### Supplement 2. Definition of invasive pulmonary aspergillosis for different population

| Author/Abbreviation | Population                                                                 | Definition                                                                                       |
|--------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Donnelly et al     | The category of proven IFD can apply to any patient, and the probable and possible categories are proposed for immunocompromised patients | **Proven**<br>Meeting one of the following:<br>1. Detection of aspergillus by microscopic analysis or culture of sterile material<br>2. Positive tissue nucleic acid test of *Aspergillus* species<br>**Probable**<br>Meeting all three criteria as following:<br>1. Host factors: meeting one of the following<br>   a: Neutropenia (<0.5 × 10⁹ for >10 days)<br>   b: Hematologic malignancy<br>   c: Receipt of an allogeneic stem cell transplant<br>   d: Receipt of a solid organ transplant<br>   e: Corticosteroids (≥0.3 mg/kg for ≥3 weeks)<br>   f: T-cell immunosuppressants<br>   g: B-cell immunosuppressants<br>   h: Inherited severe immunodeficiency<br>   i: Acute graft-versus-host disease grade III or IV<br>2. Clinical features:<br>   At least one pattern on pulmonary CT (e.g., dense, air crescent sign, cavity)<br>3. Mycological evidence: meeting one of the following<br>   a: GM antigen positive on blood, BAL, or CSF<br>   b: Two or more PCR tests positive on blood or BAL<br>   c: Positive culture of *Aspergillus* species from sputum, BAL, aspirate, or bronchial brush |
| Possible                                                                 | Meet the criteria of the probable but not for mycological evidence |
|------------------------------------------------------------------------|-------------------------------------------------------------|
| **Blot et al**<sup>2</sup>                                             |                                                              |
| *AspICU* classification                                                |                                                              |
| Patients in ICU                                                         | Proven                                                       |
|                                                                       | Same as the proven definition of EORTC/MSG criteria         |
|                                                                       | **Putative**                                                 |
|                                                                       | Meeting all four criteria as following:                     |
|                                                                       | 1. Positive culture of *Aspergillus* species from LRT specimen|
|                                                                       | 2. Signs or symptoms (e.g., refractory or recrudescence of fever, pleuritic chest pain, pleuritic rub, or dyspnea) |
|                                                                       | 3. Abnormal pulmonary imaging by CT or chest X-ray          |
|                                                                       | 4. **a** or **b**                                             |
|                                                                       | a. Host factors: neutropenia, hematological, oncological malignancy, glucocorticoid treatment (20 mg/d) or immunodeficiency |
|                                                                       | b. Positive culture of *Aspergillus* species from BAL with positive cytological smear |
|                                                                       | **Colonization**                                             |
|                                                                       | ≥ 1 criteria in the putative definition is lacked            |
| **Bulpa et al**<sup>3</sup>                                             |                                                              |
| Patients with chronic obstructive pulmonary disease                     | Proven                                                       |
|                                                                       | Detection of *Aspergillus* species by microscopic analysis accompanied with one of the following: |
|                                                                       | 1. Positive culture of *Aspergillus* species from LRT specimen|
|                                                                       | 2. Positive antibody/antigen of *A. fumigatus* in serum       |
|                                                                       | 3. Conformation of hyphae *Aspergillus* species              |
|                                                                       | **Probable**                                                 |
|                                                                       | Meeting one of the following:                               |
|                                                                       | 1. Without the evidence of 1, 2 or 3 in the proven definition |
| **Husain et al**<sup>4</sup> | **Cardiothoracic transplant recipients** |
|-----------------------------|-----------------------------------------|
| **ISHLT definition**        | **Proven**                               |
|                             | Detection of aspergillus by microscopic analysis, or positive culture of Aspergillus species from sterile material of pulmonary site |
| **Possible**                | Without the evidence of a, b or c in probable definition |
| **Colonisation**            | Positive culture of Aspergillus species without clinical features |

| **Koehler et al**<sup>5</sup> | **Patients with COVID-19** |
|-----------------------------|----------------------------|
| **ECMM/ISHAM consensus criteria** | **Proven**                   |
|                             | Meeting three criteria as following |
|                             | 1. Host factors: diagnosed with COVID-19 needing intensive care |
|                             | 2. Mycological evidence: detection of aspergillus by microscopic analysis, or |

2. Treated with steroids and on stage III or IV of GOLD, with advanced dyspnea and abnormal chest imaging, accompanied with one of the following:
   a. positive culture or microscopic analysis from LRT
   b. Serum antibody test of *Aspergillus* species
   c. Positive two serum GM tests
| positive culture/PCR from sterile material of pulmonary site |
|-------------------------------------------------------------|
| **Probable**                                                |
| Meeting three criteria as following                         |
| 1. Host factors: diagnosed with COVID-19 needing intensive care |
| 2. Clinical factors: pulmonary infiltrate or cavitating infiltrate on CT without other reason |
| 3. Mycological evidence: meeting one of criteria as following |
|   a: Detection of aspergillus by microscopic analysis, or positive culture from BAL |
|   b: Serum GM/LFA index >0.5, or BAL GM/LFA index >1, or more than two positive PCR of blood, or single positive PCR of BAL with without single positive PCR of blood |
| **Possible**                                                |
| Meeting three criteria as following                         |
| 1. Host factors: diagnosed with COVID-19 needing intensive care |
| 2. Clinical factors: pulmonary infiltrate or cavitating infiltrate on CT without other reason |
| 3. Mycological evidence: meeting one of the following        |
|   a: Positive microscopic analysis/positive culture from non-BAL material |
|   b: Single GM index of non-BAL material >4.5 |
|   c: More than one GM index of non-BAL material >1.2 |
|   d: Single GM index >1.2 plus positive LFA/PCR of non-BAL material |

Schauwvliegh et al\textsuperscript{6} modified AspICU classification

| Patients with influenza in ICU |
|--------------------------------|
| Meeting three criteria as following: |
| 1. Clinical criteria (e.g., refractory/recrudescent fever despite antibiotic therapy for at least three days without recognized reason, dyspnea, or haemoptysis) |
| 2. Radiological criteria: infiltrate on pulmonary imaging |
| Verweij et al. IAPA definition | Mycological criteria: meeting one of the following |
|-------------------------------|--------------------------------------------------|
| Patients with influenza in ICU | a: Detection of hyphae by microscopic analysis with positive culture from tissue |
|                               | b: Positive culture from BAL |
|                               | c: BAL GM index > 1 or serum GM index > 0.5 |

| Proven | Meeting two criteria as following: |
|--------|-----------------------------------|
|        | 1. Host factors: diagnosed with influenza |
|        | 2. Detection of Aspergillus species by microscopic analysis or positive culture/PCR from tissue |

| Probable | Meeting one of the following: |
|----------|-------------------------------|
|          | 1. Pulmonary infiltrate companied with serum GM index > 0.5/BAL GM index > 1/positive BAL culture |
|          | 2. Cavitating infiltrate Cavitating infiltrate companied with positive sputum/tracheal aspirate culture |

**Abbreviations:** EORTC/MSG = European Organization for Research and Treatment of Cancer and the Mycoses Study Group; GOLD = Global Initiative for Chronic Obstructive Lung Disease; IFD = invasive fungal disease; GM = galactomannan; CT = computerized tomograph; BAL = bronchoalveolar lavage; CSF = cerebrospinal fluid; ICU = intensive care unit; LRT = lower respiratory tract; ISHLT = International Society for Heart and Lung Transplantation; ECMM/ISHAM = European Confederation for Medical Mycology and the International Society for Human and Animal Mycology institution; COVID-19 = coronavirus disease 2019; LFA = lateral-flow assay; IAPA = influenza-associated pulmonary aspergillosis.

1. Donnelly JP, Chen SC, Kauffman CA, et al. Revision and Update of the Consensus Definitions of Invasive Fungal Disease From the European Organization for Research and Treatment of Cancer and the Mycoses Study Group Education and Research Consortium. Clin Infect Dis 2020;71(6):1367-76.
2. Ascio glu S, Rex JH, de Pauw B, et al. Defining opportunistic invasive fungal infections in immunocompromised patients with cancer and
hematopoietic stem cell transplants: an international consensus. Clin Infect Dis 2002;34(1):7-14.

3. Bulpa P, Dive A, Sibille Y. Invasive pulmonary aspergillosis in patients with chronic obstructive pulmonary disease. Eur Respir J 2007;30(4):782-800.

4. Husain S, Mooney ML, Danziger-Isakov L, et al. A 2010 working formulation for the standardization of definitions of infections in cardiothoracic transplant recipients. J Heart Lung Transplant 2011;30(4):361-74.

5. Koehler P, Bassetti M, Chakrabarti A, et al. Defining and managing COVID-19-associated pulmonary aspergillosis: the 2020 ECMM/ISHAM consensus criteria for research and clinical guidance. Lancet Infect Dis 2021;21(6):e149-e62.

6. Schauwvlieghe A, Rijnders BJA, Philips N, et al. Invasive aspergillosis in patients admitted to the intensive care unit with severe influenza: a retrospective cohort study. Lancet Respir Med 2018;6(10):782-92.

7. Verweij PE, Rijnders BJA, Brüggemann RJM, et al. Review of influenza-associated pulmonary aspergillosis in ICU patients and proposal for a case definition: an expert opinion. Intensive Care Medicine 2020;46(8):1524-35.