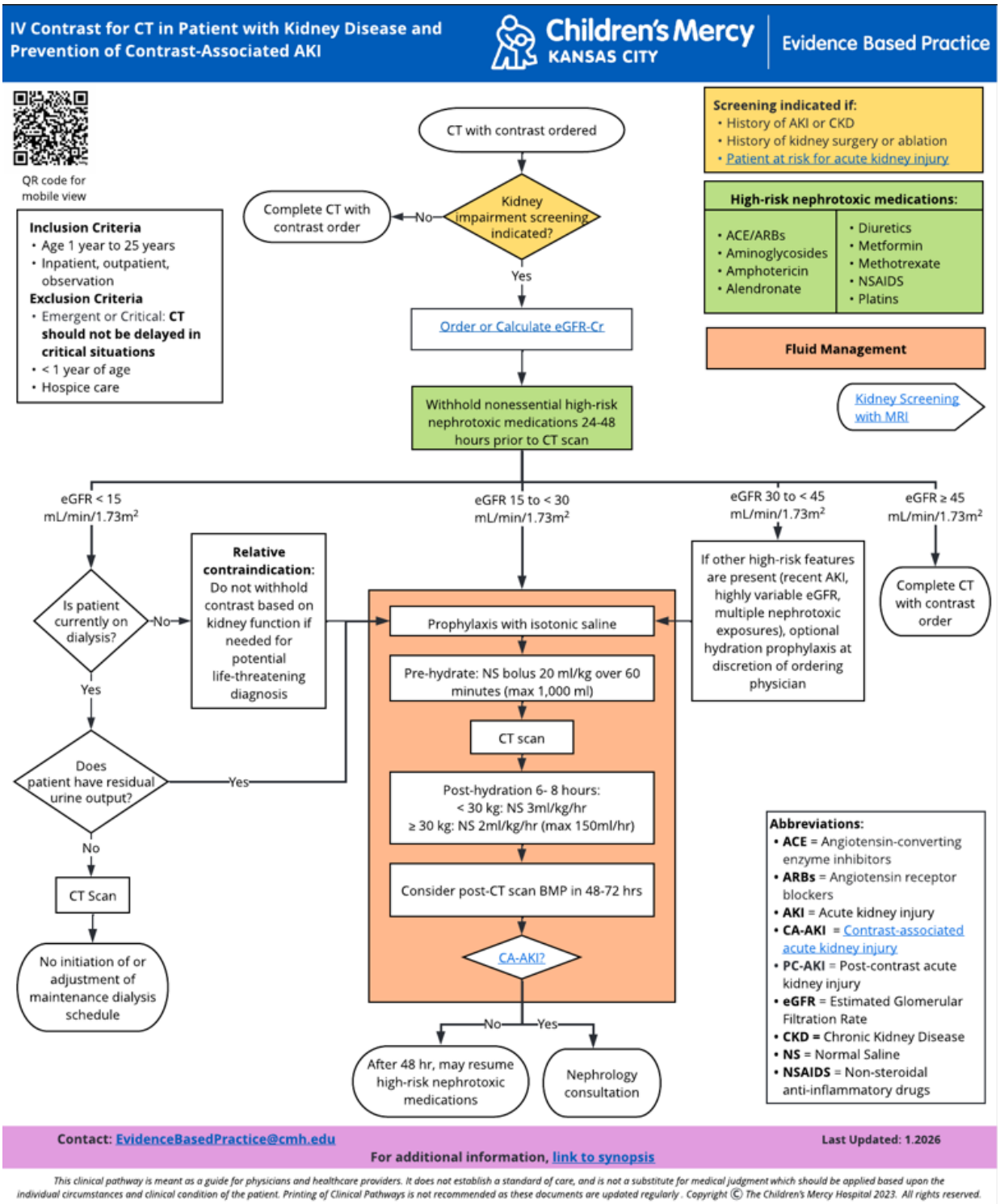
IV Contrast for MRI and CT in Patients with Kidney Disease Clinical Pathway



These clinical pathways do not establish a standard of care to be followed in every case. It is recognized that each case is different, and those individuals involved in providing health care are expected to use their judgment in determining what is in the best interests of the patient based on the circumstances existing at the time. It is impossible to anticipate all possible situations that may exist and to prepare a clinical pathway for each. Accordingly, these clinical pathways should guide care with the understanding that departures from them may be required at times.



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Objective of Clinical Pathway

To provide care standards for the patient who is at risk for or diagnosed with kidney impairment and the use of intravenous (IV) contrast for a magnetic resonance imaging (MRI) scan, magnetic resonance angiography (MRA), magnetic resonance venography (MRV) or a computed tomography (CT) scan. The Contrast MRI and CT in Kidney Disease Clinical Pathway is intended to align CMH provider practices with new consensus recommendations from the American College of Radiology and the National Kidney Foundation regarding the pretreatment and treatment of patients with kidney impairmentwho have indication(s) to receive IV contrast with diagnostic imaging techniques.

Background

Contrast media, such as intravenous iodine and gadolinium-based contrast agents, plays an important role in diagnostic imaging techniques to evaluate a disease process and inform a provider or providers of a patient's response to treatment (Davenport et al., 2020; Weinreb et al., 2021). Historically, perceived risk of contrast-associated acute kidney injury (CA-AKI), nephrogenic systemic fibrosis (NSF), or nephrotoxicity in response to the use of or repeated exposure to contrast media resulted in the delay or denial of diagnostic imaging techniques for patients with reduced kidney function (Davenport et al., 2015; Davenport et al., 2020; Weinreb et al., 2021). Additionally, varying levels of uncertainty amongst providers surrounding the use of contrast media with diagnostic imaging for patients with reduced kidney function led to inconsistent clinical practices (Weinreb, et al. 2021)

Realizing the potential for inconsistent clinical practices, data was pooled for the number of CT scans and MRI scans ordered at CMH in 2021 (Mitchell et al., 2022). Data suggests a total of N = 8,236 CT (n = 3,295) and MRI (n = 4,941) scans with contrast were ordered. The data was further analyzed to determine the number of CT or MRI scans with contrast ordered for children with kidney disease. For children with kidney disease, a total of N = 511 CT (n=312) and MRI (n = 199) scans with contrast were ordered (Mitchell et al., 2022). While the differences between the number of CT and MRI scans with contrast ordered for children with kidney disease in 2021 is unknown, the American College of Radiology and the National Kidney Foundation (Davenport et al., 2020; Weinreb et al., 2021) have released consensus recommendations regarding the use of contrast media for MRI and CT scans, including for individuals with kidney disease. The consensus recommendations are a shift from an historical perspective and designed to provide evidence-based strategies and decision support, specifically pertaining to the use of IV contrast during diagnostic imaging techniques, for providers caring for patients with a diagnosis of kidney disease.

Target Users

- Physicians and providers treating patients with or at risk for kidney impairment

Target Population

Inclusion Criteria

- Patient between the ages of 1-25 years
- Patient who is considered inpatient, outpatient, or observation

Exclusion Criteria

- Patient who is considered emergent or critical (**imaging should not be delayed in critical situations**)
- Patient less than one year of age
- Patient under hospice care

AGREE II

The American College of Radiology (ACR) and National Kidney Foundation (NKF) consensus statements provided guidance to the Contrast MRI and CT in Kidney Disease Committee (Davenport et al., 2020; Weinreb et al., 2021). See Table 1 and 2 for AGREE II.

Table 1

AGREE II[a] Summary for the ACR and NKF Use of IV Iondinated Contrast Media Consensus Statements (Davenport et al., 2020)

Domain	Percent Agreement	Percent Justification^

Scope and purpose	90%	The aim of the consensus statements, the clinical questions posed, and target populations **were** identified.
Stakeholder involvement	69%	The consensus statements **were developed** by the appropriate stakeholders. The consensus statements **did not** include the viewpoints of the intended user.
Rigor of development	49%	The developers of the consensus statements **did no**t provide how the evidence was gathered and synthesized, how the recommendations were formulated nor how the statements will be updated.
Clarity and presentation	88%	The recommendations of the consensus statements **are** clear, unambiguous, and easily identified; in addition, different management options are presented.
Applicability	54%	The consensus statements **did not fully** address implementation barriers and facilitators, utilization strategies, nor resource costs associated with implementation.
Editorial independence	98%	The recommendations **were not** biased with competing interests.

Note: Four EBP Scholars completed the AGREE II on this guideline.
^Percentage justification is an interpretation based on the Children's Mercy EBP Department standards.

Table 2
AGREE II[a] Summary for the ACR and NKF Use of IV Gadolinium-Based Contrast Media Consensus Statements (Weinreb et al., 2021)

Domain	Percent Agreement	Percent Justification^
Scope and purpose	97%	The aim of the consensus statements, the clinical questions posed, and target populations **were** identified.
Stakeholder involvement	75%	The consensus statements **were developed** by the appropriate stakeholders. The consensus statements **did not** include the viewpoints of the intended user.
Rigor of development	50%	The developers of the consensus statements **did** describe the methods for formulating the recommendations, though **did not** provide how the evidence was gathered and synthesized, nor how the consensus statements would be updated.
Clarity and presentation	83%	The consensus statement recommendations **are** clear, unambiguous, and easily identified; however, different management options **were not** presented.
Applicability	46%	Barriers and facilitators to implementation and strategies to improve utilization **were addressed** in the consensus statement. The consensus statement **did not** address resource costs associated with implementation.
Editorial independence	100%	The recommendations **were not** biased with competing interests.

Note: Four EBP Scholars completed the AGREE II on this guideline.
^Percentage justification is an interpretation based on the Children's Mercy EBP Department standards.

Practice Recommendations

The American College of Radiology (ACR) and National Kidney Foundation (NKF) consensus statements provided guidance to the Contrast MRI and CT in Kidney Disease Committee (Davenport et al., 2020; Weinreb et al., 2021).

Children's Mercy Practice Recommendations and Reasoning

Children's Mercy adopted most of the practice recommendations made by the American College of Radiology and the National Kidney Foundation consensus statements (Davenport et al., 2020; Weinreb et al., 2021). Variations/Additions include:

Contrast MRI

- A kidney impairment screening be conducted for all patients with history of acute or chronic kidney disease regardless of gadolinium-containing contrast media (GBCM) group classification, whereas the ACR and NKF consensus statements suggest that kidney screening is optional when using group II GBCM, though necessary when using group III GBCM in patients with kidney disease (Weinreb et al., 2021)
- All cases for patients with an eGFR < 30 mL/min/1.73m^2 should be discussed with a Nephrologist prior to proceeding with an MRI with contrast, whereas the ACR and NKF consensus statements suggest that communication occur between the radiologist and ordering physician only when group III GBCM administration is considered in patients with an eGFR < 30 mL/min/1.73m^2 or an acute kidney injury (Weinreb et al., 2021)

Contrast CT

- Patients considered at risk include those with a history of acute or chronic kidney disease, history of kidney surgery or ablation, complex congenital heart disease, those with an eGFR < 30 mL/min/1.73m^2 , and those with an eGFR < 45 mL/min/1.73m^2 demonstrating other high risk features recent acute kidney injury, highly variable eGFR, or multiple nephrotoxic exposures), whereas the ACR and NKF consensus statements suggest patients at risk include those with recent acute kidney injury, those with an eGFR < 30 mL/min/1.73m^2, including nonanuric patients undergoing maintenance dialysis (Davenport et al, 2020)
- A kidney impairment screening be conducted for all patients with history of acute or chronic kidney disease, history of kidney surgery or ablation, and complex congenital heart disease, whereas the ACR and NKF consensus statements suggest a kidney impairment screen be completed for patients with a personal history of chronic kidney disease, remote acute kidney injury, kidney surgery or ablation (Davenport et al., 2020)
- Prophylaxis with normal saline is recommended for patients with an eGFR < 15 mL/min/1.73m^2 with clinically significant kidney function, all patients with an eGFR < 30 mL/min/1.73m^2 , and considered for patients with an eGFR < 45 mL/min/1.73m^2 when accompanied by other high risk features (recent acute kidney injury, highly variable eGFR, multiple nephrotoxic exposures), whereas the ACR and NKF consensus statements suggest prophylaxis with normal saline for patients not undergoing dialysis who have an eGFR < 30 mL/min/1.73m^2 or acute kidney injury and considered for patients with an eGFR 30-44 mL/min/1.73m^2 when accompanied by high risk features (Davenport et al., 2020)

Additional Questions Posed by the Committee

No clinical questions were posed for this review.

Measures

- MRI/MRA/MRV Kidney Screen
- CT Kidney Screen

Potential Cost Implications

The following potential improvements may reduce costs and resource utilization for healthcare facilities and reduce healthcare costs and non-monetary costs (e.g., missed school/work, loss of wages, stress) for patients and families.

- Decreased unwarranted variation in care

- Decreased potential delay in diagnosis or treatment
- Decreased risk of overdiagnosis
- Decreased risk of overtreatment
- Decreased frequency of admission
- Decreased inpatient length of stay

Organizational Barriers and Facilitators

Potential Barriers

- Variability of acceptable level of risk among providers
- Challenges with follow-up faced by some families

Potential Facilitators

- Collaborative engagement across care continuum settings during development
- High rate of use of CLINICAL PATHWAY
- Standardized order set for Urgent Care Clinic, Emergency Department, Hospital Medicine, and Pediatric Intensive Care

Associated Policies

- IV Contrast Administration (2021)
- Standing Order for Contrast Administration (2021)

Clinical Pathway Preparation

This clinical pathway was prepared by the EBP Department in collaboration with content experts at Children's Mercy. If a conflict of interest is identified the conflict will be disclosed next to the committee member's name.

Implementation & Follow-Up

Once approved, the clinical pathway was presented to appropriate care teams and implemented. Care measurements will be assessed and shared with appropriate care teams to determine if changes need to occur. This clinical pathway is scheduled for revision January 2029.

Clinical Pathway Representation

This clinical pathway was originally developed with representation from Nephrology, Radiology, Heme/Onc/BMT, Emergency Medicine, Hospital Medicine, and Urology.

IV Contrast MRI and CT in Kidney Disease Revision Representation

- Darcy Weidemann, MD, MHS| Nephrology | Committee Co-Chair
- Grace Mitchell, MD, MBA | Radiology | Committee Co-Chair
- Joel Thompson, MD | Hematology/Oncology/BMT | Committee Member
- Shobhit Jain, MD | Emergency Medicine | Committee Member
- Adrienne DePorre, MD | Hospital Medicine | Committee Member
- Joel Koenig, MD | Urology | Committee Member

EBP Committee Members

- Todd Glenski, MD, MSHA, FASA | Anesthesiology, Evidence Based Practice
- Jarrod Dusin, PhD, RD, CPHQ | Evidence Based Practice

Additional Review & Feedback

- The clinical pathway was presented to each division or department represented on the committee as well as other appropriate stakeholders. Feedback was incorporated into the final product.

Clinical pathway Model Development Funding

The development of this guideline was underwritten by the EBP, Nephrology, Radiology, Hematology/Oncology/BMT, Emergency Medicine, Hospital Medicine, and Urology Departments.

Conflict of Interest

The contributors to the Contrast MRI and CT in Kidney Disease Clinical pathway have no conflicts of interest to disclose related to the subject matter or materials discussed in this clinical pathway.

Version History

Date	Comments
December 2022	Version one – developed algorithms and synopsis
January 2026	Version two – minor updates to synopsis

Disclaimer

When evidence is lacking or inconclusive, options in care are provided in the supporting documents and the power plan(s) that accompany the clinical pathway. These clinical pathways do not establish a standard of care to be followed in every case. It is recognized that each case is unique, and healthcare providers are expected to use their judgment to determine what is in the best interests of the patient based on the circumstances existing at the time. It is impossible to anticipate all possible situations that may arise and to prepare clinical pathways for each one. Accordingly, these clinical pathways should guide care with the understanding that departures from them may be required at times.

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