

Foreword: 4th edition of the American Society of Transplantation Infectious Diseases Guidelines

Michael Green¹  | Emily A. Blumberg² | Lara Danziger-Isakov³  | Shirish Huprikar⁴ |
Camille Nelson Kotton⁵ | Deepali Kumar⁶ 

¹Division of Infectious Diseases, University of Pittsburgh School of Medicine, UPMC Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania

²Division of Infectious Diseases, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania

³Cincinnati Children's Hospital Medical Center, University of Cincinnati, Cincinnati, Ohio

⁴Division of Infectious Diseases, Department of Medicine, Icahn School of Medicine at Mount Sinai, New York, New York

⁵Transplant and Immunocompromised Host Infectious Diseases, Infectious Diseases Division, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts

⁶Medicine, Transplant Infectious Diseases, University Health Network, Toronto, Ontario

Correspondence

Michael Green, Division of Infectious Diseases, UPMC Children's Hospital of Pittsburgh, 4401 Penn Ave, Pittsburgh, PA 15224.

Email: Michael.green@chp.edu

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Since the advent of solid organ transplantation (SOT), infections have been recognized as a major cause of morbidity and mortality in both transplant candidates and recipients. The potentially devastating impact of these infections has prompted efforts to understand risk factors, optimize treatment, and where applicable, implement strategies to prevent infection. Indeed, the importance of infectious complications coupled with the growing number of children and adults undergoing SOT has led to the establishment and growth of the subspecialty of transplant infectious diseases (TID). Together with the transplant surgeons and physicians who care for these patients, TID specialists have worked to enhance our understanding of the complexity of infectious complications in the SOT recipient. These efforts resulted in the publication of the 1st Edition of the American Society of Transplantation (AST) Guidelines for the Prevention and Treatment of Infectious Complications of Solid Organ Transplantation in 2004. Since then, evolution and progress in clinical practice in organ transplantation and infectious diseases have required periodic critical reassessments of the Guidelines to provide transplant clinicians updated guidance based on the most currently available evidence. This 4th Edition of the AST Infectious Diseases Guidelines continues to reflect the ongoing evolution of the discipline and is designed to inform current clinical practice and also highlight gaps in our knowledge and research opportunities.

As with previous editions, the 4th Edition of the Guidelines is endorsed by AST and represents the collaboration of numerous members of the Infectious Diseases Community of Practice (ID COP) of the AST

who have served as both authors and reviewers. We have again leveraged the diversity of expertise and generosity of the ID COP membership in completing this update to the Guidelines. As with the 3rd edition, all of the authors and nearly all of the reviewers are current members of the ID COP in our effort to involve as many ID COP members as possible. In our selection of invited authors and reviewers, we tried to expand opportunity to more junior ID COP members by pairing senior TID specialists with subject matter expertise with more junior members of the ID COP to bring "fresh eyes" to the Guidelines. As a result, new authors were recruited for completion of the updated Guidelines and frequently paired with one of the previous authors of a specific section. As has been our practice, we have acknowledged the important efforts of the authors of the 3rd edition of the Guidelines in each section with new authorship.

The 4th edition of the Guidelines recognizes the evolving nature of the field. Consequently, we have both updated the previous individual sections and expanded our coverage of clinical syndromes in the SOT recipient with the addition of sections focused on pneumonia, diarrhea, surgical site infections, and intraabdominal infections. We also split the coverage of parasitic infections in two sections with one covering intestinal parasites and the other covering tissue and blood-borne parasites. The presentation of information throughout the Guidelines was aligned by the implementation of templated structures for pathogen-specific and syndrome-based sections including bulleted recommendations (Table 1).

The authors provide specific recommendations at the end of template defined topics within each of the individual Guidelines. Using

Pathogen-specific sections	Clinical syndrome sections
1. Pathogen description	1. Clinical presentation
2. Epidemiology and risk factors	2. Differential diagnosis including infectious and non-infectious etiologies
3. Clinical manifestations	3. Diagnostic testing with algorithm
4. Diagnostic strategies	4. Management/Treatment of infectious etiology
5. Treatment	
6. Prevention	
7. Knowledge gaps and areas for future research	

TABLE 1 Section templates**TABLE 2** Authors for the 4th Edition of the AST ID Guidelines

Lilian Abbo	Jason Goldman	Nicolas Mueller
Upton Allen	Michael Green	Anoma Nellore
Judith Anesi	Paulo Grossi	Gopi Patel
Michael Angarone	Ghady Haidar	Rebecca Madan Pellet
Monica Ardura	Jonathan Hand	Steve Pergam
Saima Aslam	Hans Hirsch	Stephanie Pouch
Maha Assi	Atul Humar	Marcus Pereira
Robin Avery	Shirish Huprikar	Jutta Preiksaitis
John Baddley	Shahid Husain	Raymund Razonable
Emily Blumberg	Michael Ison	Meenakshi Rana
Helen Boucher	Kathleen Julian	Parmjeet Randhawa
Arianne Buchan	Daniel Kaul	Gail Reid
Jose Camargo	Camille Kotton	Alejandro Restrepo
Peter Chin Hong	Christine Koval	Christin Rogers
Nina Clark	Deepali Kumar	Coleman Rotstein
Jennifer Daly	Ricardo La Hoz	Joanna Schaeffer
Lara Danziger-Isakov	Dong Lee	Tanvi Sharma
Ed Dominguez	Tracy Lemonovich	Shmuel Shoham
Karen Doucette	Ajit Limaye	Fernanda Silveira
Erik Dubberke	Sarah Longworth	David Snyderman
Dan Dulek	Maricar Malinis	Tracy Sparkes
Albert Eid	Oriol Manuel	Valentina Stosor
Michele Estabrook	Marian Michaels	Aruna Subramanian
Jay Fishman	Rachel Miller	Helen Te
Diana Florescu	Michele Morris	Nicole Theodoropoulos
Graeme Forrest	Kate Mullane	Cameron Wolfe
Hayley Gans		Richard Zuckerman

a modified Grading of Recommendations Assessment, Development and Evaluation (GRADE) system,¹⁻⁶ each recommendation was characterized by the authors and confirmed by reviewers and editors as strong or weak and the level of evidence was assessed as high, moderate, low, or very low. The majority of Guidelines did not use

a comprehensive evidence review format due to lack of extensive data in many areas of transplant infectious diseases. However, all evidence was reviewed by the authors and further confirmed by the section reviewers and at least two editors. Therefore, we believe our process of evidence review was rigorous yet practical, and the recommendations generated will be very useful to transplant clinicians.

An important part of assuring the quality of content and validity of the recommendations for each of the sections was our review process. A responsible editor and two confidential peer reviewers were identified for each of the sections. The reviewers were asked to assess the content, recommendations and, where appropriate, adherence to the template outlines, as well as to carefully assess the strength and quality of evidence proposed by our authors within each of the sections as part of their review process. The responsible editors served as a 3rd non-anonymous peer reviewer, integrating their own comments and assessments of the recommendations with those of the reviewers. The responsible editor then worked with the authors to optimize each section. A second editor subsequently reviewed each revised section providing a 4th peer reviewer to affirm the content and confirm the recommendations and assessments of the strength and quality of evidence. In addition, the editors also paid attention to the alignment of recommendations between sections, especially those that might be addressed in both pathogen-specific and syndrome-based sections. For such overlapping recommendations between sections, a greater consensus was required between all authors and editors of the sections.

As our readers will be aware, the 4th Edition has moved from its prior home at the American Journal of Transplantation (AJT) to Clinical Transplantation. We wish to thank AJT and its editors for their support and input into the first three editions as well as their input in defining the path toward publication of the 4th edition. We are extremely grateful to our publisher Wiley and *Clinical Transplantation* and its editor-in-chief Dr Ron Shapiro for providing the Guidelines with their new home. As with prior editions published in AJT, the editors and editorial staff of Clinical Transplantation were given full access to all review documents and all versions of each chapter to ensure that critical review had occurred. Clinical Transplantation is an online-only journal, and an online supplement web page of the 4th Edition of the Guidelines has been developed to enhance ease of access.

The editors would like to gratefully acknowledge the tremendous efforts of all of the Guidelines authors and give a special thank you to our reviewers whose efforts were critically important to the successful completion of the 4th edition. The contributions of the authors (Table 2) and reviewers (Table 3) were greatly appreciated as they provided not only their expertise but also their valuable time to complete

TABLE 3 Reviewers for the 4th Edition of the AST ID Guidelines

Rima Abdel	Graeme Forrest	Sang-Oh Lee	Costi Sifri
Carolyn Alonso	Monica Fung	Josh Levitsky	Fernanda Silveira
Judith Anesi	Steve Garbadi	Ajit Limaye	Cedric Spak
Monica Ardura	Hayley Gans	Deborah Lugo	William Steinbach
Upton Allen	Paulo Grossi	Oriol Manuel	Aruna Subramanian
Saima Aslam	Natasha Halasa	Gerry Miller	Joanna Schaenman
Robin Avery	Jonathan Hand	Rachel Miller	Timothy Sullivan
John Baddley	Hans Hirsch	Sherif Mossad	Terri Stillwell
Arthur Baker	Seyed Hosseini	Nicholas Mueller	Valentina Stosor
Catherine Burton	Atul Humar	William Muller	Sarah Taimur
Jose Camargo	Shahid Husain	Yoichiro Natori	Susanna Tan
Peter Chin Hong	Michael Ison	Natalie Nierenberg	Nicole Theodoropoulos
Nina Clark	Samantha Jacobs	Gopi Patel	Jennifer Trofe Clark
Heather Clauss	Joseph Kahwaji	Grant Paulsen	David Van Duin
Eric Cober	Daniel Kaul	Robert Rakita	Paschalis Vergidis
Jennifer Daly	Karen Krok	Raymund Razonable	Steve Webber
Vikas Dharnidharka	Bernie Kubak	Mark Robien	Kate Whitaker
Michele Estabrook	Shimon Kusne	Jennifer Schuster	David Wojciechowski
Jay Fishman	Anne Lachiewicz	Shmuel Shoham	Alissa Wright

the document in a timely fashion. We would also like to thank the AST Board for their support and endorsement of the 4th edition. Finally, we would like to recognize the support of our many colleagues in the ID COP, the AST and the transplant community at large for their collaboration and ongoing contributions of new data and clinical evidence, which have been critical to informing the 4th Edition of the AST ID Guidelines. We hope that as you read these Guidelines, you will find them helpful in informing your clinical decisions as you care for your patients. They are not intended to replace the valuable consultation of your local experts but rather to enhance your understanding of the complex nature of preventing and treating infections in transplant candidates and recipients.

CONFLICT OF INTEREST

The authors have no relevant conflicts of interest to report related to this work.

ORCID

Michael Green  <https://orcid.org/0000-0002-6011-2894>

Lara Danziger-Isakov  <https://orcid.org/0000-0002-5691-5221>

Deepali Kumar  <https://orcid.org/0000-0003-1961-0477>

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