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Executive Summary
Final Outcomes Summary – Online Enduring

Program Overview
The goal of this innovative, multimedia, chapterized online activity was to improve the knowledge and competence of allergists and pulmonologists in the diagnosis and management of HES. The activity was distributed on Medscape and included an algorithmic roadmap to demonstrate complex clinical decision-making in HES diagnosis and treatment; whiteboard animations to illustrate HES pathophysiology; and a patient perspective video clip to bring the patient experience to life.

Online Launch Date: 05/21/2021
Online End Date: 05/21/2022
Activity Link: https://www.medscape.org/viewarticle/950848

Learning Objectives
- Describe the pathophysiology of HES and role of eosinophils in HES.
- Review best practices for the evaluation and differential diagnosis of HES.
- Identify the mechanisms of action of biologic therapies approved for HES and other eosinophilic disorders.
- Apply the results of clinical studies that examine the safety, efficacy, and tolerability of approved agents when selecting and monitoring therapy for HES.

Target Audience & Accreditation
- Allergist/Immunologists and Pulmonologists
- National Jewish Health designates this online enduring activity for a maximum of 1.0 AMA PRA Category 1 Credit™.
Program Features
Final Outcomes Summary – Online Enduring

Patient Video

95% of evaluation respondents found the patient experience insights helpful for their practice [N=1,112]

Whiteboard Animation Clips

Clinical Reference Aid: Algorithmic Roadmap

87% of evaluation respondents reported they are likely to use the clinical reference aid in practice [N=1,112]

Hyperesinophilic Syndrome (HES) Roadmap:
A Guided Workflow for Improved Diagnosis and Treatment in HES

National Jewish Health
Sustaining Science to Life.
**Personalized targeting tools** across numerous tactics reach health care providers by leveraging demographic data (such as location, profession, specialty) and behavioral data (such as learner participation history, areas of interest).

**Personalized emails and e-newsletters** to NJH and MedScape databases and

**Spotlight in 2021-2022 Pulmonary Highlights publication**

**Dedicated landing page** on NJH and MedScape websites

**Search engine optimization** on MedScape platform

**Social media ads and posts**

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**CME**

Hypereosinophilic Syndrome Roadmap: A Guided Workflow for Improved Diagnosis and Treatment in HES

Authors: Michael E. Wechsler, MD, MIM (Activity Co-Chair); Flavia Cecília Lago-Hoyos, MD (Activity Co-Chair); Faculty and Disclosures
Activity Format: Online Enduring
Final Online Outcomes Summary

Hypereosinophilic Syndrome Roadmap: A Guided Workflow for Improved Diagnosis and Treatment in HES

Authors: Michael E. Wocherler, MD, MMSc (Activity Co-Chair); Ravis Ceccita Leger Hoyte, MD (Activity Co-Chair)

Identifying HES Patients
- The challenge:
  - HES is a rare and complex disease; only ~5000 cases in the US
  - Many clinicians don’t understand HES or are not aware of it and don’t look for it
  - There is no typical HES presentation
- HES patients present to a wide variety of clinicians:
  - Pulmonary
  - Hematology
  - GI
  - Allergy
  - ID
  - Cardiology
  - Dermatology

Program Summary Dashboard – Final Outcomes Summary Through 5/21/2022
Hypereosinophilic Syndrome Roadmap: A Guided Workflow for Improved Diagnosis and Treatment in HES
Program Faculty: Michael E. Wechsler, MD, MMSc, Flavia Hoyte, MD
Online: May 21, 2021-May 21, 2022

Online Program Participation

2,240 Learners | 1,110 Completers

Completers by Degree

MD/DO 65%
PA 11%
RN 3%
NP 2%
Other 19%
N=1,110

78% Physicians and advanced practice providers

Learning Objectives

1. Describe the pathophysiology of HES and role of eosinophils in HES.
2. Review best practices for the evaluation and differential diagnosis of HES.
3. Identify the mechanisms of action of biologic therapies approved for HES and other eosinophilic disorders.
4. Apply the results of clinical studies that examine the safety, efficacy, and tolerability of approved agents when selecting and monitoring therapy for HES

Specialty | # ofCompleters
--- | ---
Family Med/General | 306
Allergy/Immunology | 115
Pulmonology | 97
Internal Medicine | 71
Surgery | 39
Emergency Medicine | 27
Pulmonology | 97
Pediatrics | 23
Hematology/Oncology | 23
Cardiology | 8
Gastroenterology | 7
Other | 394
Total | 1,110

Satisfaction

Evaluation respondents for this online activity reported: N=1,112

- The activity met the learning objectives 95%
- The activity met their educational needs 95%
- The activity was free of commercial bias 96%
Program Summary Dashboard – Final Outcomes Summary Through 5/21/2022
Hypereosinophilic Syndrome Roadmap: A Guided Workflow for Improved Diagnosis and Treatment in HES
Program Faculty: Michael E. Wechsler, MD, MMSc, Flavia Hoyte, MD
Online: Medscape May 21, 2021 – May 21, 2022

Knowledge

Online Program

40% 84%
Pre-Test (N=1574) Post-Test (N=1215)

110% relative gain in knowledge
44% absolute gain in knowledge

Competence

Evaluation respondents in the live and online activities were asked how likely they are to make changes in their practice as a result of what they learned in the activity:

Not Likely 12%
Somewhat Likely 44%
Extremely Likely 44%

N=1,112

94% of evaluation respondents reported the activity reinforced and/or improved their skills

Top 3 Practice Changes

Evaluation respondents for this activity reported specific intended practice changes as a result of what they learned:

1. Improve differential diagnosis of HES
2. Conduct a more comprehensive history and physical exam for patient screening
3. Evaluate for evidence of end-organ damage or dysfunction

Patient Impact

1,112 evaluation respondents
Who treat 6,162 patients with HES and related eosinophilic disorders weekly

Based on self-reported number of patients seen on a weekly basis with conditions discussed in activity (multiplied by 48 for annual estimate).

Potential impact to 295,776 patient visits annually
A gap persists related to describing the pathophysiology of HES:

Learners were asked to explain the role of eosinophils in HES:

Online:

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>49%</td>
<td>76%</td>
</tr>
</tbody>
</table>

Pre N = 1574
Post N = 1215

In this online activity, 24% still remained unable to correctly describe the role of eosinophils in HES pathophysiology at post-test.

Program Insights:

- Evaluation respondents demonstrated a significant increase in confidence applying the learning objectives in practice. Relative confidence gain from pre- to post-activity was 120%.

- Competence-based learning occurred in 91% of test-takers, demonstrated by their ability to answer case-based questions accurately.

- Needs for future education include pathophysiology of HES, differential diagnosis, and advances in pharmacologic treatment.
Level (1) Outcomes: Participation (Degree)

Final Online Outcomes Summary

- 65% Total Completers: 1,110
- 78% of learners were physicians and advanced practice providers

<table>
<thead>
<tr>
<th>Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD/DO</td>
<td>726</td>
</tr>
<tr>
<td>NP</td>
<td>17</td>
</tr>
<tr>
<td>PA</td>
<td>121</td>
</tr>
<tr>
<td>RN/LPN</td>
<td>32</td>
</tr>
<tr>
<td>Other</td>
<td>214</td>
</tr>
<tr>
<td><strong>Total Completers</strong></td>
<td><strong>1,110</strong></td>
</tr>
</tbody>
</table>

Legend:
- MD/DO
- NP
- PA
- RN
- Other
### Level (1) Outcomes: Participation (Specialty)

**Final Online Outcomes Summary**

<table>
<thead>
<tr>
<th>Specialty</th>
<th># of completers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Med/General</td>
<td>306</td>
</tr>
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<td>Allergy/Immunology</td>
<td>115</td>
</tr>
<tr>
<td>Pulmonology</td>
<td>97</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>71</td>
</tr>
<tr>
<td>Surgery</td>
<td>39</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>27</td>
</tr>
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<td>Pediatrics</td>
<td>23</td>
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<tr>
<td>Hematology/Oncology</td>
<td>23</td>
</tr>
<tr>
<td>Cardiology</td>
<td>8</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>394</td>
</tr>
<tr>
<td><strong>Total Completers</strong></td>
<td><strong>1,110</strong></td>
</tr>
</tbody>
</table>

**Specialty Participation Summary**

- Pulmonary: 35%
- Allergy/Immunology: 10%
- Family Med/General: 9%
- Internal Medicine: 6%
- Emergency Medicine: 4%
- Pediatrics: 28%
- Surgery: 6%
- Hematology/Oncology: 2%
- Gastroenterology: 2%
- Cardiology: 2%
- Other: 1%
- Total Completers: 1,110
## Level (2) Outcomes: Satisfaction

**Final Online Outcomes Summary**

<table>
<thead>
<tr>
<th>Evaluation respondents report the activity was “Excellent” to “Good” at:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting your educational needs</td>
<td>95%</td>
</tr>
<tr>
<td>Meeting the learning objectives</td>
<td>95%</td>
</tr>
<tr>
<td>Providing tools and strategies you can apply to practice</td>
<td>94%</td>
</tr>
<tr>
<td>Improving your ability to treat or manage your patients</td>
<td>94%</td>
</tr>
<tr>
<td>Reinforcing and/or improving your current skills</td>
<td>94%</td>
</tr>
</tbody>
</table>

- **96%** Reported the material was presented without commercial bias
- **96%** Reported the content was evidence-based and clinically relevant

N = 1,112
Overall Knowledge Gain
Final Online Outcomes Summary

Online Program

Pre-Test (N=1574)
40%

Post-Test (N=1215)
84%

110% relative gain in knowledge
44% absolute gain in knowledge
**Learning Objective:** Describe the pathophysiology of HES and role of eosinophils in HES.

**Question 1:** Eosinophils play an important role in all of the following EXCEPT:

- Tissue remodeling and repair
- Inducing Tumor Growth
- Host protection against parasites
- Mediating inflammation through recruitment of inflammatory cells

**Clinical Rationale:**
Eosinophils are a type of leukocyte, or white blood cell. They generally represent <5% of circulating white blood cells and are important in both health and disease. In normal physiology, eosinophils contribute to regulatory and homeostatic roles, tissue remodeling and repair, and induction of host protection, especially against parasites. Eosinophils can also contribute to inflammation through the recruitment and activation of other inflammatory cells. Eosinophils also appear to play a role in abrogating tumor growth in some malignancies (answer B is thus incorrect).
Level (3 & 4) Outcomes: Knowledge & Competence

Final Online Outcomes Summary

Learning Objective: Review best practices for the evaluation and differential diagnosis of HES.

Question 2: HES can be differentiated from other pulmonary eosinophilic conditions by which of the following?

Clinical Rationale: Primary pulmonary eosinophilic disorders include acute and chronic eosinophilic pneumonia and eosinophilic granulomatosis with polyangiitis. In contrast to HES and the other pulmonary eosinophilic disorders, only acute eosinophilic pneumonia is characterized by acute presentation of symptoms and association with smoking (answers a and C are incorrect). Both chronic eosinophilic pneumonia and EGPA have a common history of asthma and allergies; this is uncommon in HES (answer c is incorrect). While heart and skin involvement may be seen in EGPA, they are more commonly presenting manifestation of HES vs, the other entities (answer D is correct). Initial studies will involve an electrocardiogram and echocardiogram to look for cardiac involvement, pulmonary function tests to assess lung function and look for evidence of asthma, pulse oximetry and chest x-ray to help rule out other causes of pulmonary eosinophilia.
Level (3 & 4) Outcomes: Knowledge & Competence

Final Online Outcomes Summary

Learning Objective: Identify the mechanisms of action of biologic therapies approved for HES and other eosinophilic disorders.

Question 3: Key drivers of eosinophilic inflammation which serve as potential targets in the treatment of HES include all of the following EXCEPT:

Clinical Rationale:
The eosinophil possesses multiple targets that are the focus of active research in patients with eosinophilic diseases. These include IL-5, which is the primary cytokine responsible for eosinophil differentiation, maturation, and growth, the IL-5 receptor alpha, found on both eosinophils and basophils; CCR3, which is highly expressed in eosinophils and basophils but can also be detected in TH1 and TH2 cells, as well as in airway epithelial cells; Siglec-8, or Sialic acid-binding Ig-like lectin 8, which is expressed on eosinophils and mast cells and less-so on basophils; EMR1, or EGF-like module-containing mucin-like hormone receptor-like 1, which in humans is uniquely expressed on eosinophils; CRTH2, which is a prostaglandin D2 receptor present on many cell types. Interleukin 8 is not thought to be a key driver of eosinophilic inflammation (answer D is correct).
Level (3 & 4) Outcomes: Knowledge & Competence

Learning Objective: Identify the mechanisms of action of biologic therapies approved for HES and other eosinophilic disorders.

Question 4: A 53-year-old female is diagnosed with idiopathic HES after her eosinophil count was found to be consistently in the 5000-6000 range. Her FIP1L1-PDGFRα mutation analysis was negative, and her bone marrow biopsy does not show evidence of other abnormal cell lines or known genetic mutations. She is currently doing well other than peripheral neuropathy of the hands and feet and a dermatitis that has demonstrated eosinophils without vasculitis on biopsy. Her symptoms respond well to bursts of glucocorticoids, but return almost immediately each time the steroid dose is weaned. What is the safest and most effective long-term therapy for this patient?

Clinical Rationale:
Although there are various drugs in development or drugs approved for other conditions, which target the various receptors on the eosinophil surface and, as such, serve as potential therapies for HES, mepolizumab is the only medication currently approved for the treatment of HES.

Note: Pre-test N is lower on this question due to a technical issue on the Medscape platform.
Evaluation respondents reported their confidence as it relates to the learning objectives before and after the activity (Very confident – confident)

1. Describe the pathophysiology of HES and role of eosinophils in HES
   - Before Presentation: 37%
   - After Presentation: 81%

2. Review best practices for the evaluation and differential diagnosis of HES
   - Before Presentation: 37%
   - After Presentation: 80%

3. Identify the mechanisms of action of biologic therapies approved for HES and other eosinophilic disorders
   - Before Presentation: 35%
   - After Presentation: 79%

4. Apply the results of clinical studies that examine the safety, efficacy, and tolerability of approved agents when selecting and monitoring therapy for HES
   - Before Presentation: 36%
   - After Presentation: 79%
Level (4) Outcomes: Competence

Final Online Outcomes Summary

What change(s) will you incorporate in your practice?

1. Improve differential diagnosis of HES (548 responses)
2. Conduct a more comprehensive history and physical exam for patient screening (292 responses)
3. Assess clinical variant to aid in treatment selection (198 responses)
4. Initiate corticosteroid therapy when indicated (166 responses)
5. Evaluate for evidence of end-organ damage or dysfunction (236 responses)
6. Consider biologic agents when indicated (90 responses)
7. Improve patient monitoring for long-term management (81 responses)
8. Consider immunomodulating agents when indicated (109 responses)
9. Evaluate for evidence of end-organ damage or dysfunction (236 responses)

Evaluation respondents intend to make changes in practice as a result of the activity.

88%

N=1,112

Respondents could provide more than one intended practice change.

N=1,720
**Evaluation respondents reported their key takeaways from the activity:**

<table>
<thead>
<tr>
<th>Key Takeaway</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better understanding of management of HES</td>
<td>Burden of hypereosinophilic syndrome</td>
</tr>
<tr>
<td>Careful evaluation</td>
<td>Consider eosinophilic related disease</td>
</tr>
<tr>
<td>Coordination of evaluation with other subspecialists</td>
<td>Pharmacologic treatment of HES</td>
</tr>
<tr>
<td>Complexity of HES presentation and the advances in treatment</td>
<td>Earlier diagnosis and treatment options</td>
</tr>
<tr>
<td>Advancements in targeted therapy</td>
<td>Importance of biologics in HES</td>
</tr>
<tr>
<td>Importance of eosinophils</td>
<td>Differential diagnosis of HES and understanding of the pathophysiology</td>
</tr>
</tbody>
</table>

82% of respondents indicated the activity addressed strategies for overcoming barriers to optimal patient care.
**What topics would you like more information about in future educational activities?**

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring patient response to medication</td>
</tr>
<tr>
<td>Updates in clinical guidelines</td>
</tr>
<tr>
<td>New biologics</td>
</tr>
<tr>
<td>New advances in treatment of HES</td>
</tr>
<tr>
<td>Tolerability and side effects of new treatments</td>
</tr>
<tr>
<td>Differential diagnosis of HES</td>
</tr>
<tr>
<td>Cardiac involvement with HES</td>
</tr>
<tr>
<td>Related eosinophilic diseases</td>
</tr>
<tr>
<td>Drug therapy in more detail</td>
</tr>
</tbody>
</table>
National Jewish Health is accredited with Commendation by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. The NJH Office of Professional Education produced and accredited this program and adhered to the updated ACCME guidelines.

NJH designates the enduring material for a maximum of 1.0 AMA PRA Category 1 Credit™.