EQUAL Score Cards

Invasive Pulmonary Aspergillosis, Candidemia, Mucormycosis & Cryptococcosis

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Objective and Methods

Detailed guidelines and treatment algorithms lead microbiologists and clinicians in diagnosis and treatment of invasive fungal diseases. Adherence to guidelines is important to benchmark our daily clinical decision making, but there is no tool to measure adherence. To develop such a tool, we reviewed current guidelines provided by five scientific societies (European Society for Clinical Microbiology and Infectious Diseases, European Confederation of Medical Mycology, European Respiratory Society, Infectious Diseases Society of America (IDSA), and Infectious Diseases Working Party of the German Society for Hematology and Medical Oncology) and selected the strongest recommendations for management as key components.

Factors incorporated were diagnostic measures, key treatment parameters and follow-up procedures including species-specific measures. The EQUAL Scores aggregate and weigh the components and provide a tool to support antifungal stewardship and to quantify guideline adherence. They are available as pocket cards in several languages and are easy to apply in daily clinical practice. Currently, EQUAL Scores for invasive pulmonary aspergillosis, candidemia, mucormycosis and cryptococcosis are available on an open access basis.

Invasive Pulmonary Aspergillosis

EQUAL Aspergillosis Score 2018: An ECMM Score Derived From Current Guidelines to Measure **QUAL**ity of Clinical Invasive Pulmonary Aspergillosis Management

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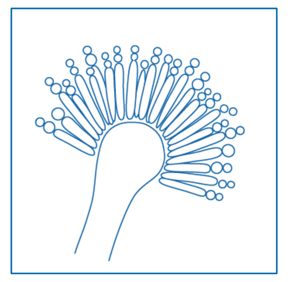

Background

The EQUAL Aspergillus Score weighs and aggregates factors for ideal management of invasive pulmonary aspergillosis.
EQUAL Scores reflect the strongest recommendations from current guidelines. The Score Cards are a quick reference to measure guideline adherence and to support antifungal stewardship.

Maximum Score		If positive culture	If refractory disease	If positive culture and refractory disease
Diagnosis	10	12	13	15
Treatment	5			
Follow-up	7			
Total	22	24	25	27

References

1. Patterson et al. *Clin Infect Dis* 2016; 2. Liss et al. *Mycoses* 2015; 3. Vehreschild et al. *Eur Radiol* 2017; 4. Ullmann et al. *Clin Microbiol Infect* 2018.

EQUAL Aspergillosis Score 2018

	Item	Points
Diagnosis	Neutropenia >10d or alloHSCT → mould active prophylaxis or GM screening 2-3x/week	3
	72-96h of persistent fever → CT scan	3
	Lung infiltrate → BAL	
	- Galactomannan	1
	- Direct microscopy incl. fluorescent dyes: Calcofluor white, Uvitex 2B, or Blankophor	1
	- Culture	1
	- Fungal PCR (pan, Aspergillus, Mucorales)	1
	Aspergillus grows in culture	
	- Identification to species level	1
	- Susceptibility testing	1
	Refractory cases → histology	
	- Silver stain	1
	- PAS	1
	- Visible hyphae → molecular diagnostics	1
Treatment	1st-line treatment:	
	- Isavuconazole or voriconazole or – after prior mould prophylaxis – liposomal amphotericin B or caspofungin	5
	- Voriconazole without TDM (target through range 1-5.5mg/L)	-1
Follow-up	- CT scan on day 7	2
	- CT scan on day 14	3
	- CT scan on day 21 or 28	2

Candidemia

EQUAL Candida Score 2018: An **E**CMM Score Derived From Current Guidelines to Measure **QUAL**ity of Clinical Candidemia Management

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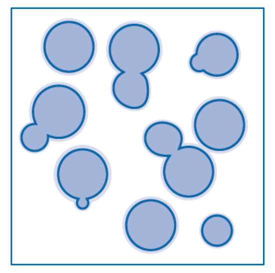

Background

The EQUAL Candida Score weighs and aggregates factors recommended for the ideal management of candidemia and provides a tool for antifungal stewardship as well as for measuring guideline adherence. Current guidelines provided by the European Society for Clinical Microbiology and Infectious Diseases[4,5] and by the Infectious Diseases Society of America[3] were reviewed and the strongest recommendations for management quality selected as basis for this scoring tool.

Maximum Score

	Non-CVC carriers	CVC carriers
Diagnosis	10	10
Treatment	7	10
Follow-up	2	2
Total	19	22

References

1. Mellinghoff et al. *Mycoses* 2018; 2. Koehler et al. *Mycoses* 2014; 3. Pappas et al. *Clin Infect Dis* 2016; 4. Cuenca-Estrella et al. *Clin Infect Dis* 2012; 5. Cornely et al. *Clin Microbiol Infect* 2012; 6. Munoz et al. *Diagn Microbiol Infect Dis* 2017; 7. Andes et al. *Clin Infect Dis* 2012.

EQUAL Candida Score 2018 [1,2]

	Item	Points
Diagnosis	Initial blood culture (40mL) [3,4]	3
	Species identification [3,4]	3
	Susceptibility testing [3,4]	2
	Echocardiography [3,5]	1
	Ophthalmoscopy [5,6]	1
Treatment	Echinocandin treatment [3,5]	3
	Step down to fluconazole depending on susceptibility result [3,5]	2
	Treatment for 14 days after first negative follow-up culture [3,5]	2
	CVC carriers*: CVC removal [3,5,7] ≤ 24 hours from diagnosis	3
	> 24 < 72 hours from diagnosis	2
Follow-up	Follow-up blood culture (at least one per day until negative) [3,5]	2

* CVC carriers receive extra points, total score thus differs in Non-CVC vs. CVC carriers

Mucormycosis

EQUAL Mucormycosis Score 2018: An **E**CMM Score Derived From Current Guidelines to Measure **QUAL**ity of Mucormycosis Management

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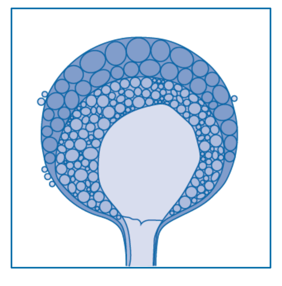

Background

The EQUAL Mucormycosis Score 2018 weighs and aggregates factors for ideal management of mucormycosis.
EQUAL Scores reflect the strongest recommendations from current guidelines. The Score Cards are a quick reference to measure guideline adherence and to support antifungal stewardship.

Maximum Score		In case of isolate	In case of biopsy	In case of isolate and biopsy
Diagnosis	11	13	16	18
Treatment	8			
Follow-up	6			
Total	25	27	30	32

References

1. Cornely et al. *Clin Microbiol Infect* 2014; 2. Tacke et al. *Mycoses* 2014; 4. Koehler et al. *Infect Dis Clin N Am* 2015; 3. Tissot et al. *Haematol* 2017.

EQUAL Mucormycosis Score 2018

	Item	Points
Diagnosis	Neutropenia >10d or alloHSCT → Mould active prophylaxis	3
	72-96h of persistent fever → Chest CT	3
	Inversed halo	
	– CT/MR staging: Head, neck, abdomen	2
	– BAL	
	– Direct microscopy, preferably using optical brighteners	1
	– Culture	1
	– Fungal PCR (pan, *Aspergillus*, Mucorales)	1
	Microbiological test results negative → Biopsy	
	– Culture	2
	– Histopathology	2
	– Molecular-based tests on fresh clinical material or embedded tissue	1
	Isolate grows → Identification to species level and susceptibility testing	2
1st line Treatment	Surgical debridement	2
	with microscopically clear resection margins	1
	L-AmB ≥5 mg/kg/d or	3
	Isavuconazole with TDM or posaconazole with TDM	2
	Control of risk factors: Neutropenia, hyperglycaemia, ketoacidosis, corticosteroids	2
Follow-up	CT scan on day 7	2
	CT scan on day 14	2
	Weekly CT scan until improvement	2

Cryptococcosis

EQUAL Cryptococcosis Score 2018: A **E**uropean Confederation of Medical Mycology (ECMM) score derived from current guidelines to measure **QUAL**ity of clinical cryptococcosis management

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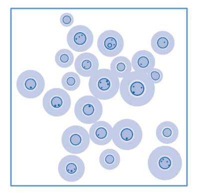

Background

The EQUAL Cryptococcosis Score weighs and aggregates factors for ideal management of cryptococcal infection. EQUAL Scores reflect the strongest recommendations from current guidelines. The Score Cards are a quick reference to measure guideline adherence and to support antifungal stewardship.

		Mild-moderate disease, non-CNS or localized			Moderately severe-severe, CNS or disseminated		
		Maximum score	Diagnosis	Therapy	Maximum score	Diagnosis	Therapy
Diagnosis		6			13	-4	-9
Management	Antifungal	3	-3	-2	9		-5
	Immuno-modulation			-5			
	ID consult	2					-7
	Follow-up			-1	2		-5
Total		11	8	0	24	20	0

Comments

1. HIV infected individuals with CD4 ≤100 cells/µL should be screened prior to ART initiation or re-initiation with serum CrAg, regardless of clinical manifestations, who live in high prevalence areas with cryptococcal antigenaemia (i.e. >3%).
2. All patients with disseminated disease or underlying immunosuppression and positive blood culture, serum CrAg or tissue biopsy) should get LP, even if asymptomatic.
3. One week of AmB plus 5-FC is acceptable if no better alternative available.
4. Non-transplant, Non-HIV patients and pregnant women may require at least 4 weeks of induction therapy.
5. 6 weeks induction therapy in the presence of cryptococcoma, neurological complications (e.g. deterioration, persistent coma or seizures), severe uncorrected immunosuppression or positive fungal CSF culture at the end of 2 weeks of treatment.
6. If there is intracranial hypertension ≥25 cmH_2O, decrease until ≤20 cmH_2O or reduction of opening pressure by 50%. Therapeutic lumbar drainage should be repeated daily in the setting of clinical symptoms and persistent pressure elevations ≥25 cm of CSF until stabilized for >2 days. There is no data on the maximum volume of CSF that can be safely drained during LP.

References

1. Spec A, Mejia-Chew C, Powderly WG, Cornely OA. EQUAL Cryptococcus Score 2018: A European Confederation of Medical Mycology Score Derived From Current Guidelines to Measure QUALity of Clinical Cryptococcosis Management. *Open Forum Infect Dis.* 2018; 5(11): ofy299.

EQUAL Cryptococcosis Score 2018

	Item	Points
Diagnosis	Blood fungal culture	3
	Serum CrAg	3
	Other sites explored based on clinical presentation	
	- Tissue/fluid fungal culture not obtained upon biopsy performed	-1
	- Histology with fungal stains not obtained if biopsy performed	-1
	Immunosuppressed or CNS symptoms	
	- LP + opening pressure	3
	- CSF fungal culture	2
	- CSF CrAg titer	2
	- CSF India ink, if no CNS CrAg	1
	- Brain CT or MRI not done prior to LP, if focal neurological or immunosuppressed	-1
Treatment	Mild-moderate, localized or non-CNS	
	Pulmonary symptoms	
	- If bronchoscopy done, no BAL/biopsy sent for fungal culture	-1
	- 1st line: Fluconazole for 6-12 mo	3
	- 2nd line: Another azole for 6-12 mo	2
	- Any azole for <6 months	1
Treatment	Moderately severe-severe, CNS or disseminated	
	1. Induction	
	- LFAmB + 5-FC for ≥2 wks OR	3
	- AmBD + 5-FC for ≥2 wks OR	2
	- LFAmB for 4-6 wks OR	2
	- LFAmB + fluconazole for 2 wks OR	2
	- Fluconazole +/- 5-FC for 6 wks	1
	2. Consolidation	
	- Fluconazole for ≥8 wks OR	3
	- Other azole for 10-12 wks	1
	3. Maintenance	
	- Fluconazole for ≥12 months OR	3
	- Itraconazole for ≥12 months OR	1
	- AmBD 1mg/kg IV per wk	1
	- No TDM If itraconazole is used	-1
	ICH management (CNS disease)	
	- No decompression LP OR no lumbar drain or no ventriculostomy OR VP shunt to maintain CSF pressure <20 cmH_2O	-3
	- Corticosteroids if no parenchymal edema	-2
	- Acetazolamide	-1
	- Mannitol	-1
Treatment	ID consult	2
	Immunomodulation	
	Immunocompetent	
	- HIV test not done	-2
	- History/immunosuppressive drugs not reviewed	-1
	Transplant recipient	
	- No decrease in net immunosuppression	-1
	HIV positive patient	
	- ART started within 2 wks or not started 4 months after diagnosis	-3
	Antifungals stopped if IRIS	-2
Follow-up	- Repeat serum CrAg to monitor response	-1
	- If CNS disease: Not repeating CSF culture day 14	-1
	- If CNS disease: Repeat CSF CrAg to monitor response	-2
	- If HIV positive, fluconazole not stopped at 1 year of treatment on those on ART with CD4 ≥100 cells/µL	-1

For language specific EQUAL Score Cards see https://www.ecmm.info/equal-scores/, or scan this QR code

The authors for the other languages may differ from the English version

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