



Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection

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Table 13i. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Nephrotoxic Effects
(Last updated April 27, 2017; last reviewed April 27, 2017) (page 1 of 2)

Adverse Effects	Associated ARVs	Onset/Clinical Manifestations	Estimated Frequency	Risk Factors	Prevention/Monitoring	Management
Urolithiasis/ Nephrolithiasis	ATV, IDV DRV causes crystalluria but is not associated with nephrolithiasis.	<u>Onset:</u> • Weeks to months after starting therapy <u>Clinical Findings:</u> • Crystalluria, hematuria, pyuria, flank pain, sometimes increased creatinine	ATV-related nephrolithiasis occurs in <10%. IDV-related higher (29%) in children than adults (12.4%)	In adults, elevated urine pH (>5.7) Unknown in children	<u>Prevention:</u> • Maintain adequate hydration. • IDV is not FDA-approved for use in children and should be avoided. <u>Monitoring:</u> • Obtain urinalysis at least every 6–12 months.	Provide adequate hydration and pain control; consider using alternative ARV. If on IDV, discontinue.
Renal Dysfunction	TDF	<u>Onset:</u> • Variable; in adults, weeks to months after initiation of therapy. • Hypophosphatemia appears at a median of 18 months. • Glucosuria may have onset after a year of therapy. • Abnormal urine protein/osmolality ratio may be an early indicator. <u>Presentation:</u> <i>More Common:</i> • Increased serum creatinine, proteinuria, normoglycemic glucosuria. Hypophosphatemia, usually asymptomatic; may present with bone and muscle pain, weakness. <i>Less Common:</i> • Renal failure, acute tubular necrosis, Fanconi syndrome, proximal renal tubulopathy, interstitial nephritis, nephrogenic diabetes insipidus with polyuria	<u>Adults:</u> • Approximately 2% with increased serum creatinine • Approximately 0.5% with severe renal complications <u>Children:</u> • Approximately 4% with hypophosphatemia or proximal tubulopathy; higher with prolonged TDF therapy, in advanced HIV infection or concomitant use of ddI	<u>Risk May Be Increased in Children with:</u> • Age >6 years • Black race, Hispanic/Latino ethnicity • Advanced HIV infection • Hypertension • Diabetes • Concurrent use of ddI or PIs (especially LPV/r), and preexisting renal dysfunction • Risk increases with longer duration of TDF treatment.	Monitor urine protein and glucose or urinalysis, and serum creatinine at 3- to 6-month intervals. For patients taking TDF, some panelists add serum phosphate to the list of routine labs to monitor. In the presence of persistent proteinuria or glucosuria, or for symptoms of bone pain or muscle pain or weakness, also measure serum phosphate. Because toxicity risk increases with duration of TDF treatment, frequency of monitoring should not decrease with time.	If TDF is the likely cause, consider using alternative ARV. TAF has significantly less toxicity than TDF.

Table 13i. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Nephrotoxic Effects
(Last updated April 27, 2017; last reviewed April 27, 2017) (page 2 of 2)

Adverse Effects	Associated ARVs	Onset/Clinical Manifestations	Estimated Frequency	Risk Factors	Prevention/Monitoring	Management
Elevation in Serum Creatinine	DTG, COBI, RPV	<p><u>Onset:</u></p> <ul style="list-style-type: none"> • Within a month of starting treatment <p><u>Presentation:</u></p> <ul style="list-style-type: none"> • Asymptomatic. These drugs decrease renal tubular secretion of creatinine, leading to an increase in measured serum creatinine without a true change in eGFR. 	<p>Common</p> <p>Need to distinguish between true change in eGFR and other causes. True change might be associated with other medical conditions, continuing rise of serum creatinine with time, and albuminuria.</p>	N/A	Monitor serum creatinine. Assess for renal dysfunction if serum creatinine increases by >0.4 mg/dL or increases are ongoing with time.	<p>No need to change therapy.</p> <p>Reassure patient about the benign nature of the laboratory abnormality.</p>

Key to Acronyms: ARV = antiretroviral; ATV = atazanavir; COBI = cobicistat; ddI = didanosine; DRV = darunavir; DTG = dolutegravir; eGFR = estimated glomerular filtration rate; FDA = Food and Drug Administration; IDV = indinavir; LPV/r = boosted lopinavir/ritonavir; PI = protease inhibitor; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate

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