Management of IRIS

Medical Care Criteria Committee, June 2017

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Purpose of this Guideline

Medical Care Criteria Committee, June 2017

This guideline was developed by the New York State Department of Health (NYSDOH) AIDS Institute (AI) for primary care providers and other practitioners who manage immune reconstitution inflammatory syndrome (IRIS) in patients with HIV infection. The guideline aims to achieve the following goals:

▪ Raise awareness among healthcare providers about IRIS, including its clinical presentation.
▪ Provide treatment recommendations for IRIS.
▪ Encourage clinicians to seek the assistance of an experienced HIV care provider when managing IRIS.
▪ Emphasize that antiretroviral therapy (ART) should not be interrupted in patients with IRIS except in life-threatening cases.

The NYSDOH AI is publishing this guideline at a critical time: 1) Initiation of ART is now recommended for all patients diagnosed with HIV infection; 2) Identifying and linking patients with HIV infection to care and treatment that achieves optimal virologic suppression are crucial to the success of New York State’s Ending the Epidemic initiative; and 3) The ability of primary care providers and other clinicians in New York State to manage IRIS is key to the successful treatment of patients with HIV infection.

Overview of This Guideline

Although ART dramatically reduces HIV-associated mortality and improves patient outcomes, initiation of or a change in ART introduces the potential for IRIS. This early complication is seen most often within the first 8 weeks of therapy in patients with advanced HIV disease. Mild IRIS resolves over time in most patients, and symptomatic treatment is often sufficient. Severe IRIS may threaten a patient’s functional status or cause permanent disability or death. But interrupting combination ART in a patient with IRIS may lead to acquisition of new opportunistic infections, recurrence of IRIS when therapy is later restarted, and possible HIV-drug resistance.

This guideline, therefore, addresses management of IRIS to avoid ART interruption except in life-threatening cases. Key recommendations cover the following:

▪ Timing of ART initiation relative to timing of treatment for opportunistic infections.
▪ When to consult an experienced HIV care provider.
▪ Diagnosis of IRIS.
▪ Management and treatment of mild and severe IRIS.

Development of This Guideline

This guideline was developed by the NYSDOH AI Clinical Guidelines Program, which is a collaborative effort between the NYSDOH AI Office of the Medical Director and the Johns Hopkins University School of Medicine, Division of Infectious Diseases.

Established in 1986, the goal of the Clinical Guidelines Program is to develop and disseminate evidence-based, state-of-the-art clinical practice guidelines to improve the quality of care provided to people with HIV, hepatitis C virus, and sexually transmitted infections and to improve drug user health and LGBT health throughout the State of New York. NYSDOH AI guidelines are developed by committees of clinical experts through a consensus-driven process.

The NYSDOH Medical Care Criteria Committee (MCCC) was charged with developing evidence-based clinical recommendations for primary care clinicians in New York State who manage IRIS in patients with HIV infection. The resulting recommendations are based on an extensive review of the medical literature and reflect consensus.
among the MCCC panel of experts. Each recommendation is rated for strength and for quality of the evidence (see below). If recommendations are based on expert opinion, the rationale for the opinion is included.

<table>
<thead>
<tr>
<th>AIDS Institute HIV Clinical Guidelines Program Recommendations Rating Scheme</th>
</tr>
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<tbody>
<tr>
<td><strong>Strength of Recommendation</strong></td>
</tr>
<tr>
<td>A = Strong</td>
</tr>
<tr>
<td>B = Moderate</td>
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<tr>
<td>C = Optional</td>
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</table>
Manifestations of IRIS

Medical Care Criteria Committee, June 2017

The goal of antiretroviral therapy (ART) in individuals with HIV is immune reconstitution, which may also produce the manifestation of immune reconstitution inflammatory syndrome (IRIS). IRIS, which is also known as immune restoration disease, refers to a disease- or pathogen-specific inflammatory response that may be triggered after ART initiation in treatment-naïve patients, after re-initiation of ART, or after a change to a more effective ART regimen in patients who fail to achieve viral suppression. After a patient starts ART, IRIS may manifest as a worsening of previously diagnosed disease, termed paradoxical IRIS, or as the appearance of a previously undiagnosed disease, termed unmasking IRIS.

➔ TERMINOLOGY

- **IRIS**: An undesirable disease- or pathogen-specific inflammatory response that may be triggered by ART-associated immune system recovery.
- **Immune restoration disease**: Another name for IRIS.
- **Paradoxical IRIS**: Refers to the worsening of a previously diagnosed disease after ART initiation.
- **Unmasking IRIS**: Refers to the appearance of a previously undiagnosed disease following ART initiation.

IRIS is usually accompanied by an increase in CD4 cell count and/or a rapid decrease in viral load. Although most cases of IRIS occur in patients who have low CD4 counts and high viral loads at the time of ART initiation, IRIS can occur at any CD4 count [Muller et al. 2010; Shelburne et al. 2005a, 2005b; Novak et al. 2012; Breton et al. 2004]. It usually presents within the first 4 to 8 weeks after ART initiation but has occurred many weeks later and in sequestered sites, such as bone [McComsey et al. 2012].

Development and Pathogenesis of IRIS

IRIS often presents within the first 4 to 8 weeks after initiation of or a change in ART as mild to moderate disease or symptoms; life-threatening cases are rare [Muller et al. 2010]. Although most cases of IRIS occur in patients who, at the time of ART initiation, have a low CD4 cell count, particularly below 50 cells/mm$^3$, and a high viral load (>100,000 copies/mL) [Muller et al. 2010; Shelburne et al. 2005a, 2005b; Novak et al. 2012; Breton et al. 2004], specific changes in these markers are not required for the diagnosis of IRIS. For example, IRIS may occur without a significant increase in the absolute CD4 count, suggesting that measurements obtained from the peripheral blood may not reflect the number of CD4 cells present at the site of an opportunistic infection (OI) [Haddow et al. 2010b].

Although understanding of the pathogenesis of IRIS, including the inflammatory role of T-regulatory cells and cytokine imbalances [Haddow et al. 2010a; Shankar et al. 2008; Boulware et al. 2010], remains largely speculative, inflammatory reactions to many pathogens have been described, including mycobacteria, fungi, viruses, and bacteria (see Table 3. Major and Minor Presentations of IRIS, below). IRIS that involves worsening symptoms of some malignancies, including Kaposi’s sarcoma (KS) [Feller et al. 2008], and autoimmune phenomena, such as sarcoid [Foulon et al. 2004], also have been documented. IRIS may be more severe in patients with a higher burden of an OI organism, suggesting that antigen load may play a role in pathogenesis [Shelburne et al. 2005a].

Paradoxical IRIS

“Paradoxical IRIS” describes the worsening of previously diagnosed disease after ART is initiated. Epidemiologic data regarding paradoxical IRIS are variable and depend largely on the CD4 cell count and the prevalence and types of OI present at the time of ART initiation. A recent review and meta-analysis of 54 cohort studies from 22 countries that included 13,903 patients initiating ART found that, overall, 13% of patients developed IRIS [Muller et al. 2010]. In 22 studies (41%) that reported participants’ CD4 counts at the start of therapy, CD4 counts were low overall, with a median of 57 cells/mm$^3$ (range, 17 to 174 cells/mm$^3$), and occurrences of IRIS were significantly higher among patients with CD4 counts <50 cells/mm$^3$. Though rates of IRIS were highest in patients with cytomegalovirus (CMV) retinitis (37.7%), it was also observed in patients with cryptococcal meningitis (19.5%), progressive multifocal leukoencephalopathy (16.7%), tuberculosis (TB) (15.7%), herpes zoster (12.2%), and KS (6.4%). As noted in the analysis, the higher occurrences of IRIS associated with CMV retinitis, in particular, were
not surprising because this condition most often occurs at CD4 counts <50 cells/mm$^3$. Significant heterogeneity between studies was also noted, in part, because of non-standardized diagnostic criteria and difficulty in distinguishing IRIS from progression of OIs.

In the United States, the prospective AIDS Clinical Trials Group study A5164 reported IRIS in 7.6% of patients [Grant et al. 2010], and another large multisite U.S. prospective cohort reported an occurrence of 10.6% [Novak et al. 2012]. However, concurrent steroid treatment in some individuals and the studies’ inclusion of low numbers of patients with the OIs that are most commonly associated with IRIS may obscure the true incidence. Retrospective studies have reported a higher occurrence, with IRIS reported in 63% of patients with a history of CMV retinitis [Karavellas et al. 1999] and in 30% to 34% of those with previously diagnosed cryptococcal infection [Shelburne et al. 2005a, 2005b]. Other retrospective studies have reported IRIS in 30% and 31% of patients with TB and Mycobacterium avium complex (MAC), respectively [Shelburne et al. 2005b]. However, the studies were conducted in the era before early treatment, when ART was more often initiated in patients with low CD4 counts, and, as retrospective studies, are more likely to overestimate the incidence of IRIS.

Unmasking IRIS

“Unmasking IRIS” describes the appearance of previously undiagnosed disease after ART is initiated. Data on unmasking IRIS are limited primarily to case reports. A re-analysis of cohort data from 6 European countries and the United States found a significantly increased risk of MAC–IRIS up to 3 months after ART initiation. A slight but statistically nonsignificant increase of IRIS–associated TB, CMV retinitis, herpes simplex virus, KS, and non-Hodgkin lymphoma was reported among patients without HIV infection who had a median CD4 count of 279 cells/mm$^3$ at the time of ART initiation. The epidemiologic patterns for MAC and TB were most consistent with unmasking IRIS [HIV–CAUSAL Collaboration 2014]. In a French study of 47 patients taking ART at the time of TB diagnosis, 11 patients were diagnosed with unmasking TB–IRIS; identified risk factors for unmasking TB–IRIS included African origin, higher baseline RNA, and a strong response to ART [Valin et al. 2010].

Mortality

IRIS is associated with an increased risk of death, with a reported overall mortality rate of 4.5% [Muller et al. 2010; Novak et al. 2012]. However, mortality rates depend on the associated OI, access to treatment, diagnostic criteria, degree of immunosuppression, and geography. In general, the highest mortality rates (13% to 75%) have been reported among patients with IRIS affecting the central nervous system [Muller et al. 2010; Bahr et al. 2013].

References


Timing of ART Initiation in Patients with Recent OIs and Prevention of IRIS

Medical Care Criteria Committee, June 2017

<table>
<thead>
<tr>
<th>RECOMMENDATIONS</th>
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<tbody>
<tr>
<td><strong>Initiating ART</strong></td>
</tr>
<tr>
<td>• Clinicians should recommend that patients initiate antiretroviral therapy (ART) within 2 weeks of beginning treatment for active opportunistic infections (OIs), with exceptions to this recommendation noted below. (A1)</td>
</tr>
<tr>
<td>• Clinicians should consult with a provider experienced in managing HIV in the setting of active OIs to determine when to initiate ART in patients with tuberculosis (TB) meningitis, extrapulmonary TB, cytomegalovirus (CMV) retinitis, or cryptococcal infection. (A3)</td>
</tr>
<tr>
<td>• For patients with CD4 counts &lt;100 cells/mm$^3$ or known concomitant OIs who are initiating ART, clinicians should be vigilant for the signs and symptoms of IRIS and should educate patients about the risk of developing IRIS. (A3)</td>
</tr>
<tr>
<td>• For patients with HIV who have hepatitis B virus (HBV) or hepatitis C virus (HCV) co-infection, clinicians should:</td>
</tr>
<tr>
<td>▫ Measure transaminase levels before initiation of ART, at 6 and 12 weeks after initiation, and at least every 6 months thereafter to monitor for possible IRIS. (A3)</td>
</tr>
<tr>
<td>▫ Refer patients with elevated transaminase levels in conjunction with jaundice, elevated bilirubin levels, or loss of synthetic function for evaluation by a hepatologist. (B3)</td>
</tr>
</tbody>
</table>

Because ART is key to recovery of immune function, the benefits of early ART initiation outweigh the risks of IRIS under most circumstances [Grant et al. 2010; The HIV–CAUSAL Collaboration 2014]. Clinicians should strongly recommend that patients being treated for any of the following active infections initiate ART within 2 weeks of starting OI treatment or as soon as the patient is clinically stable on OI therapy and the potential for drug–drug interactions has been minimized:
• Cryptosporidiosis.
• Microsporidiosis.
• Progressive multifocal leukoencephalopathy.
• Kaposi’s sarcoma (KS).
• *Pneumocystis jiroveci* pneumonia—formerly known as *Pneumocystis carinii*
• HBV infection.
• HCV infection.
• Any other serious bacterial infection.

The optimal timing for ART initiation is not well established for other OIs, including TB meningitis, extrapulmonary TB, CMV retinitis, and cryptococcal meningitis, as described below. Clinicians should consult with a care provider experienced in the management of ART in patients with these infections.

<table>
<thead>
<tr>
<th>KEY POINTS</th>
</tr>
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<tbody>
<tr>
<td>• Before initiating ART in patients who have TB meningitis, extrapulmonary TB, CMV retinitis, or cryptococcal infection, clinicians should consult with a care provider who is experienced in managing the care of patients with HIV in the setting of active OIs.</td>
</tr>
<tr>
<td>• The Clinical Education Initiative (CEI) line, which is available through the New York State Department of Health CEI, provides access to providers with experience in managing all aspects of HIV infection: 866–637–2342.</td>
</tr>
</tbody>
</table>
### Table 2. Summary of Recommendations Regarding Timing of ART Initiation

<table>
<thead>
<tr>
<th>Opportunistic Infection (OI)</th>
<th>Timing of ART Initiation After Starting OI Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cryptosporidiosis</td>
<td>Within 2 weeks of starting treatment for an OI or as soon as the patient is clinically stable</td>
</tr>
<tr>
<td>• Microsporidiosis</td>
<td></td>
</tr>
<tr>
<td>• Progressive multifocal leukoencephalopathy (PML)</td>
<td></td>
</tr>
<tr>
<td>• Kaposi’s sarcoma (KS)</td>
<td></td>
</tr>
<tr>
<td>• Pneumocystis jiroveci pneumonia (formerly PCP)</td>
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<tr>
<td>• Hepatitis B virus (HBV) infection</td>
<td></td>
</tr>
<tr>
<td>• Hepatitis C virus (HCV) infection</td>
<td></td>
</tr>
<tr>
<td>• Pulmonary tuberculosis (TB)</td>
<td></td>
</tr>
<tr>
<td>• Other serious bacterial infections</td>
<td></td>
</tr>
<tr>
<td>Pulmonary TB</td>
<td>• CD4 count &gt;50 cells/mm³: Initiate ART as soon as the patient is clinically stable after initiating TB therapy, but no more than 12 weeks later</td>
</tr>
<tr>
<td></td>
<td>• CD4 count &lt;50 cells/mm³: Initiate ART within the first 2 weeks after initiating TB therapy</td>
</tr>
<tr>
<td>Extrapulmonary TB</td>
<td>Optimal timing has not been established; consult with an experienced HIV care provider</td>
</tr>
<tr>
<td>TB meningitis</td>
<td>Optimal timing has not been established; consult with an experienced HIV care provider</td>
</tr>
<tr>
<td>Cryptococcal meningitis</td>
<td>• Delay 2 to 10 weeks after starting antifungal therapy</td>
</tr>
<tr>
<td></td>
<td>• Optimal timing has not been established; consult with an experienced HIV care provider</td>
</tr>
<tr>
<td>Cryptococcal infection other than meningitis</td>
<td>• Delay at least 2 weeks after starting antifungal therapy</td>
</tr>
<tr>
<td></td>
<td>• Optimal timing has not been established; consult with an experienced HIV care provider</td>
</tr>
<tr>
<td>CMV retinitis</td>
<td>• Immediate ART is not recommended</td>
</tr>
<tr>
<td></td>
<td>• Optimal timing has not been established; consult with an experienced HIV care provider</td>
</tr>
</tbody>
</table>

See NYSDOH AI definition of an experienced HIV care provider.

Prevention of complications associated with IRIS involves careful monitoring, particularly in patients with low CD4 counts and a past or current history of co-infections. After initiating ART in patients at highest risk for IRIS, including those with CD4 counts <100 cells/mm³ or known concomitant OIs, clinicians should be vigilant for signs and symptoms of IRIS, which are described in more detail in Presentation and Diagnosis of IRIS. These patients should be counseled about the risk of developing IRIS at the time of ART initiation. To promote trust in the treatment plan and adherence to ART, patients should be informed that starting ART could lead to an initial worsening of OI symptoms or the appearance of a previously undiagnosed OI (e.g., herpes zoster).

**References**


Pulmonary TB

Medical Care Criteria Committee, June 2017

RECOMMENDATIONS

Pulmonary TB

- For patients with pulmonary TB, clinicians should initiate ART as follows:
  - CD4 counts ≥50 cells/mm$^3$: As soon as patients are clinically stable on anti-TB therapy and no later than 12 weeks after initiating anti-TB therapy. (A1)
  - CD4 counts <50 cells/mm$^3$: Within the first 2 weeks after initiating anti-TB therapy. (A1)
- For patients with pulmonary TB who are ART-naïve, who have a CD4 count <100 cells/mm$^3$, and who started on anti-TB treatment within the last 30 days, clinicians should initiate prednisone 40 mg daily for 14 days, followed by 20 mg daily for 14 days at the time of ART initiation. (B1)

IRIS has been described in 8% to 51% of patients with HIV and TB after initiation of ART [Haddow et al. 2010; Meintjes et al. 2008; Narendran et al. 2013] with a reported overall mortality rate of 2% [Namale et al. 2015]. In determining the timing of ART initiation in patients with HIV/TB co-infection, the risk of TB-IRIS and the overlapping toxicity, potential drug–drug interactions, and adherence challenges of multidrug therapy for HIV and TB warrant careful consideration.

Several studies have assessed the optimal timing of ART initiation during treatment for pulmonary TB [Abdool Karim et al. 2010; Blanc et al. 2011; Havlir et al. 2011; Mfinanga et al. 2014; Manosuthi et al. 2012; Sinha et al. 2012; Amogne et al. 2015]. Results of a recent meta-analysis comparing ART initiation at 1 to 4 weeks after starting TB treatment with ART initiation at 8 to 12 weeks after starting TB treatment indicate that early ART reduced overall mortality. However, the decrease was statistically significant only in the subgroup of patients with CD4 counts <50 cells/mm$^3$. Early ART doubled the incidence of TB-IRIS irrespective of CD4 count. The authors concluded that although early ART improves survival for patients with low CD4 counts, not enough evidence is available to support or refute a survival benefit from early ART in patients with pulmonary TB who have CD4 counts >50 cells/mm$^3$. Further studies are needed to more definitively determine the CD4 count threshold below which the mortality benefit supports early initiation of ART [Uthman et al. 2015].

Two trials compared ART initiation during TB treatment with deferral until after completion of TB treatment. The SAPIT trial (n = 642) in South Africa [Abdool Karim et al. 2010], which evaluated patients with smear-positive TB, was stopped early because the mortality rate in the group that initiated ART during TB treatment was 56% lower than in the deferred group. The survival benefit of initiating ART before completing TB treatment was observed in all ranges of CD4 counts but was highest in patients with CD4 counts <50 cells/mm$^3$. Although the incidence of IRIS was much higher in patients who initiated ART early, it was mostly mild and was outweighed by the other benefits of early treatment. The subsequent TB–HAART trial (n = 1,675), conducted in South Africa, Tanzania, Uganda, and Zambia [Mfinanga et al. 2014], compared initiation of ART after 2 weeks of TB treatment with ART initiation deferred until after completion of 6 months of TB treatment in patients with CD4 counts >220 cells/mm$^3$. More grade 3 and 4 adverse events were reported among those with early ART initiation, with no difference in mortality or IRIS incidence between early and deferred ART.

Although early ART increases the risk of TB-associated IRIS, this risk should be weighed against the survival benefit of early HIV treatment given a patient’s CD4 count. Overall, these studies indicate that when a patient’s CD4 count is <50 cells/mm$^3$, ART should be initiated in the second week after starting treatment for pulmonary TB [Amogne et al. 2015]. The benefits of early ART initiation in patients with active TB and very low CD4 counts (<50 cells/mm$^3$) likely outweigh the risks for morbidity associated with TB–IRIS [Lawn et al. 2007; Battegay et al. 2008].

To decrease the risk of IRIS, initiation of ART may be safely delayed up to 12 weeks after starting TB therapy in patients with CD4 counts of ≥50 cells/mm$^3$. Careful monitoring for IRIS, and timely treatment if it occurs, may significantly reduce morbidity associated with TB–IRIS; it may also ensure that other risks associated with severe immunosuppression (CD4 counts <50 cells/mm$^3$) are managed effectively with ART.
A recent pilot study of 240 patients enrolled in the PredART trial demonstrated that prednisone initiated around the time of ART initiation reduced the risk of IRIS in patients receiving TB treatment [Meintjes et al. 2017]. ART-naïve adults with HIV infection, CD4 counts <100 cells/mm³, who were on confirmed treatment for TB were randomized to receive either 40 mg per day of prednisone for 2 weeks followed by 20 mg per day of prednisone for 2 weeks or placebo. The prednisone and ART were initiated on the same day and were initiated within 30 days of the start of TB treatment. Use of corticosteroids was allowed to treat IRIS if it developed. Patients with rifampin resistance, central nervous system (CNS) TB, KS, HBVsAg+, or poor adherence were excluded from the study. In patients receiving prednisone, TB-IRIS was reduced by 30% (47% vs 28%; RR 0.7, p 0.02) and subsequent use of corticosteroids to treat IRIS was reduced by 53% (28% vs 13%; RR 0.47). Grade 3 adverse events were reduced from 45% to 29% (p 0.01), and there were fewer hospitalizations in patients who received prednisone. The prednisone was well tolerated, and there were no additional infections or malignancies in patients receiving prednisone compared with those receiving placebo.

References


TB Meningitis and Extrapulmonary TB

Medical Care Criteria Committee, June 2017

✓ RECOMMENDATION

TB Meningitis or Extrapulmonary TB

- For patients with TB meningitis or extrapulmonary TB, clinicians should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)

Compared with non-CNS-related diseases, IRIS-associated TB meningitis has a higher mortality rate [Marais et al. 2013]. The optimal timing of ART initiation in patients treated for TB meningitis or extrapulmonary TB remains unclear. In a randomized controlled trial, initiation of ART within 7 days was not associated with increased survival for patients with TB meningitis compared with delaying treatment for 2 months. Although the incidence of severe (grade 3 and 4) adverse events was similar in the two groups, early initiation of ART was associated with a higher incidence of the most severe (grade 4) adverse events [Torok et al. 2011]. A two- to nine-fold increased risk of development of IRIS has been described for patients with extrapulmonary TB after ART initiation [Namale et al. 2015]; however, insufficient data are available to guide timing of ART initiation.

References


Cryptococcal Meningitis
Medical Care Criteria Committee, June 2017

RECOMMENDATIONS

Cryptococcal Meningitis

- Clinicians should treat ART-naive patients diagnosed with cryptococcal meningitis with standard antifungal therapy and should:
  - Delay ART initiation until the patient has completed at least 2 weeks of antifungal treatment. (A1)
  - Consult with an experienced HIV care provider to determine optimal timing for ART initiation. (A3)
- If the patient initiates ART before completing 10 weeks of antifungal therapy, the clinician should monitor closely for intracranial pressure and other signs and symptoms of IRIS and manage intracranial pressure aggressively. (A2)
- For patients with other types of cryptococcal infection (not meningitis), clinicians should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)

With rapid immune reconstitution in patients with cryptococcal meningitis, there is a risk of increased inflammatory response in the meninges that can lead to paradoxical worsening of the symptoms and, sometimes, death. Paradoxical IRIS was noted in 6% to 45% of patients with cryptococcal meningitis following ART initiation [Longley et al. 2013]. Most cases occurred within the first 1 to 2 months, but some occurred 6 to 9 months later. The presentation of cryptococcal IRIS may mimic aseptic meningitis and can be difficult to distinguish from progression of cryptococcal disease associated with treatment failure [Haddow et al. 2010; Bicanic et al. 2009; Boulware 2010].

KEY POINTS

- Steroids should not be used routinely as induction therapy in treatment of cryptococcal IRIS.
- Steroids are not effective in reducing intracranial pressure.

The optimal timing of ART initiation in patients with cryptococcal meningitis is controversial, with inconclusive study results among the four trials conducted to date. In two studies, initiation of ART within 2 weeks of diagnosis was observed to be safe but without significant improvement in survival [Zolopa et al. 2009; Bisson et al. 2013]. In contrast, two clinical trials were stopped early because of a high mortality rate in the early ART arm [Makadzange et al. 2010; Boulware et al. 2014]. In a study from Zimbabwe of 54 patients with cryptococcal meningitis, administration of ART within 72 hours of diagnosis resulted in higher mortality than when ART was deferred for 10 or more weeks [Makadzange et al. 2010]. The more recent and larger COAT trial involving 177 ART-naïve patients with HIV infection and cryptococcal meningitis in Uganda and South Africa was also stopped early because of a 15% higher mortality in the group randomized to ART initiation within 2 weeks compared with delaying treatment by at least 5 weeks [Boulware et al. 2014]. However, interpretation of results is limited because neither trial included flucytosine in the cryptococcal treatment regimen [Scriven et al. 2015].

Until further studies are available to definitively determine the optimal time for ART initiation for patients with cryptococcal meningitis, treatment should be delayed for at least 2 weeks (after completion of antifungal therapy induction phase) and possibly for up to 10 weeks (after completion of both induction and consolidation phases of antifungal therapy), particularly in those with increased intracranial pressure or low cerebral spinal fluid white blood cell counts. If ART is started before 10 weeks, clinicians should be vigilant for signs and symptoms of IRIS and aggressively manage any complications. The optimal timing for initiation of ART for other forms of cryptococcosis is also unclear; it is recommended to delay ART initiation for at least 2 weeks after starting antifungal therapy [McComsey et al. 2012].
References


CMV Retinitis
Medical Care Criteria Committee, June 2017

✅ RECOMMENDATIONS

CMV Retinitis

-Clinicians should ensure that patients with HIV who have CD4 counts <100 cells/mm³ receive dilated ophthalmologic examination to assess for signs of CMV before initiation of ART. (A2)
- Clinicians should not initiate ART immediately in patients with CMV retinitis (A2) but should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)
- Clinicians should ensure that after initiating ART, patients with a history of CMV retinitis are monitored by dilated ophthalmologic examination to assess for possible IRIS as follows:
  - Every 3 months for the first year after initiation of ART. (A3)
  - Immediately if there is a change in visual acuity or development of floaters. (A2)

Immediate initiation of ART is not recommended based on the results of a controlled study that reported a lower prevalence and severity of immune recovery uveitis in patients with deferred initiation of ART [Ortega-Larrocea et al. 2005]. The optimal timing for initiation of ART in patients treated for CMV retinitis has not been definitively established. The overall incidence of CMV-IRIS has declined to an estimated 2.7 to 3.6 per 100 person-years in recent years [Jabs et al. 2010], and the risk of IRIS should be weighed against the risk of developing other OIs due to delay in ART initiation.

To avoid the possible devastating effects of CMV-IRIS, all patients with HIV infection who have CD4 counts <100 cells/mm³ should be screened for signs of CMV by dilated ophthalmologic examination before initiation of ART. Consideration should be given to deferring ART until after completion of induction therapy.

Even if receiving treatment, patients with a history of CMV retinitis should receive a dilated ophthalmologic examination every 3 months for the first year after initiation of ART and immediately if there is a change in visual acuity or development of floaters. Cases of CMV-IRIS myelopathy that respond to steroids have been reported, as have cases of CMV-IRIS colitis [Acosta et al 2008; von Buth et al. 2008]. (See DHHS > Guidelines for Prevention and Treatment of OIs in HIV-Infected Adults and Adolescents > CMV Disease for more information.).

References


Presentation and Diagnosis of IRIS
Medical Care Criteria Committee, June 2017

✓ RECOMMENDATIONS

Diagnosing IRIS

▪ Clinicians should include immune reconstitution inflammatory syndrome (IRIS) as part of the differential diagnosis when inflammatory signs or symptoms occur following recent initiation of, re-initiation of, or a change to an antiretroviral therapy (ART) regimen. (A3)

▪ In assessing patients for IRIS, clinicians should exclude HIV disease progression, new infections, and drug reactions as underlying causes for inflammatory signs or symptoms. (A3)

Table 3, below, describes major and minor clinical presentations of IRIS. Proposed case definitions do not provide clear consensus on the many manifestations of IRIS [Haddow et al. 2010a, 2010b; Meintjes et al. 2008; Bicanic et al. 2009; French et al. 2004; Roberston et al. 2006; Shelburne et al. 2006]. Common features are clinical deterioration after ART initiation and localized tissue inflammation, with or without a systemic inflammatory response [Walker et al. 2015], but the presentation of IRIS varies depending on the underlying opportunistic infection (OI) or illness. The majority of IRIS cases occur within 4 to 8 weeks after initiation of or a change in ART [Shelburne et al. 2005b; Novak et al. 2012; Breton et al. 2004]. However, cases have been reported as early as 3 days or as late as several months, or, rarely, several years, after ART initiation [Haddow et al. 2010b; Shelburne et al. 2005b; Novak et al. 2012; Valin et al. 2010; Rambeloarisoa et al. 2002; Lortholary et al. 2005; Letang et al. 2013]. Late manifestations of IRIS (>7 months) may be atypical, such as osteomyelitis resulting from Mycobacterium avium complex [Aberg et al. 2002].

A definitive diagnostic test is not available for IRIS; therefore, diagnosis is based largely on clinical judgment, which may be challenged by the broad array of IRIS signs and symptoms and the presence of multiple OIs. A rise in CD4 count is often present in IRIS cases but is not a required criterion for diagnosis [Haddow et al. 2010a, 2010b; Meintjes et al. 2008; Robertson et al. 2006; Walker et al. 2015]; therefore, absence of an increase in absolute CD4 count should not exclude the possibility of IRIS during a paradoxical response to treatment of an OI.

In patients who were responding favorably to OI treatment prior to ART initiation, but who worsen after, the differential diagnosis includes OI treatment toxicity, OI drug resistance, poor OI treatment adherence, or development of a new OI. Development of a new OI after ART initiation of ART may be attributable to unmasking IRIS or to the effects of persistent immune compromise [Walker et al. 2015].

<table>
<thead>
<tr>
<th>Underlying OI</th>
<th>IRIS Signs/Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Presentations</td>
<td></td>
</tr>
</tbody>
</table>
| Tuberculosis (TB) | • Patients responding to TB treatment may have worsening of pulmonary symptoms, X-ray findings that suggest worsening of TB disease, enlarging lymph nodes causing airway obstruction, or meningeal symptoms  
• Enlarging tuberculoma or pericardial effusions have been described [Meintjes et al. 2008]  
• TB-IRIS can also result in hepatotoxicity, which may be difficult to distinguish from medication-induced toxicity [Lawn et al. 2007]  
• TB-IRIS may occur in patients with undiagnosed multidrug-resistant TB [Meintjes et al. 2009] |
| Mycobacterium avium complex (MAC) | • May present as pulmonary disease or systemic inflammation that is indistinguishable from active MAC  
• Atypical presentations, such as localized lymphadenitis or endobronchial mass lesions, may occur [Lawn et al. 2005a]; osteomyelitis is an atypical late manifestation [Aberg et al. 2002]  
• Patients with MAC-IRIS may not be bacteremic and may have no known history of MAC diagnosis [Lawn et al. 2005a] |
### Table 3. Major and Minor Presentations of Immune Reconstitution Inflammatory Syndrome (IRIS), continued

<table>
<thead>
<tr>
<th>Underlying OI</th>
<th>IRIS Signs/Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Presentations</strong></td>
<td></td>
</tr>
<tr>
<td>Cryptococcal meningitis</td>
<td>Usually presents as worsening of meningitis symptoms [Rambeloarisoa et al. 2002; Lortholary et al. 2005; Shelburne et al. 2005a; Kambugu et al. 2008; Lawn et al. 2005b; Gray et al. 2005], including possible rapid hearing and/or vision loss, ataxia, and/or elevated intracranial pressure</td>
</tr>
</tbody>
</table>
| Cytomegalovirus (CMV) retinitis | • Presents as retinitis, vitritis, or uveitis (variable timing, with median time to immune reconstitution vitritis 20 weeks after ART initiation in one study) [Karavellas et al. 1999]:  
  ▫ Retinitis is inflammation that is usually at the site of previous CMV retinitis lesions  
  ▫ Uveitis and vitritis are the presence of inflammatory cells in the eye as a result of IRIS and may help to distinguish IRIS from active CMV retinitis [Karavellas et al. 1999]  
  ▫ CMV-IRIS in the eye can cause rapid and permanent vision loss |
| Hepatitis B or C virus | • Transient elevations in transaminases may occur after initiation of ART with immune reconstitution and can be difficult to distinguish from drug-induced hepatitis [Anderson et al. 2010; Drake et al. 2004; Crane et al. 2009; Knopnicki et al. 2005; Perrella et al. 2006]  
  • Hepatic flares are usually mild and self-limited but can result in decompensation in someone with preexisting cirrhosis [Anderson et al. 2010; Drake et al. 2004; Crane et al. 2009; Knopnicki et al. 2005; Perrella et al. 2006] |
| Progressive multifocal leukoencephalopathy (PML) | PML lesions may be unmasked or worsen and could appear as new or worsening focal neurologic deficits or lesions on MRI [Gray et al. 2005; Safdar et al. 2002; Tan et al. 2009] |
| Kaposi’s sarcoma (KS) | • Presents as worsening of KS  
  • Cutaneous lesions are the most common presentation; other signs include lymphedema and oral, gastric, lung, genital, or conjunctival lesions [Meintjes et al. 2008; Leidner et al. 2005]  
  • Fatal cases of KS-IRIS have been reported [Stover et al. 2012; Odongo 2013] |
| Cerebral toxoplasmosis | May present as cerebral abscess (also known as toxoplasmosis encephalitis) or, rarely, diffuse encephalitis or chorioretinitis [Bowen et al. 2016] |
| Autoimmune diseases | • Preexisting sarcoidosis may be exacerbated [Foulon et al. 2004]  
  • Late presentations of Grave’s disease have been reported 8 to 33 months after ART initiation [Rasul et al. 2011] |
| **Minor Presentations** |
| Herpes simplex virus (HSV) and varicella zoster virus (VZV) | • HSV and VZV can reactivate after initiation of ART, even in patients without previously diagnosed disease  
  • Presentations are usually similar to non-IRIS disease; however, IRIS may worsen a patient’s symptoms |
| Nonspecific dermatologic complications | A number of dermatologic manifestations, such as folliculitis and oral and genital warts, may appear or worsen during immune reconstitution |
References


Odongo FC. Fatal Disseminated Kaposi’s Sarcoma due to Immune Reconstitution Inflammatory Syndrome following HAART Initiation. *Case Rep Infect Dis* 2013;2013:546578. [PMID: 23936695]


Management and Treatment of IRIS

Medical Care Criteria Committee, June 2017

✓ RECOMMENDATIONS

Management and Treatment

▪ Clinicians should initiate appropriate treatment of opportunistic infections (OIs), as well as symptomatic treatment and supportive care according to the severity of immune reconstitution inflammatory syndrome (IRIS). (A3)

▪ Clinicians should not interrupt antiretroviral therapy (ART) except in severe, life-threatening cases of IRIS. (A3)

Severe IRIS

▪ Clinicians should consult with an experienced HIV care provider for the management of severe IRIS, including the decision of whether to interrupt ART if IRIS is severe. (A3)

▪ Clinicians should treat patients with severe IRIS that is not caused by either cryptococcal meningitis or Kaposi’s sarcoma (KS) with 1 to 2 mg/kg prednisone, or the equivalent, for 1 to 2 weeks, followed by a period of tapering dose that is individualized. (B3)

▪ Clinicians should not use corticosteroids for management of cryptococcal meningitis or in patients with KS. (A2)

▪ Clinicians should closely monitor patients receiving corticosteroids for the development of OIs, including cytomegalovirus (CMV) retinitis and TB disease. (A3)

Whenever IRIS is suspected, initial efforts should focus on diagnosing and treating the underlying OI. IRIS resolves over time in most patients, and if not severe, symptomatic treatment is often sufficient.

Mild IRIS

When minor IRIS presentations occur, clinicians can reassure patients that symptoms are an indication of immune reconstitution rather than progression of HIV disease and will resolve with standard treatment. In addition to standard therapy for the underlying OI to reduce pathogen load, the following treatments may alleviate inflammation in patients with mild IRIS:

▪ Nonsteroidal anti-inflammatory agents for discomfort associated with mild inflammation or fevers.

▪ Drainage of abscesses.

▪ Excision of inflamed and painful lymph nodes.

▪ Inhaled steroids for bronchospasm or cough associated with mild pulmonary inflammation.

Severe IRIS

Severe IRIS may threaten a patient’s functional status or may cause permanent disability. Examples of this are a decline in pulmonary capacity from tuberculosis (TB) or Mycobacterium avium complex (MAC) infection, neurologic complications from cryptococcal infection, or vision loss from CMV retinitis infection.

Corticosteroid therapy to suppress inflammatory response is the most commonly used intervention in cases of severe IRIS. Studies to determine the effectiveness of corticosteroid treatment are limited. A small (n = 8) randomized, placebo-controlled trial demonstrated benefits of corticosteroids for paradoxical TB-IRIS [Meintjes et al. 2010], and a study of patients with MAC-IRIS (n = 9) demonstrated clinical response to prednisone [Phillips et al. 2005]. No trials on which to base a recommended dose of corticosteroids have been conducted, but this Committee recommends 1 to 2 mg/kg prednisone, or the equivalent, for 1 to 2 weeks, followed by a period of tapering dose that is individualized. If a flare of symptoms occurs during or at the end of the steroid taper, the dose may be increased and the taper slowed, and the patient should be assessed for possible disease progression due to failure of treatment.
The risks of corticosteroid therapy should be weighed against the severity of the IRIS manifestations and the potential benefits, particularly given the high prevalence of type 2 diabetes, hypertension, and mental health disorders among patients with HIV. Risks of corticosteroid therapy include the following:

- Hyperglycemia.
- Hypertension.
- Mental status changes.
- Avascular necrosis.
- Worsening of an existing infection.
- Predisposition to a new infection.

Except in the most severe cases, ART should not be interrupted in patients with IRIS. Discontinuation of ART can be considered in life-threatening cases in which corticosteroids did not result in improvement, usually associated with central nervous system (CNS)-IRIS. Risks of stopping combination ART include acquisition of new OIs and recurrence of IRIS when therapy is later restarted. HIV drug resistance may also be a theoretical concern. The decision to stop ART should be made in consultation with an experienced HIV care provider if possible.

**KEY POINT**

- ART should not be interrupted in patients with IRIS except in life-threatening cases, usually associated with CNS-IRIS, in which corticosteroids did not result in improvement.

In cases of cryptococcal-IRIS with worsening meningitis symptoms, including cranial nerve defects, hearing, or vision changes, therapeutic lumbar puncture can be used to lower intracranial pressure. Corticosteroids are not recommended for treatment of cryptococcal meningitis in patients with HIV. A trial of treatment of HIV-associated cryptococcal meningitis with dexamethasone was stopped because of the high incidence of adverse events and disability observed in the treatment arm compared with placebo [Beardsley et al. 2016].

Corticosteroids are associated with increased risk of development of new KS or worsening of pre-existing disease among patients with HIV [Volkow et al. 2008; Elliott et al. 2005; Gill et al. 1989]. Treatment of CMV vitritis with intraocular steroids has been described [Schrier et al. 2006] but has not been useful in uveitis.

There are limited case reports of improvement in clinical symptoms following treatment with thalidomide and other immunomodulators (pentoxifylline, chloroquine, TNF-α inhibitors, leukotriene antagonists) in patients with severe disease [Marais et al. 2009; Meintjes et al. 2012; Brunel et al. 2012; Fourcade et al. 2014; Hardwick et al. 2006]. However, data are insufficient to recommend the use of these alternative therapies.

The CCR5 inhibitor maraviroc has been used for treatment of progressive multifocal leukoencephalopathy-associated IRIS because direct treatment for JC virus is not available to lower the pathogen burden and treatment with corticosteroids may dampen the immune response. However, case reports indicate mixed success [Martin-Blondel et al. 2009; Giacomini et al. 2014; Rodriguez et al. 2014], and a recent randomized, placebo-controlled trial found that maraviroc was not effective for prevention of IRIS in patients starting ART with CD4 count <100 cells/mm³ and HIV RNA >1,000 copies/ml [Sierra-Madero et al. 2014].

For further OI-specific guidance on management of IRIS, see DHHS > Guidelines for Prevention and Treatment of Opportunistic Infections [McComsey et al. 2012].

**References**


All Recommendations

Medical Care Criteria Committee, June 2017

✓ ALL RECOMMENDATIONS

Initiating ART

- Clinicians should recommend that patients initiate antiretroviral therapy (ART) within 2 weeks of beginning treatment for active opportunistic infections (OIs), with exceptions to this recommendation noted below. (A1)
- Clinicians should consult with a provider experienced in managing HIV in the setting of active OIs to determine when to initiate ART in patients with tuberculosis (TB) meningitis, extrapulmonary TB, cytomegalovirus (CMV) retinitis, or cryptococcal infection. (A3)
- For patients with CD4 counts <100 cells/mm³ or known concomitant OIs who are initiating ART, clinicians should be vigilant for the signs and symptoms of IRIS and should educate patients about the risk of developing IRIS. (A3)
- For patients with HIV who have hepatitis B virus (HBV) or hepatitis C virus (HCV) co-infection, clinicians should:
  - Measure transaminase levels before initiation of ART, at 6 and 12 weeks after initiation, and at least every 6 months thereafter to monitor for possible IRIS. (A3)
  - Refer patients with elevated transaminase levels in conjunction with jaundice, elevated bilirubin levels, or loss of synthetic function for evaluation by a hepatologist. (B3)

Pulmonary TB

- For patients with pulmonary TB, clinicians should initiate ART as follows:
  - CD4 counts ≥50 cells/mm³: As soon as patients are clinically stable on anti-TB therapy and no later than 12 weeks after initiating anti-TB therapy. (A1)
  - CD4 counts <50 cells/mm³: Within the first 2 weeks after initiating anti-TB therapy. (A1)
- For patients with pulmonary TB who are ART-naive, who have a CD4 count <100 cells/mm³, and who started on anti-TB treatment within the last 30 days, clinicians should initiate prednisone 40 mg daily for 14 days, followed by 20 mg daily for 14 days at the time of ART initiation. (B1)

TB Meningitis or Extrapulmonary TB

- For patients with TB meningitis or extrapulmonary TB, clinicians should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)

Cryptococcal Meningitis

- Clinicians should treat ART-naive patients diagnosed with cryptococcal meningitis with standard antifungal therapy and should:
  - Delay ART initiation until the patient has completed at least 2 weeks of antifungal treatment. (A1)
  - Consult with an experienced HIV care provider to determine optimal timing for ART initiation. (A3)
- If the patient initiates ART before completing 10 weeks of antifungal therapy, the clinician should monitor closely for intracranial pressure and other signs and symptoms of IRIS and manage intracranial pressure aggressively. (A2)
- For patients with other types of cryptococcal infection (not meningitis), clinicians should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)

CMV Retinitis

- Clinicians should ensure that patients with HIV who have CD4 counts <100 cells/mm³ receive dilated ophthalmologic examination to assess for signs of CMV before initiation of ART. (A2)
- Clinicians should not initiate ART immediately in patients with CMV retinitis (A2) but should consult with an experienced HIV care provider to determine the timing of ART initiation. (A3)
- Clinicians should ensure that after initiating ART, patients with a history of CMV retinitis are monitored by dilated ophthalmologic examination to assess for possible IRIS as follows:
  - Every 3 months for the first year after initiation of ART. (A3)
  - Immediately if there is a change in visual acuity or development of floaters. (A2)
Diagnosing IRIS
• Clinicians should include immune reconstitution inflammatory syndrome (IRIS) as part of the differential diagnosis when inflammatory signs or symptoms occur following recent initiation of, re-initiation of, or a change to an antiretroviral therapy (ART) regimen. (A3)
• In assessing patients for IRIS, clinicians should exclude HIV disease progression, new infections, and drug reactions as underlying causes for inflammatory signs or symptoms. (A3)

Management and Treatment
• Clinicians should initiate appropriate treatment of opportunistic infections (OIs), as well as symptomatic treatment and supportive care according to the severity of immune reconstitution inflammatory syndrome (IRIS). (A3)
• Clinicians should not interrupt antiretroviral therapy (ART) except in severe, life-threatening cases of IRIS. (A3)

Severe IRIS
• Clinicians should consult with an experienced HIV care provider for the management of severe IRIS, including the decision of whether to interrupt ART if IRIS is severe. (A3)
• Clinicians should treat patients with severe IRIS that is not caused by either cryptococcal meningitis or Kaposi’s sarcoma (KS) with 1 to 2 mg/kg prednisone, or the equivalent, for 1 to 2 weeks, followed by a period of tapering dose that is individualized. (B3)
• Clinicians should not use corticosteroids for management of cryptococcal meningitis or in patients with KS. (A2)
• Clinicians should closely monitor patients receiving corticosteroids for the development of OIs, including cytomegalovirus (CMV) retinitis and TB disease. (A3)
Guideline Committee and Development
June 2017

NYSDOH AIDS Institute Medical Care Criteria Committee (MCCC)

The New York State Department of Health (NYSDOH) AIDS Institute (AI) protects and promotes the health of NYS’s diverse population through disease surveillance and the provision of quality services for prevention, health care, and psychosocial support for those affected by HIV/AIDS, sexually transmitted diseases, viral hepatitis, and related health concerns. In addition, the NYSDOH AI promotes the health of LGBT populations, substance users, and the sexual health of all New Yorkers. To update its existing (2009) guideline on immune reconstitution inflammatory syndrome in patients with HIV infections, the AIDS Institute clinical guidelines program prioritized development of this updated guideline on Management of IRIS.

Committee makeup: Members of the Medical Care Criteria Committee (MCCC) (see Box A1: MCCC Leaders, Members, and IRIS Guideline Reviewers) were appointed by the NYSDOH AI to ensure representation of clinical practice in all major regions of the state, relevant medical disciplines and sub-specialties, key NYS agencies, community stakeholders, and patient advocates. Individuals confirmed as Committee members are required to disclose any potential conflicts of interest; disclosures are reviewed and approved by the NYSDOH AIDS Institute Office of the Medical Director (see Funding and Financial Disclosure of Potential Conflicts of Interest, below).

Committee role: Committee members actively participate in guideline development, including evidence review, drafting of recommendations and text, manuscript review, consensus approval of all recommendations, and rating of recommendations.

Committee leadership: Working with the lead author, the MCCC Planning Group of Committee leaders reviewed and refined the manuscript, facilitated consensus approval of all recommendations, and addressed feedback from external peer and consumer reviewers.

Johns Hopkins University (JHU) editorial role: The JHU editorial team coordinated, guided, and documented all Committee activities, and edited the guideline material for clarity, flow, and style.

MCCC Planning Group for IRIS at the time of guideline publication (all Committee members and reviewers are listed in Box A1, below)

- Samuel T. Merrick, MD, Chair
- Joseph P. McGowan, MD, FACP, FIDSA, Vice-Chair
- Judith A. Aberg, MD, FIDSA, FACP, Chair Emeritus
- Charles J. Gonzalez, MD, AIDS Institute Deputy Medical Director
- Christopher J. Hoffmann, MD, MPH, JHU Principal Investigator
- Steven M. Fine, MD, PhD, Lead Author

JHU Editorial and Program Management Team

- Mary Beth Hansen, MA, Project Director
- Christina Norwood, MS, ELS, Senior Editor
- Johanna Gribble, MA, Medical Editor
- Jen Ham, MPH, Medical Editor
- Jesse Ciekot, Program Coordinator
Box A1. MCCC Leaders, Members, and IRIS Guideline External Reviewers

Guideline Program Leadership
- **Medical Director:** Bruce D. Agins, MD, MPH, New York State Department of Health AIDS Institute, New York, NY
- **Deputy Director:** Lyn C. Stevens, MS, NP, ACRN, New York State Department of Health AIDS Institute, Albany, NY
- **Principal Investigator:** Christopher J. Hoffmann, MD, MPH, Johns Hopkins University School of Medicine, Baltimore, MD

Medical Care Criteria Committee Leadership
- **Chair:** Samuel T. Merrick, MD, New York–Presbyterian Hospital, New York, NY
- **Vice-Chair:** Joseph P. McGowan, MD, FACP, FIDSA, North Shore University Hospital, Manhasset, NY
- **Chair Emeritus:** Judith A. Aberg, MD, FIDSA, FACP, Icahn School of Medicine at Mount Sinai, New York, NY

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- Elliot DeHaan, MD, SUNY Downstate Medical Center, Brooklyn, NY
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- Christine A. Kerr, MD, Hudson River HealthCare, Beacon, NY
- Luz Amarilis Lugo, MD, Mount Sinai Comprehensive Health Program–Downtown, New York, NY
- Cynthia H. Miller, MD, Albany Medical College, Albany, NY
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- David C. Perlman, MD, Mount Sinai Beth Israel, New York, NY
- Noga Shalev, MD, Columbia University Medical Center, New York, New York
- Rona M. Vail, MD, Callen–Lorde Community Health Center, New York, NY

Agency, Consumer, and Program Liaisons
- **Medical Society of the State of New York:** William M. Valenti, MD, FIDSA, Trillium Health, Rochester, NY
- **New York City Department of Health and Mental Hygiene:** Demetre Daskalakis, MD, MPH; Julie E. Myers, MD, MPH, Long Island City, NY
- **New York City Health + Hospitals Liaison:** Carlos Salama, MD, Elmhurst Hospital Center, Elmhurst, NY
- **New York State Department of Corrections and Community Supervision:** Carl J. Koenigsmann, MD, Albany, NY
- **New York State Department of Health AIDS Institute:** Charles J. Gonzalez, MD and Cheryl A. Smith, MD, NYSDOH AI, New York, NY; Antonio E. Urbina, MD, Mount Sinai St Luke's, New York, NY
- **New York State Department of Health AIDS Institute HIV Quality of Care Advisory Committee:** Peter G. Gordon, MD, Columbia University College of Physicians and Surgeons, New York, NY
- **New York State Department of Health Office of Health Insurance Programs:** Douglas G. Fish, MD, NYSDOH, Albany, NY
- **New York State Department of Veterans Affairs Medical Center:** Sheldon T Brown, MD, James J. Peters Veterans Affairs Medical Center, Bronx, NY
- **Treatment Action Group:** Jeremiah Johnson, Treatment Action Group (TAG), New York, NY
- **Women’s Health:** Gina M. Brown, MD, Bethesda, MD

External Peer Reviewers
- Susan L. Koletar, MD, FACP, FIDSA, Division Director, Division of Infectious Diseases, The Ohio State University, Columbus, OH
- Talia Swartz, MD, PhD, Assistance Professor of Medicine, Infectious Diseases, The Mount Sinai Hospital, New York, NY
Funding and Disclosure of Potential Conflicts of Interest

**Funding:** New York State funds supported development of the *Management of Immune Reconstitution Inflammatory Syndrome (IRIS)* guideline through a grant awarded to the Johns Hopkins University School of Medicine, Division of Infectious Diseases, from the New York State Department of Health AIDS Institute.

**Conflicts of interest:** All active MCCC members, invited consultants and coauthors, peer reviewers, and program staff are required to disclose financial relationships with commercial entities, including gifts that may be actual conflicts of interest or may be perceived as conflicts. These individuals must disclose financial relationships annually, for themselves, their partners/spouses, and their organization/institution. On their annual disclosures, MCCC members are asked to report for the previous 12 months and the upcoming 12 months. Box A2, below, lists reported conflicts.

**Management of COIs:** All reported financial relationships with commercial entities are reviewed by the NYSDOH AI guidelines program to assess the potential for undue influence on guideline recommendations made by the Committee. For the Committee members reporting conflicts, it was determined that the potential for exertion of undue influence on recommendations was exceedingly low to non-existent.

All guideline recommendations received consensus approval of the full MCCC, and the final review and approval of the recommendations was performed by the Committee Chair, and the NYSDOH AI Medical Director and Deputy Medical Director, none of whom reported conflicts of interest.

External peer reviewers were also required to submit conflict of interest/financial disclosure information, which were similarly screened. Neither peer reviewer reported conflicts.

<table>
<thead>
<tr>
<th>Box A2. Reported Conflicts of Interest/Financial Disclosure Results</th>
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<tbody>
<tr>
<td><strong>Committee/Guideline Role</strong></td>
</tr>
<tr>
<td>Planning Group Member</td>
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<td>Planning Group Member</td>
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<td>Committee Member</td>
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<td>Committee Member</td>
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**Recommendation Development and Ratings Process**

The clinical recommendations presented in this guideline were developed by consensus based on a synthesis of the current evidence collected through review of current published peer-reviewed literature. If no data were available, the recommendations are based on expert opinion, and this status is indicated in the rating and in the text.

The Planning Group met via monthly teleconferences over approximately 24 months to finalize the guideline and reach consensus on recommendations and rationale. Once consensus among the Planning Group members was reached, the guideline was reviewed by the full MCCC, and consensus was reached on all recommendations. These deliberations were conducted by teleconference; MCCC members were invited to submit comments in writing as well. Committee review discussions were recorded, and recordings were reviewed carefully to ensure that all decisions and changes were captured and integrated into the manuscript.
Members of the Planning Group then individually reviewed the evidence for each recommendation and assigned a two-part rating (see below). The individual ratings were compiled into a report distributed to all raters, and conference call discussions were held to deliberate ratings for which consensus was needed. Once all raters agreed on the interpretation of evidence and ratings for all recommendations, the guideline was sent to the NYSDOH AI for review and approval.

<table>
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<tr>
<th>AIDS Institute HIV Clinical Guidelines Program Recommendations Rating Scheme</th>
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<tr>
<td><strong>Strength of Recommendation</strong></td>
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<tr>
<td>A = Strong</td>
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<td>B = Moderate</td>
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<td>C = Optional</td>
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**External Review**
Two external peer reviewers recognized for their experience and expertise in HIV primary care were identified by program leaders (see Box A1). These individuals submitted a financial disclosure statement for the purpose of identifying potential conflicts of interest before participating as peer reviewers; neither disclosed financial relationships with commercial entities in the 12 months prior or the 12 months following submission of the disclosure.

Peer reviewers were asked to review the guideline for accuracy, balance, clarity, and practicality of the recommendations for primary care providers. The Planning Group addressed peer review feedback; any conflicting opinions were resolved by the Committee chairs. Members of NYSDOH AI Community Advisory Committee also reviewed and commented on the guideline.

**Guideline Updates**
Members of the MCCC will monitor developments in management of IRIS in an ongoing, structured manner to maintain guideline currency. Once the guideline is published on the program website: www.hivguidelines.org, any updates will be made to the HTML document as needed.

Notification of newly published studies will be automated, and the Planning Group will review new data at least every 6 months. Newly published data that provide support for existing recommendations will be cited in the text, and the studies will be added to the reference list(s).

If newly published data prompt a revision to recommendations or rationale, the Planning Group will propose appropriate edits and determine whether the changes warrant review and approval by the entire MCCC. If MCCC review is required, a conference call will be convened for that purpose. Deletion of existing recommendations, addition of any new recommendations, and/or substantive changes to existing recommendations will prompt MCCC review and consensus.

The full guideline will be reviewed and updated on the 4th anniversary of original publication to prepare for publication of an updated guideline on or before the 5th anniversary of original publication.