

Clinical Implications of the Airway Epithelium on the Management of Patients with Severe Asthma

Final Online Outcomes Summary
Data from 4/29/22 – 4/29/23
Grant #71029469

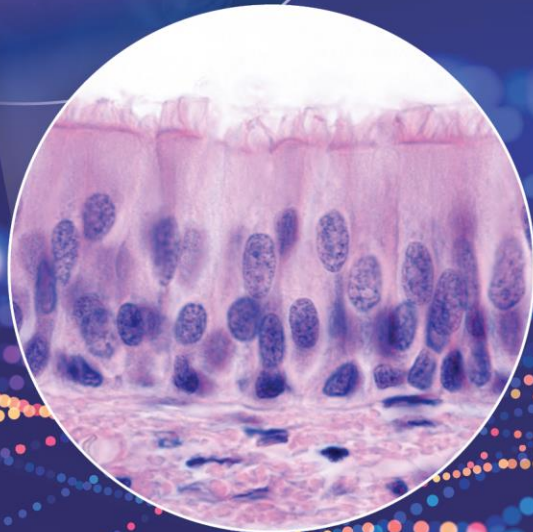


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Executive Summary

Final Outcomes Summary – Online Enduring Outcomes

Program Overview

This online educational activity took a deep dive into the role of epithelial alarmins such as TSLP, IL-33 and IL-25 as upstream mediators of severe asthma pathophysiology. Expert faculty in allergy and pulmonology discussed how this new paradigm of severe asthma can improve patient care with current and emerging therapies. The activity included 2D/3D animations and a clinical reference aid on severe asthma pathophysiology and treatment targets, as well as resources and polling questions throughout the activity to engage learners and facilitate retention.

Online Enduring Dates:

April 29, 2022 - April 29, 2023

Activity Link:

<https://cme.healio.com/pulmonology/20220331/clinical-implications-of-the-airway-epithelium-on-the-management-of-patients-with-severe-asthma/cme-overview>

Program Faculty



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Learning Objectives

1. Describe the role of the respiratory epithelium in asthma development and progression.
2. Define the epithelial alarmins and their impact on T2 and non-T2 airway inflammation, remodeling, and hyper-responsiveness in severe asthma.
3. Evaluate the results of clinical trials of emerging therapies that target the epithelial alarmins in severe asthma.

Target Audience & Accreditation

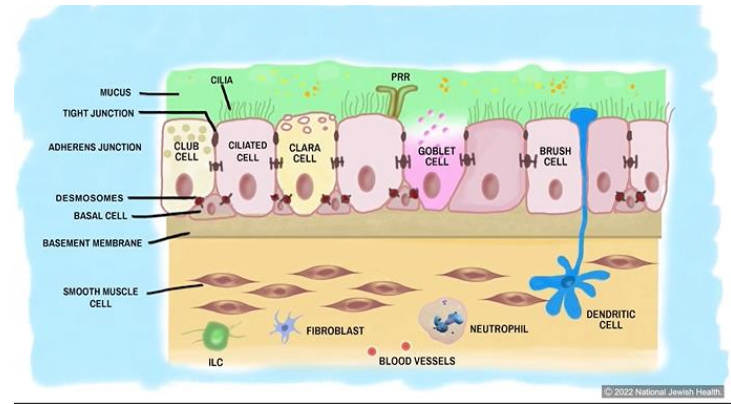
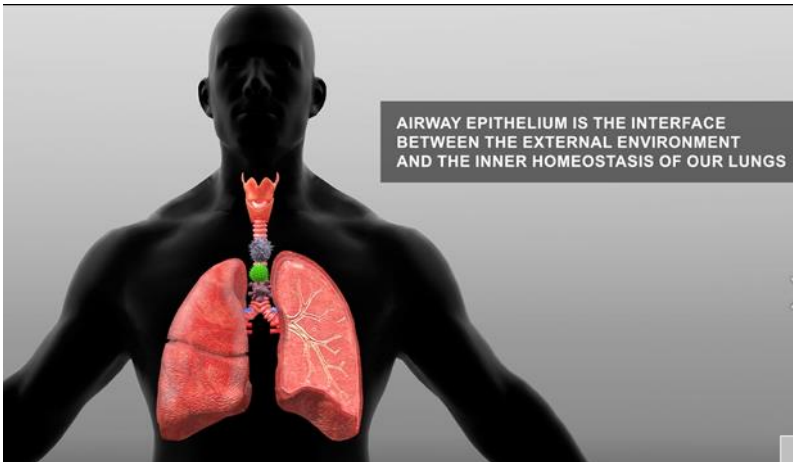
Primary target audience: Pulmonologists and Allergists
Secondary target audience: Nurse Practitioners and Physician Assistants in those specialties

National Jewish Health designates the online enduring activity for a maximum of 0.5 AMA PRA Category 1 Credit™.

Program Features

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Whiteboard Animations



Clinical Reference Aid

The Role of the Airway Epithelium in Asthma

The airway epithelium is the interface between the external environment and the inner homeostasis of our lungs. Airway epithelium acts as:

- Barrier
- Cleaner
- Neutralizer of inhaled substances

NORMAL EPITHELIUM

Fibroblasts, Epithelium, Blood Vessels, Basement Membrane, Smooth Muscle Cells

EPITHELIUM IN ASTHMA

In asthma, these protective are impaired due to exogenous genetic variation or ongoing inflammation. This leads to immune and inflammatory responses resulting in:

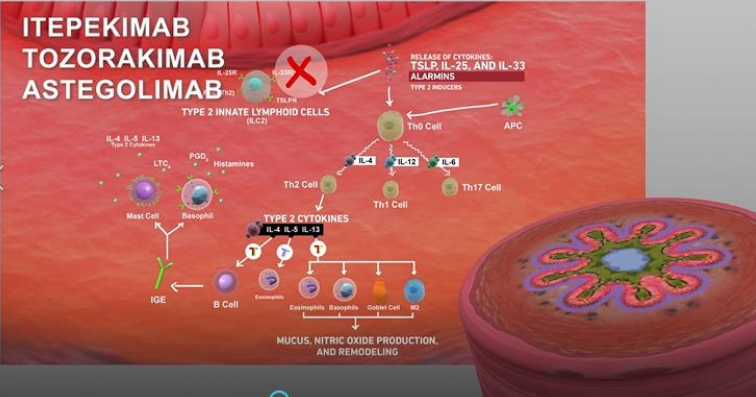
- Variable airflow obstruction
- Mucus hypersecretion
- Airway hyperresponsiveness

The inflammatory cascade of asthma is thought to begin at the airway epithelium. Once a trigger such as allergens, parasites, fungi, viruses, proteases, or other irritants is introduced:

1. Epithelial alarmins are released.
2. Innate Lymphoid Cells are triggered.
3. T cells are activated. T cells are then stimulated by cytokines and differentiate into Th1, Th2 or Th17 cells.
- 4A. Triggering of IL2 or Th2 cells leads to type 2 inflammation and the release of type 2 cytokines.

or

- 4B. Triggering of Th1 or Th17 cells leads to release of interferon-gamma and other cytokines that lead to non-Type 2 inflammation.



Interactive Learning Moments

Key Points

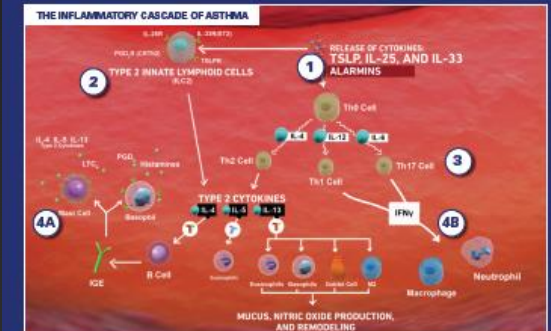
Question 0:07:44

Please pay attention to this Question

What is the most impactful information about the structure and function of the airway epithelium that may inform and influence your management of asthma patients? (Note - There is no "right" answer; we are asking for your personal opinion.)

- Ⓐ: The role of the mucociliary escalating system in clearing inhaled microbes, pollutants, and allergens.
- Ⓑ: The importance of the club cells in providing means to add hydration to mucus to prevent it from becoming too viscous.
- Ⓒ: The release of alarmins from the airway epithelium and their central role in initiating the immune and inflammatory cascades leading to Th-1 and Th-2 responses to exogenous inhaled substances including microbes, allergens and air pollutants.
- Ⓓ: The role of pattern recognition receptors (such as the Toll like receptors) in developing "memory trained immunity" responses for various inhaled microbes and allergens.
- Ⓔ: The fact that the initiation of these responses starting in the airway epithelium plays a central role in the development of airway remodeling and bronchial hyperresponsiveness.

View In Admin



CONNECTING INFLAMMATORY PATHWAYS TO TREATMENT OPTIONS

Treatment Target	Biologic Agent	FDA Approval Status in Asthma
TSLP	Tezepelumab	FDA approved for severe asthma regardless of phenotype or endotype
IL-33	Mapikimab	Not yet approved, currently in phase 2 and 3 trials
IL-33	Tozorakimab	Not yet approved, currently in phase 2 trials
IL-33 (Anti ST2)	Astegolimab	Not yet approved, currently in phase 2 trials
IL-25	None	No human studies to date
IL-4/IL-5/IL-13	Dupilumab	FDA approved for severe asthma with eosinophilic phenotype or for steroid-dependent asthma
IL-5	Mapolizumab, Reslizumab	FDA approved for severe asthma with eosinophilic phenotype
IL-6/IL-17	Brodalumab	FDA approved for severe asthma with eosinophilic phenotype

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Audience Generation

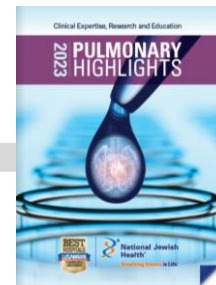
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Personalized targeting tools across numerous tactics reach HCPs by leveraging demographic data (such as location, profession, specialty) and behavioral data (such as learner participation history, areas of interest).

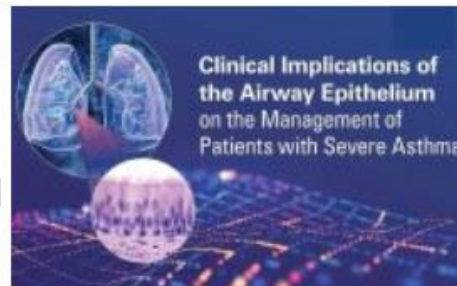
Personalized emails and e-newsletters to NJH and Healo databases



Featured in 2023 Pulmonary Highlights publication



Social media posts on NJH Twitter and LinkedIn accounts



Dedicated landing page on NJH and Healo websites

Personalized activity recommendations on Healo platform based on learner activity and preferences



Search engine optimization on Healo platform

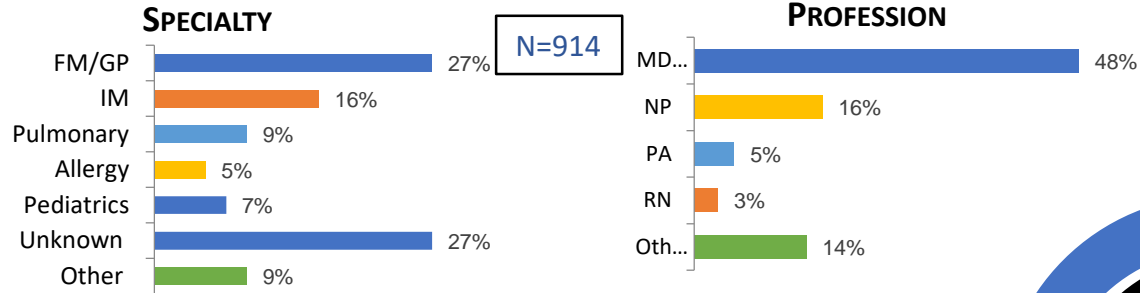
Educational Impact Summary

Final Outcomes Summary – Online Enduring Outcomes



Educational Reach

Of **914 participants** on ArcheMedx, **753 participants started** the video content, with **539 completing** the content for a completion rate of **72%**.

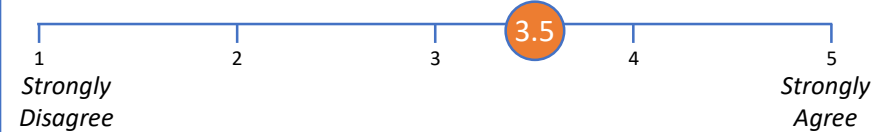


There were **2,245 total learner visits to the activity** on Healio, from **1,425 unique learners**.

Practice Change

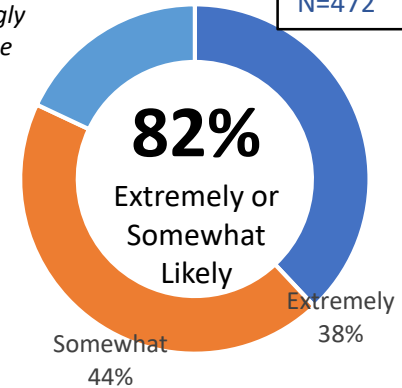
Improved ability to treat or manage patients

I plan to change my practice based on what I learned



ANTICIPATED CHANGES IN PRACTICE

- Consider asthma phenotype and endotype
- Use more specialized medications to control asthma
- Consider biologics for treatment
- Better patient education

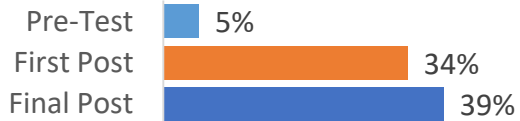


Knowledge/Competence/Confidence



IMPROVEMENTS IN MASTERY

High Confidence and Correctness



Rise in Mastery **643%**
Average Post-Test Attempts **1.38**

RELATIVE GAINS BY LEARNING OBJECTIVE

- 129%** - Describe the role of the respiratory epithelium in asthma development
- 431%** - Define the epithelial alarmins and their impact on T2 and non-T2 airway
- 254%** - Evaluate the results of clinical trials of emerging therapies that target the epithelial alarmins in severe asthma.

Learner Engagement



46%
Participants who utilized a mobile device

72%
Participants who watched 100% of the content

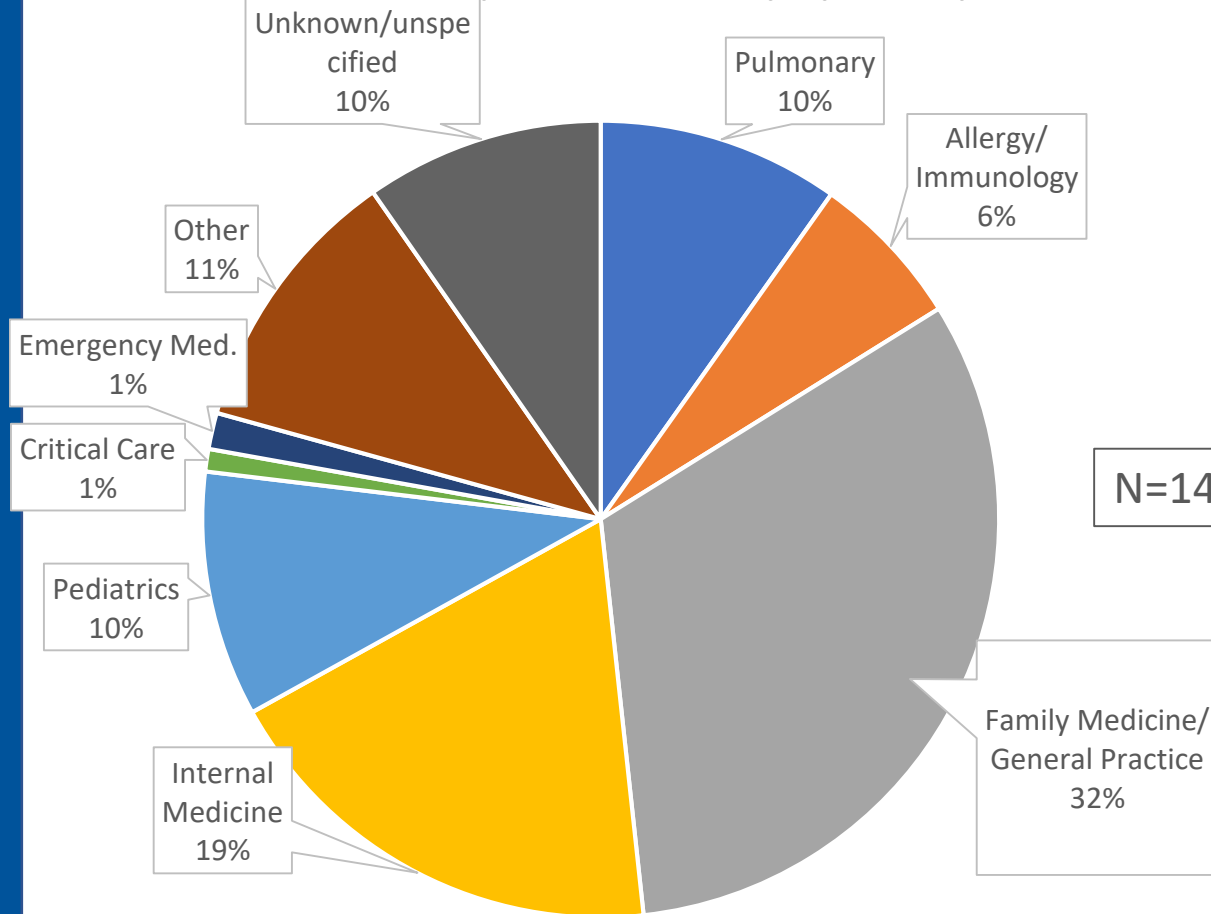
Learning Actions **2,504**

Notes Taken **80**

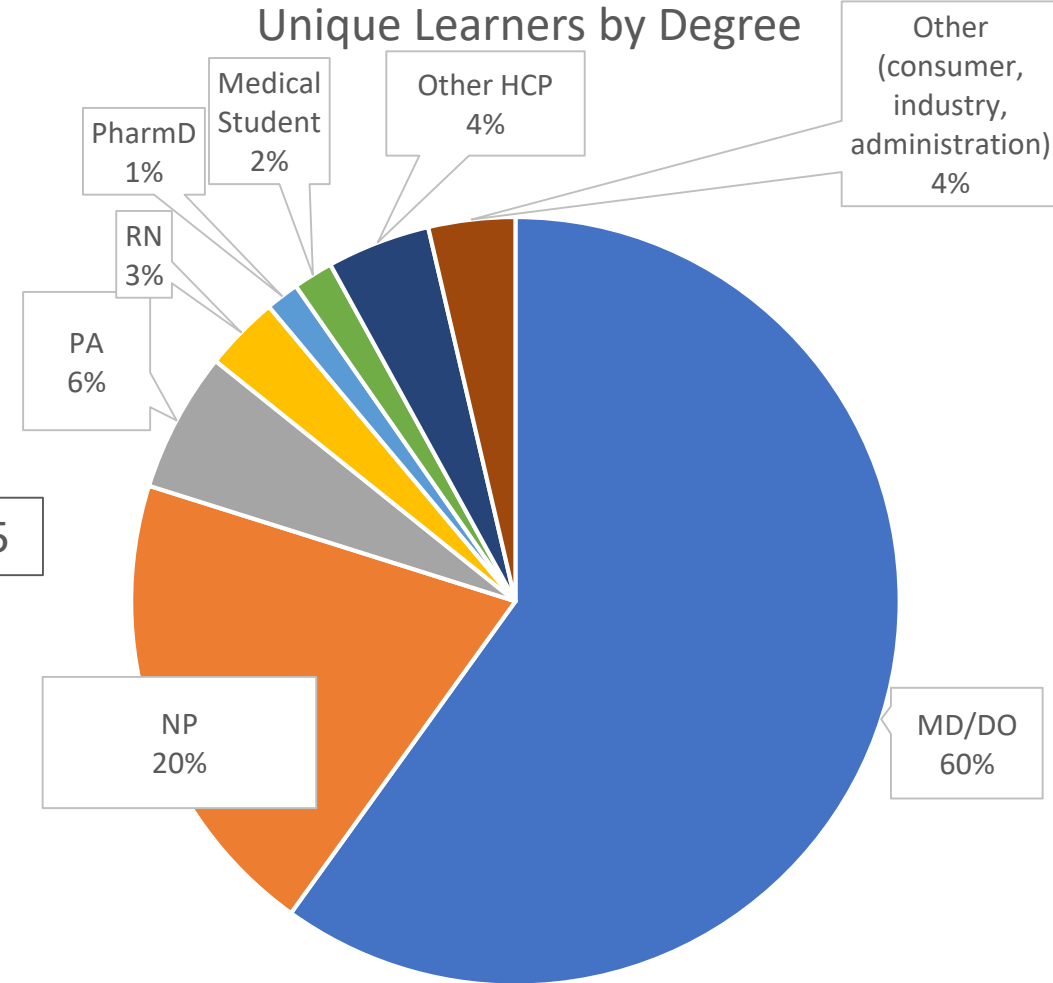
Level (1) Outcomes: Participation on Healio

Final Outcomes Summary – Online Enduring Outcomes

Unique Learners by Specialty



Unique Learners by Degree



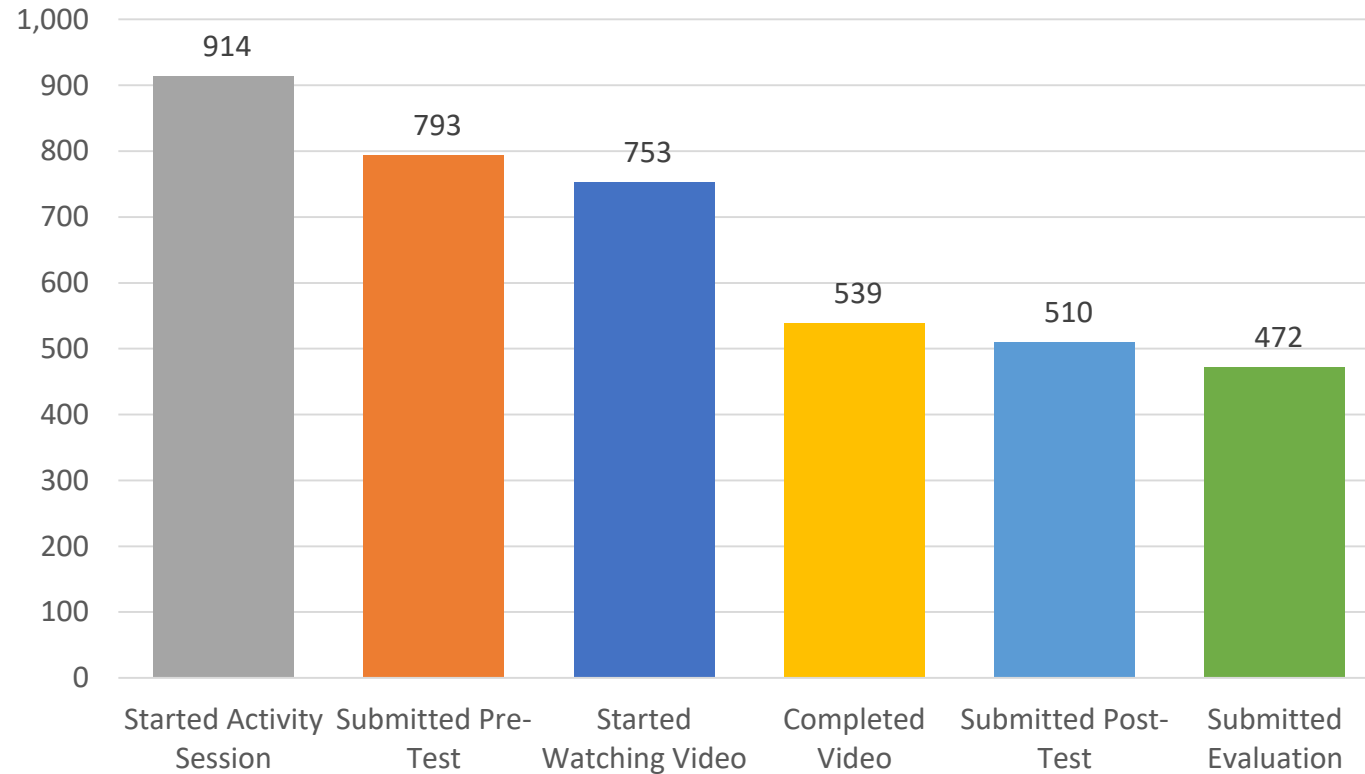
N=1425

Note: While marketing efforts were primarily targeted at pulmonologists and allergists, 51% of learners were in primary care and 10% were in pediatrics, demonstrating a need for education on severe asthma among providers in these specialties.

Unique learners are defined as unique visits to the activity on the Healio platform.

Level (1) Outcomes: Participation on ArcheMedx

Final Outcomes Summary – Online Enduring Outcomes



Time Watching Video

72%

Participants who watched 100% of the video



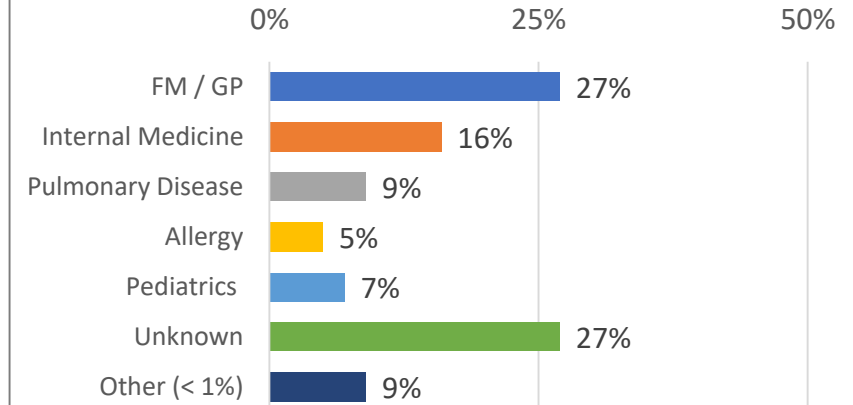
Mobile Use

46%

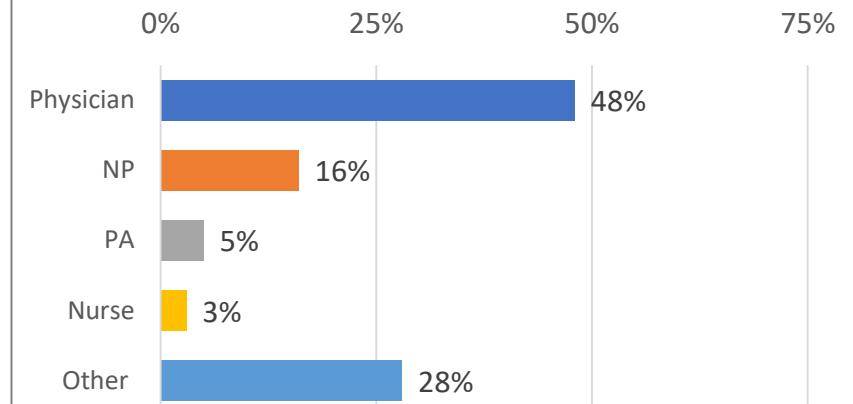
Participants who accessed the curriculum via a mobile device

Participant Top Specialties

N=914



Participant Top 5 Professions



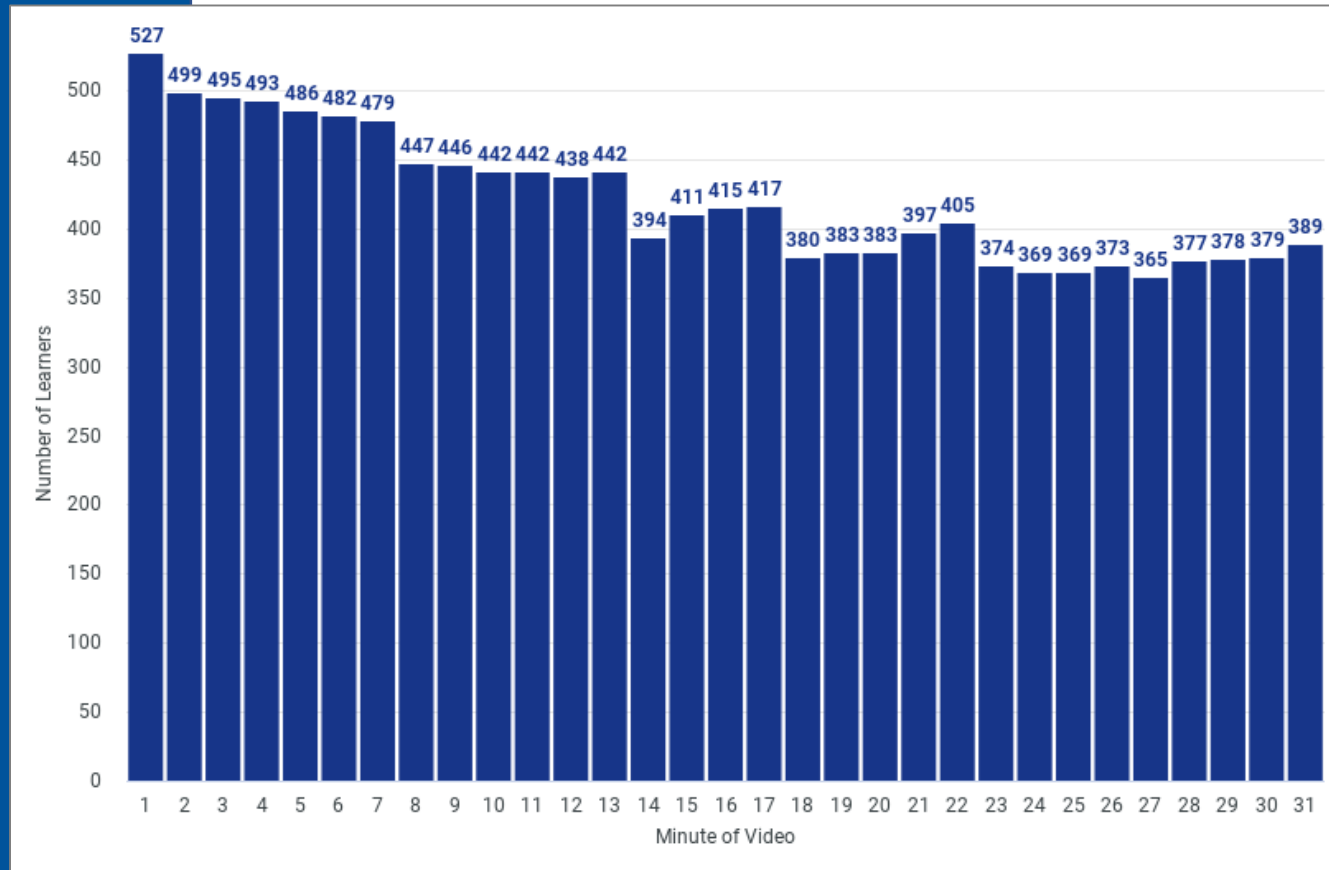
Participants are defined as clinicians who start watching the activity content on the ArcheMedx platform.

Participant Engagement while Viewing the Content

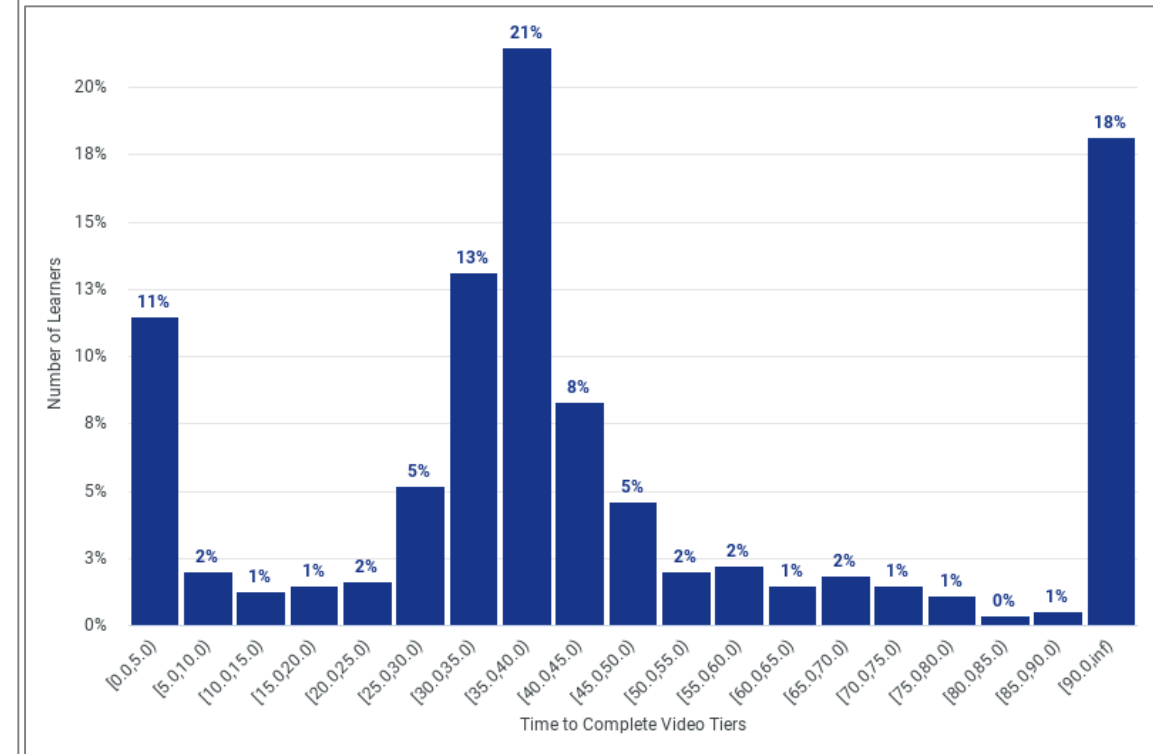


Final Outcomes Summary – Online Enduring Outcomes

Minute by minute views of video content



Time to complete video content



Participant Engagement while Viewing the Content

Final Outcomes Summary – Online Enduring Outcomes

97% of evaluation respondents stated the animations improved their understanding of severe asthma pathophysiology N=472

2,020

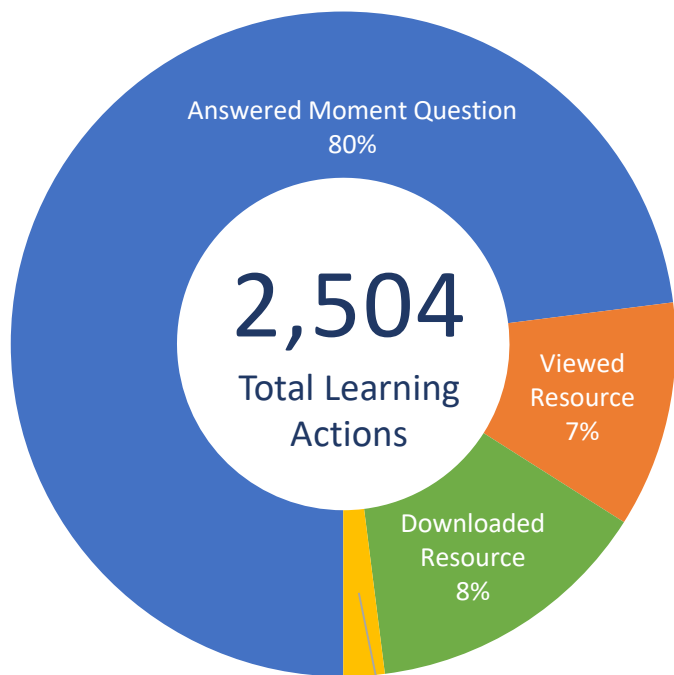
Moment
Question
Responses

197

Resource
Downloads

172

Resource
Views



2% completed other learning actions (added screenshot to note, pinned resource, and pinned moment).

Top Resources Viewed and Downloaded

Viewed

Roles in Allergic Inflammation and Therapeutic Perspectives

Clinical Reference Aid: The Role of the Airway Epithelium in Asthma

Respirology – 2015, Yao, Interleukin IL-25, Pleiotropic Roles in Asthma

Airway epithelium downloadable slides

Downloaded

Clinical Reference Aid: The Role of the Airway Epithelium in Asthma

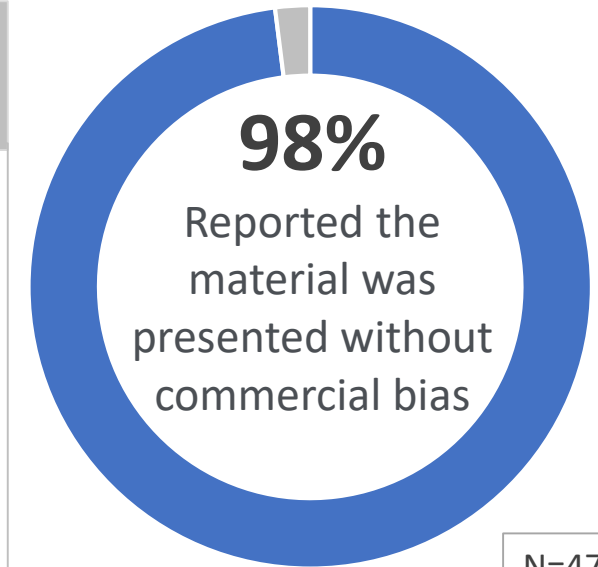
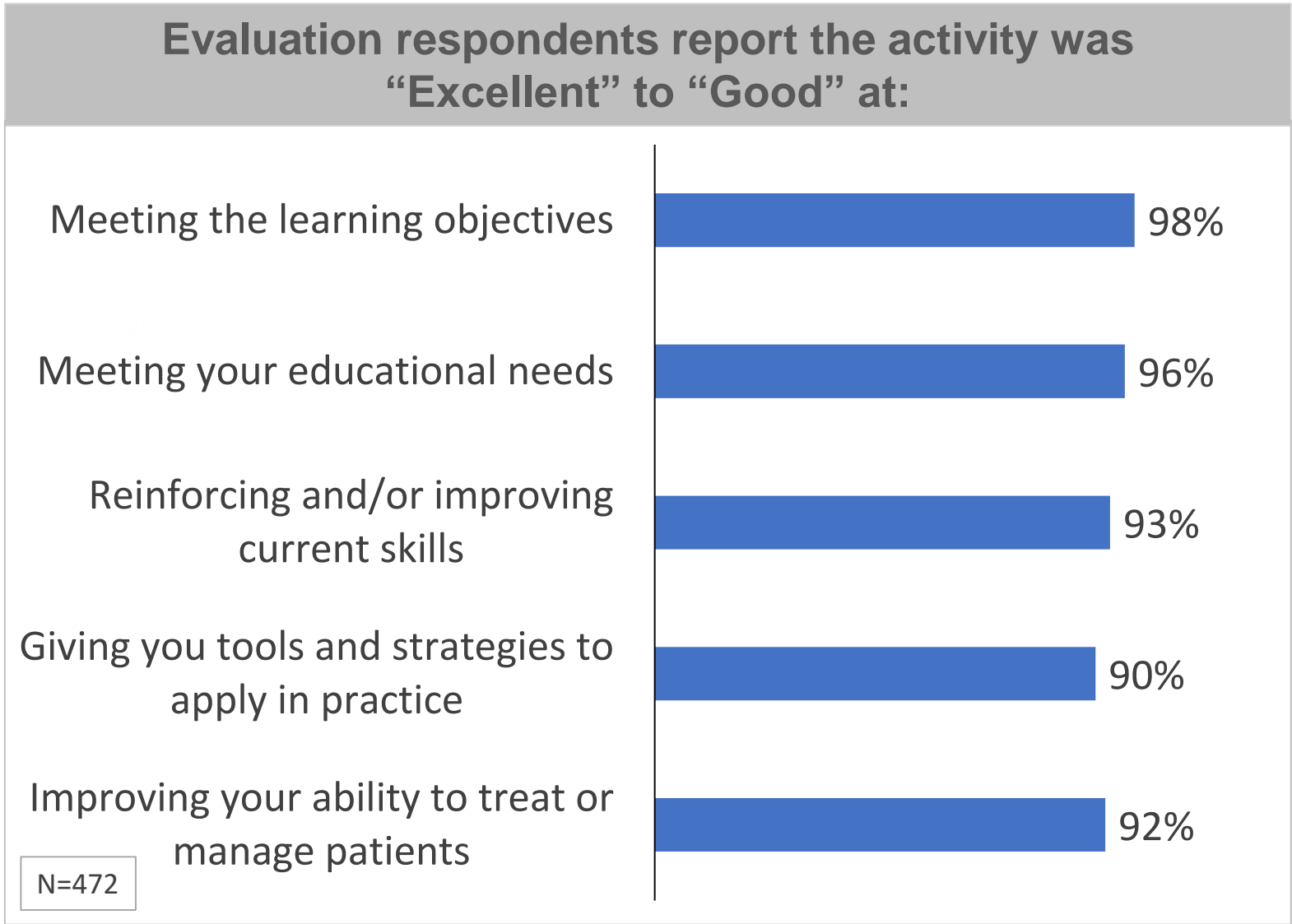
Airway epithelium downloadable slides

Roles in Allergic Inflammation and Therapeutic Perspectives

Respirology – 2015, Yao, Interleukin IL-25, Pleiotropic Roles in Asthma

Level (2) Outcomes: Satisfaction

Final Outcomes Summary – Online Enduring Outcomes



N=472

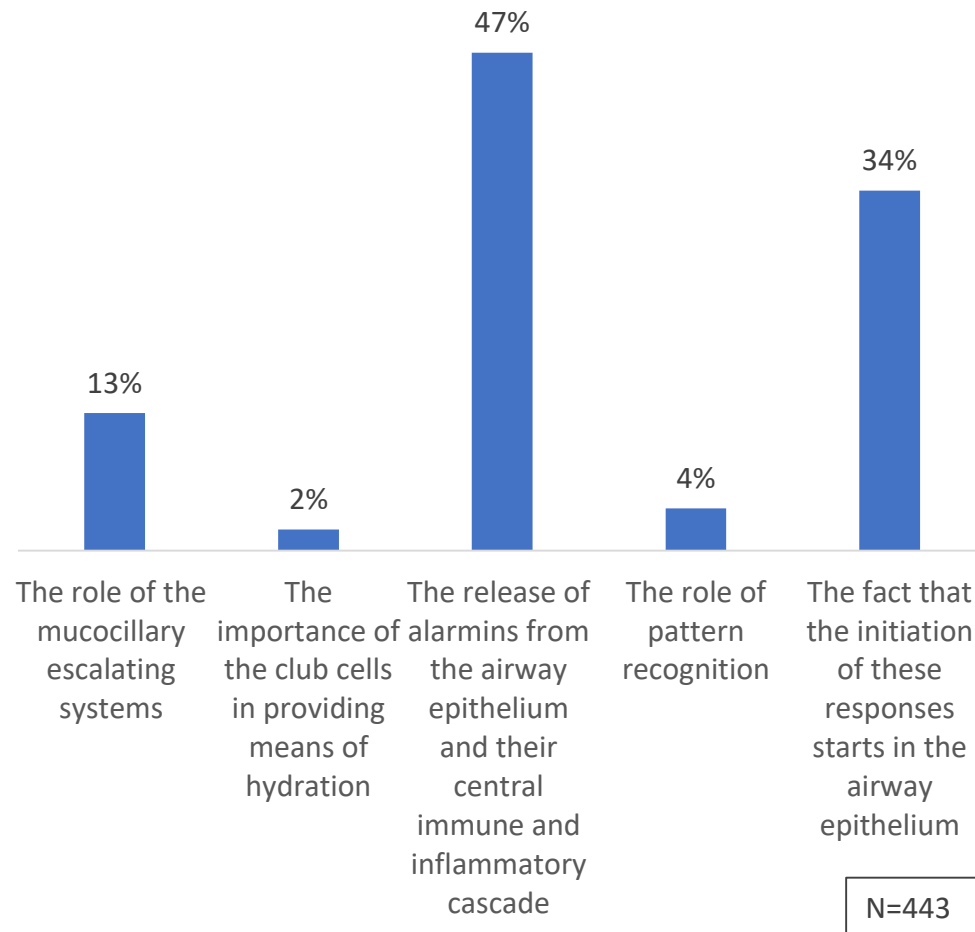


Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

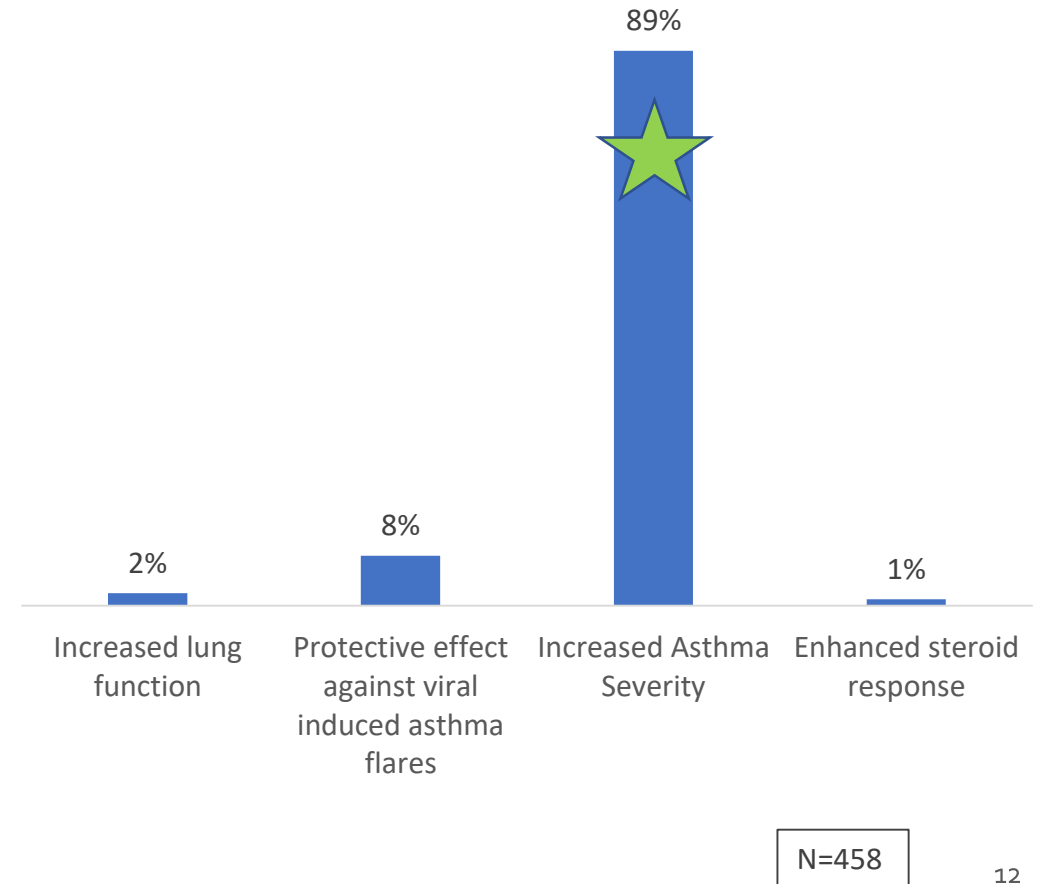
Reflection: What is the most impactful information about the structure and function of the airway epithelium that may inform and influence your management of asthma patients?

Learning Moment 1



Question: Which of the following is a clinical feature associated with elevated levels of TSLP?

Learning Moment 2



Learning Moment 3

Reflection: How might new understandings of the role of the airway epithelium in asthma change the way you approach patient care?

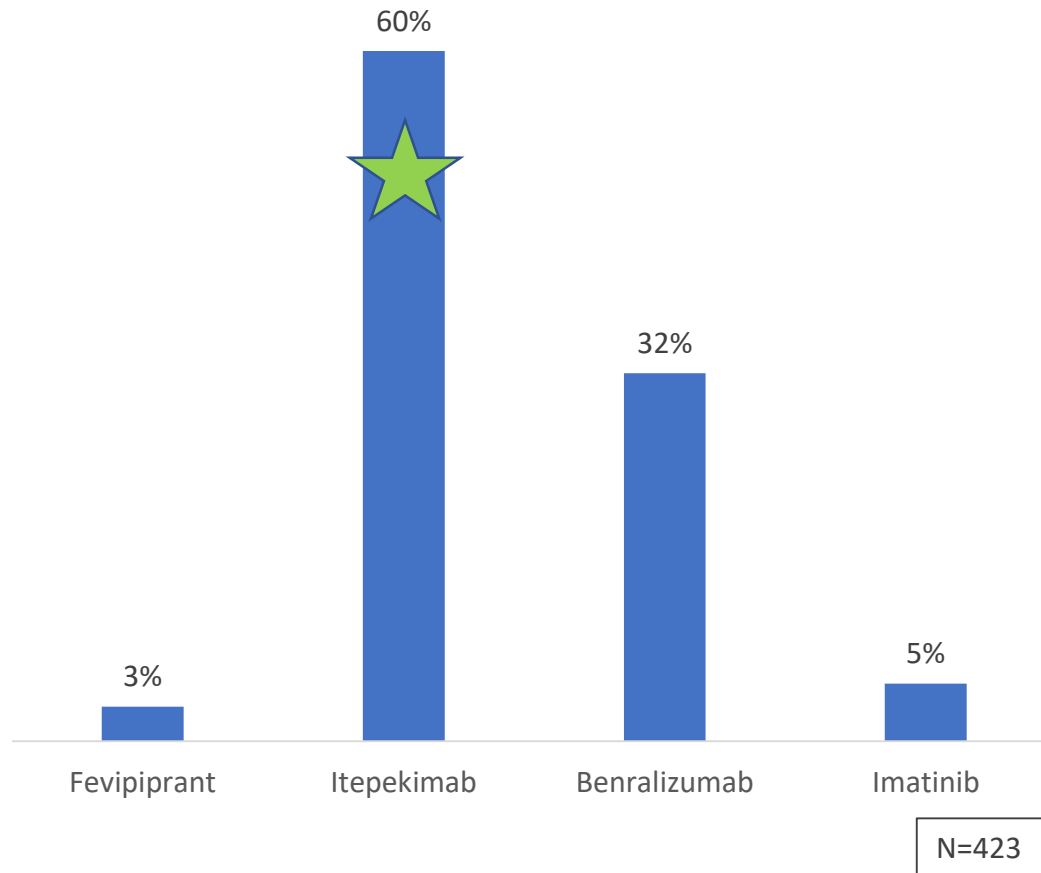
- New ways to target the inflammatory response in asthma, possibly targeting IL-25 as a marker for disease.
- It will significantly impact my daily practice in patients with asthma.
- Customize care once we have a better understanding of which of these substances are more related to asthma severity or specific triggers.
- New understandings of the role of the airway epithelium will help to better guide which medication choice is best for each patient type.
- Helps me to understand steroid non-responsiveness better and makes it easier to select biologics based on understanding of asthma etiology and clinical responsiveness.
- Investigate any drugs that block biomarker triggers.
- Prescribing medications to help suppress inflammation.
- Consider the roles of biomarkers in early diagnosis.
- Choosing the right medication targeting the underlying issue in asthma process will be more successful in treating severe asthma.
- Personalized management and achieving better control.
- The alarmins help explain asthma being triggered by pollutants, viruses and other non-allergic stimuli and may also help better understand airway remodeling and bronchial hyperreactivity.
- Consider immunology referral for complete assessment.

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

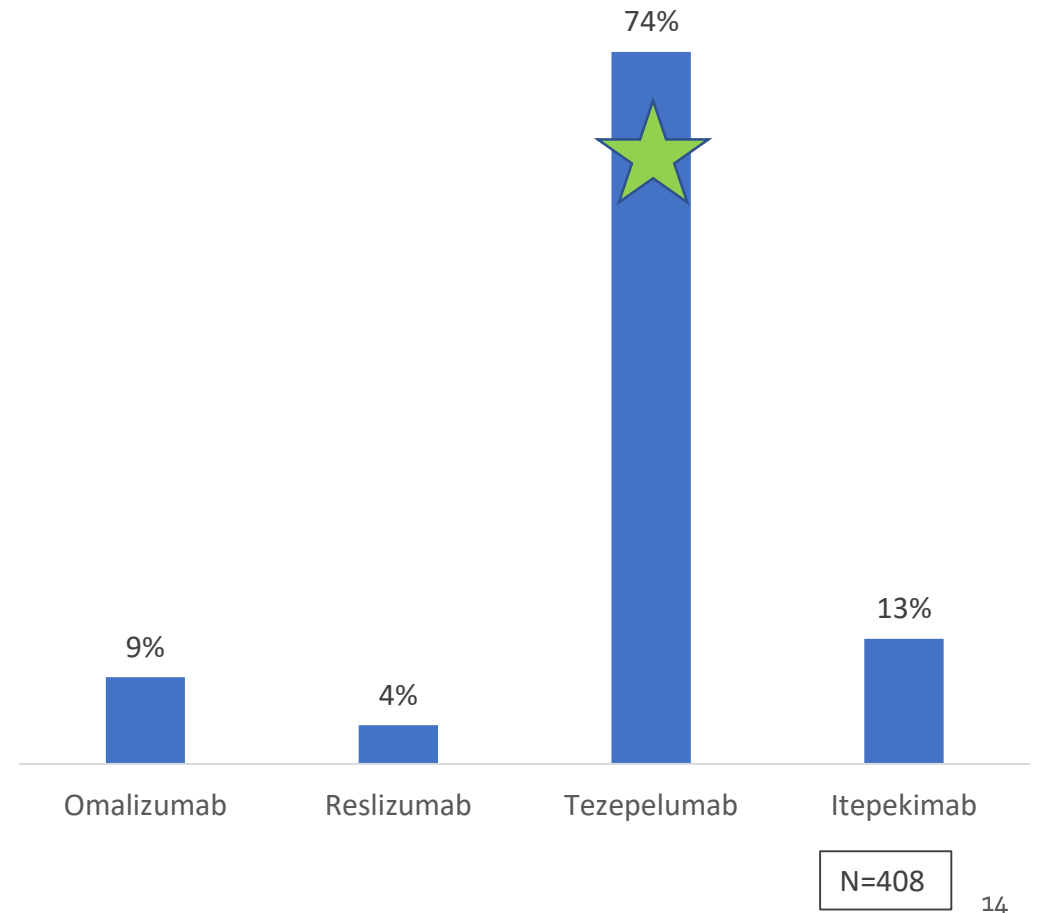
Question: Which of the following therapies is a monoclonal antibody against an epithelial alarmin, currently being studied for asthma?

Learning Moment 4



Question: Which of the following therapies is approved for severe asthma regardless of phenotype?

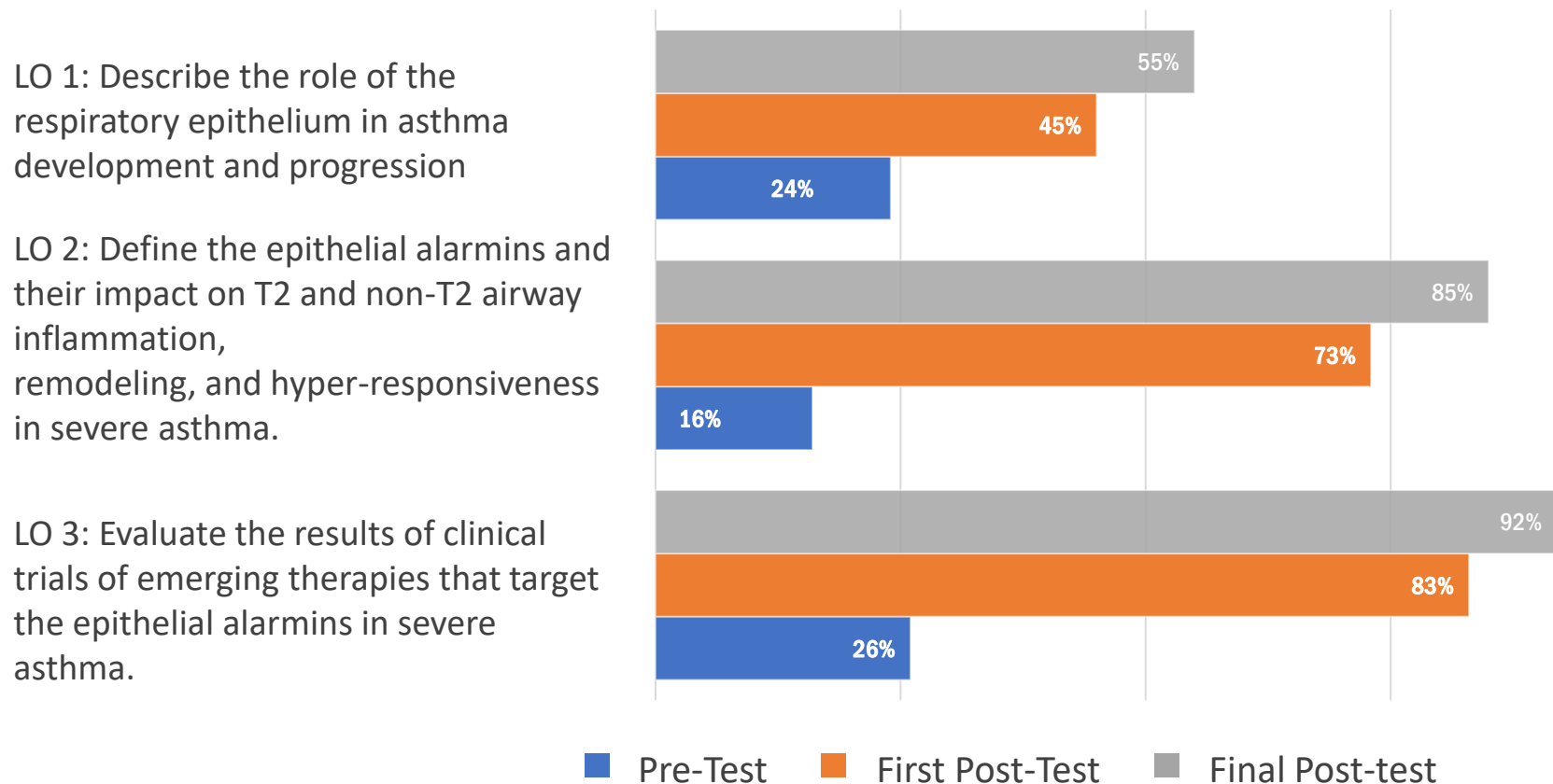
Learning Moment 5



Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

Knowledge Gain by Learning Objective



Relative Change

First Post-Test Final Post-Test

Learning Objective	First Post-Test	Final Post-Test
LO 1: Describe the role of the respiratory epithelium in asthma development and progression	88%	129%
LO 2: Define the epithelial alarmins and their impact on T2 and non-T2 airway inflammation, remodeling, and hyper-responsiveness in severe asthma.	356%	431%
LO 3: Evaluate the results of clinical trials of emerging therapies that target the epithelial alarmins in severe asthma.	219%	254%

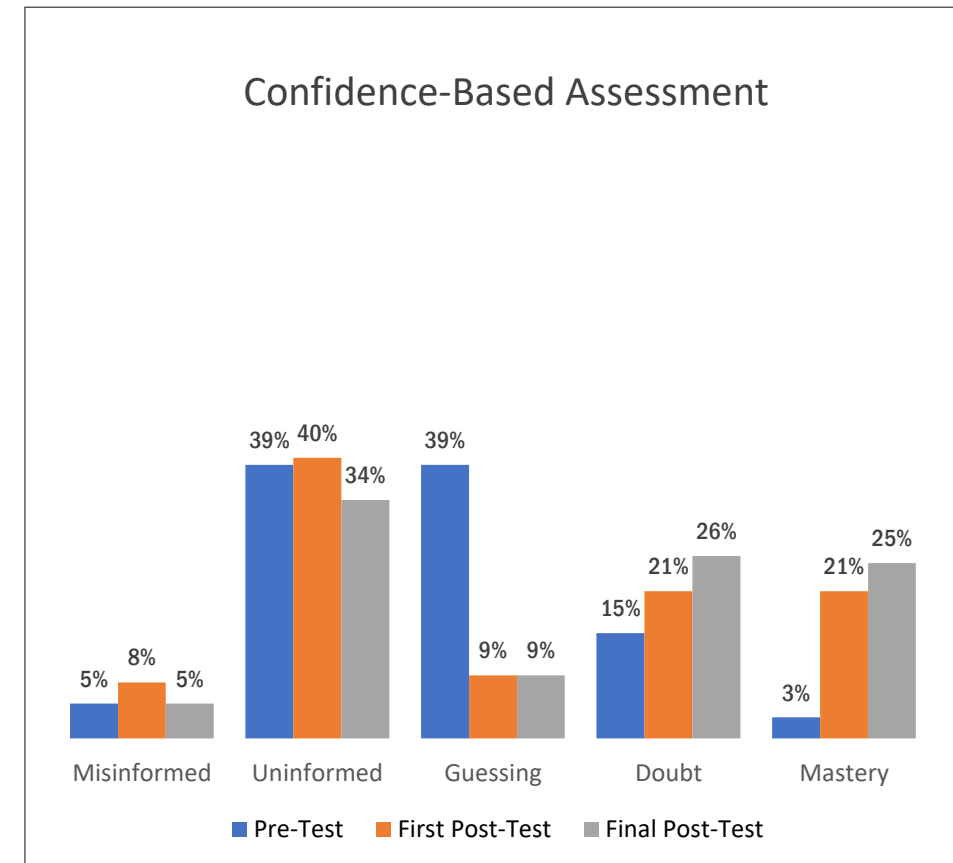
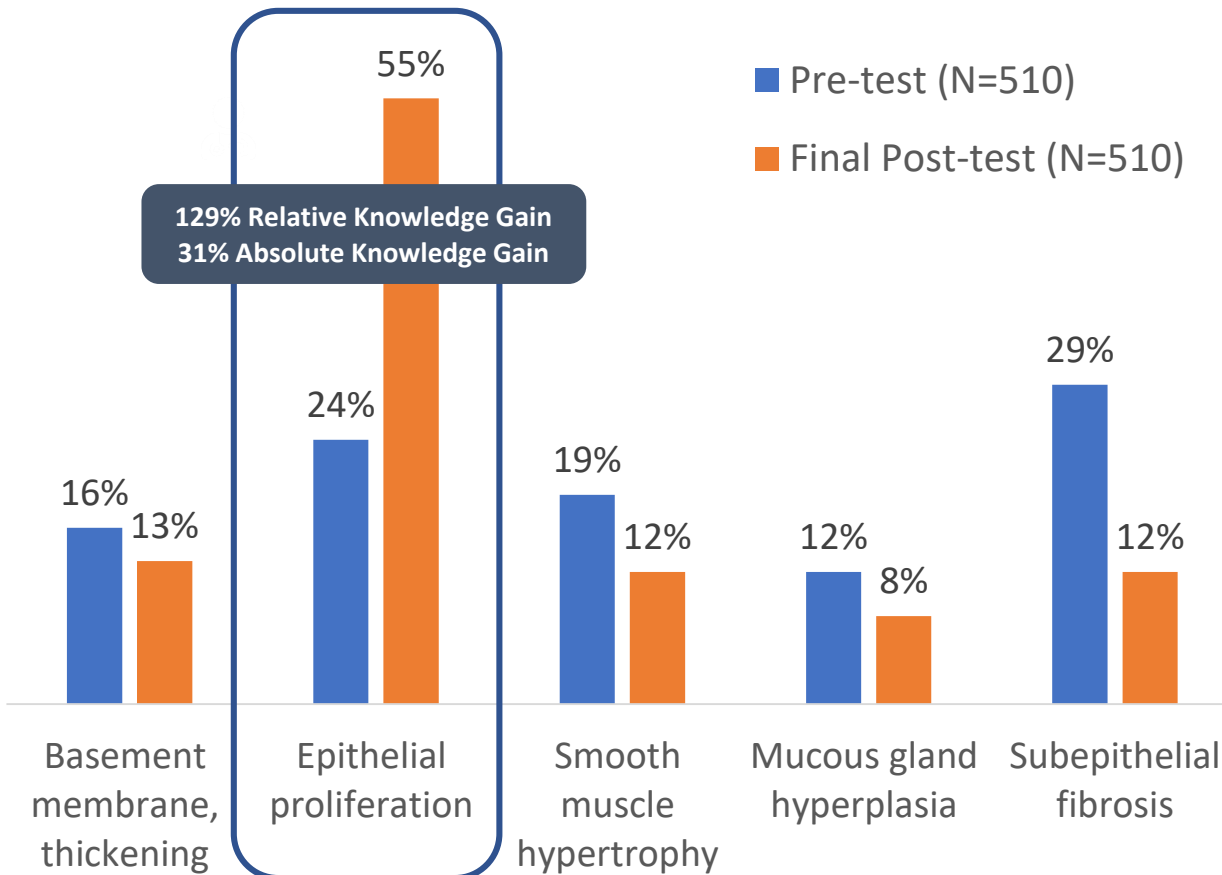
N=510

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

Question 1: Which of the following characteristics is not a feature of airway remodeling?

Learning Objective: Describe the role of the respiratory epithelium in asthma development and progression.

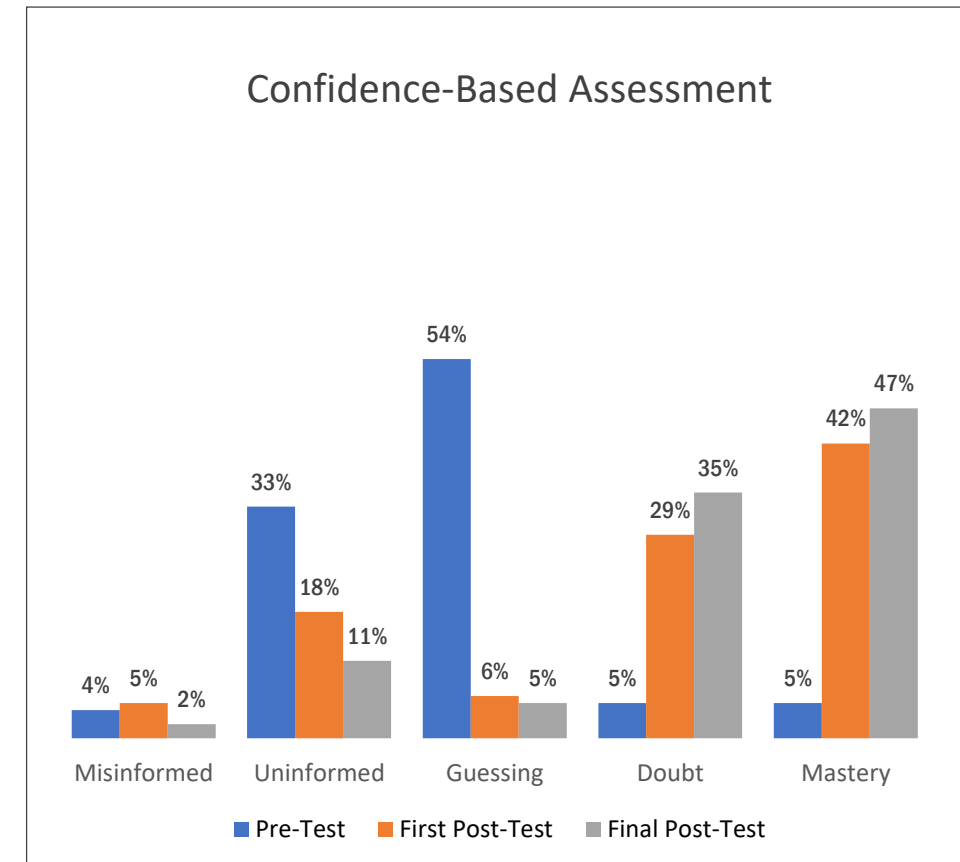
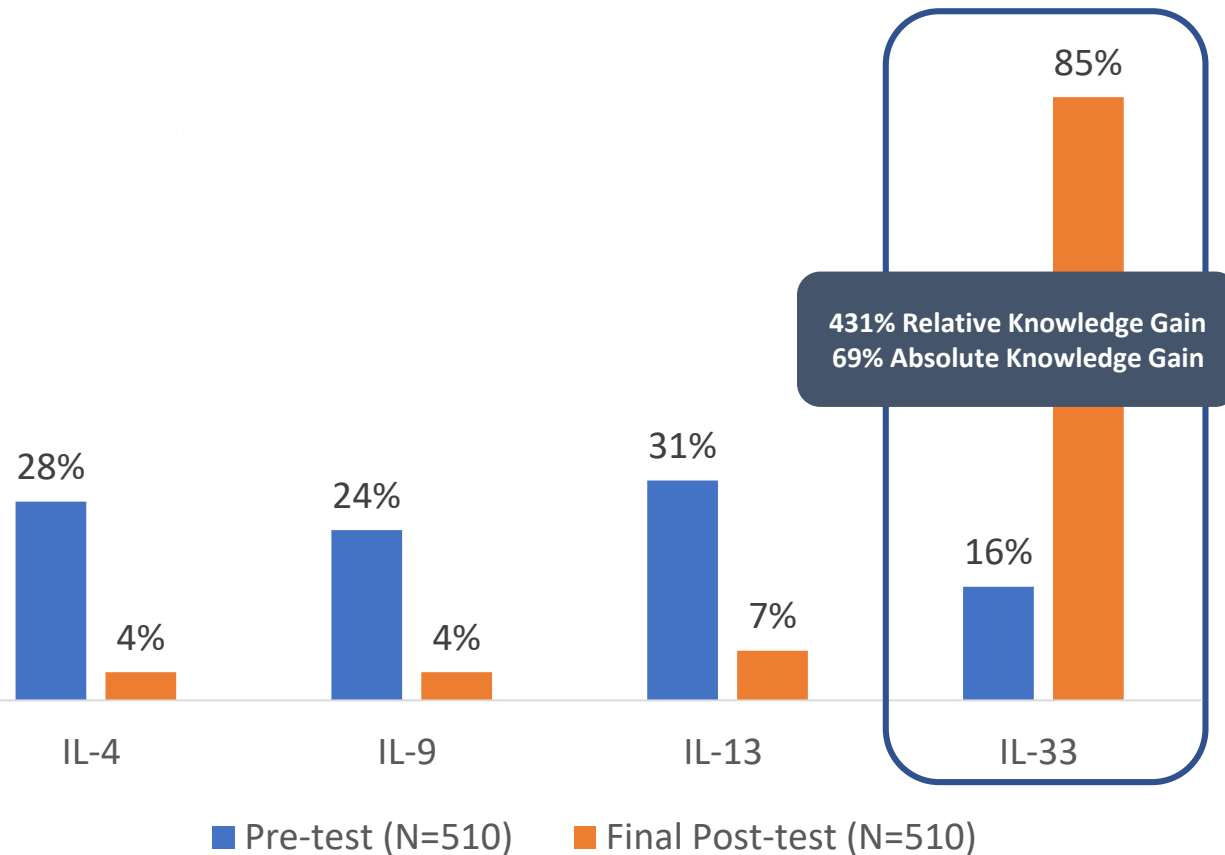


Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

Question 2: Which of the following is an epithelial alarmin active in asthma?

Learning Objective: Define the epithelial alarmins and their impact on T2 and non-T2 airway inflammation, remodeling, and hyper-responsiveness in severe asthma.

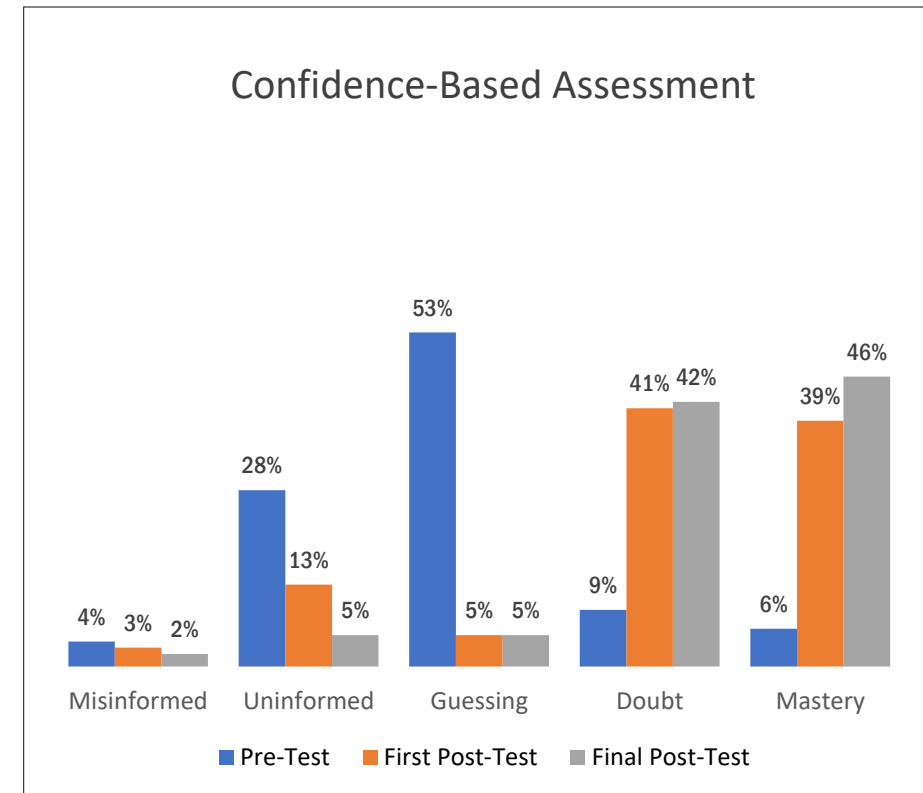
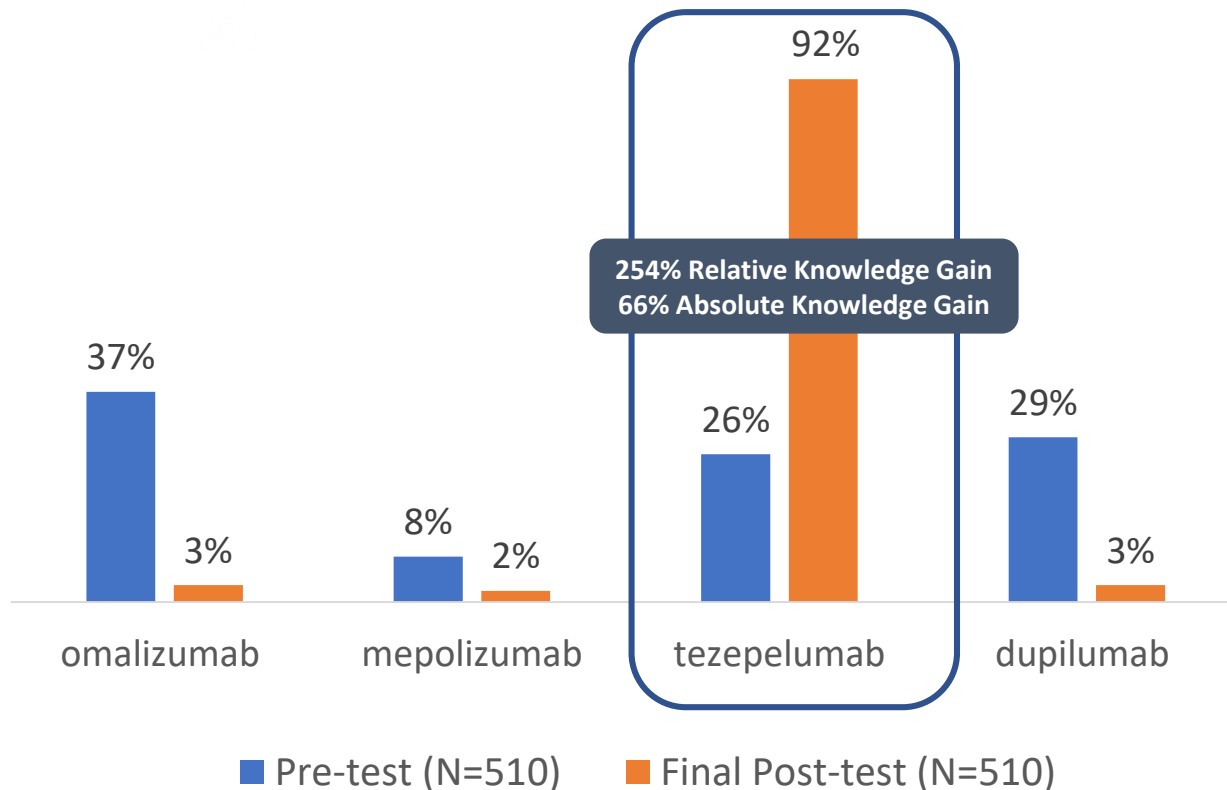


Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Online Enduring Outcomes

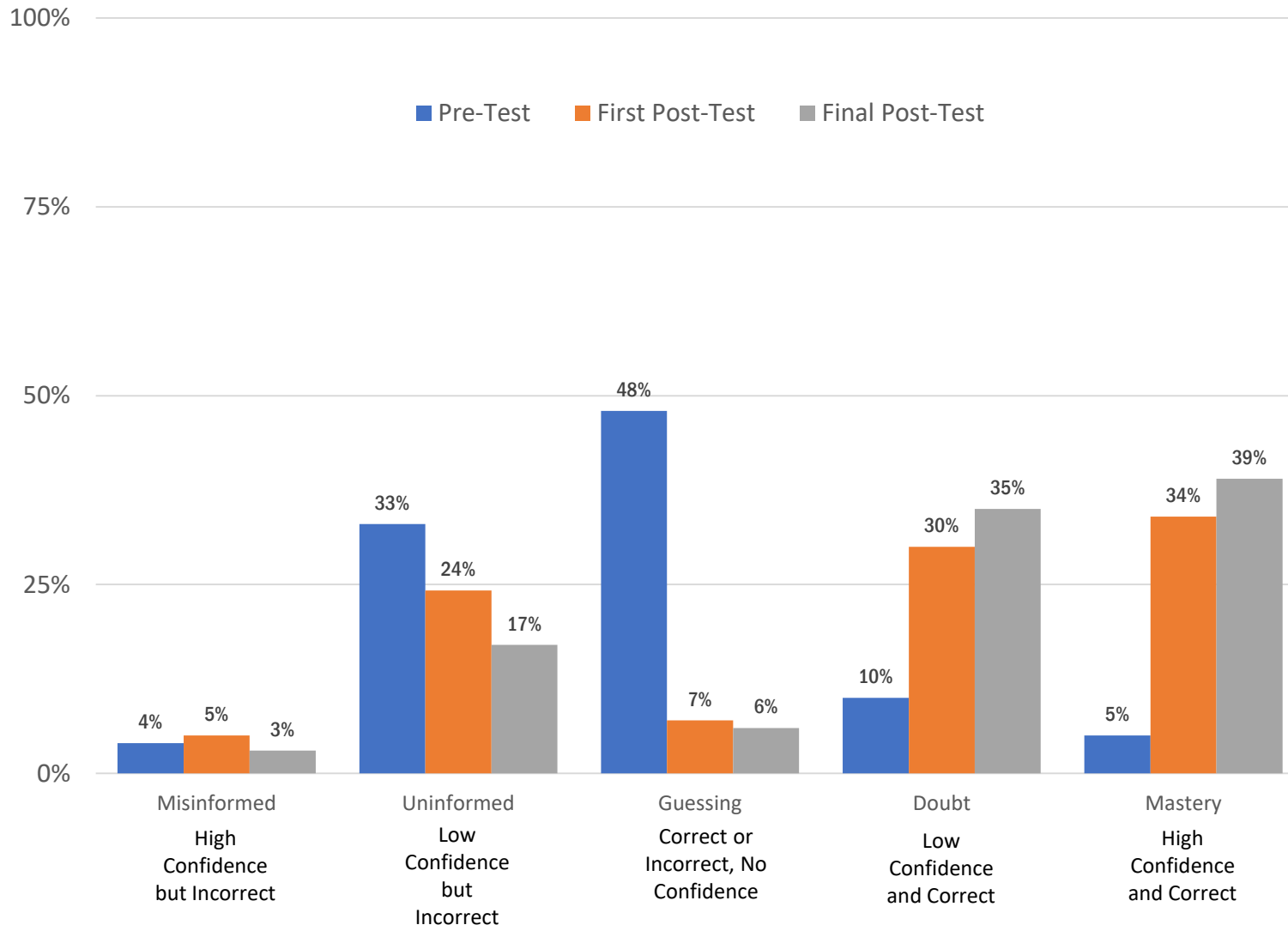
Question 3: Cindy is a 45-year-old female with adult-onset asthma, her main triggers being wildfire smoke and viral infections. She is non-atopic (negative allergy skin testing) and has normal eosinophil counts, exhaled nitric oxide, and total IgE levels on testing. Which of the following biologics would be most appropriate to prescribe if she is having 2 corticosteroid-requiring exacerbations per year despite high-dose ICS/LABA therapy?

Learning Objective: Evaluate the results of clinical trials of emerging therapies that target the epithelial alarmins in severe asthma.

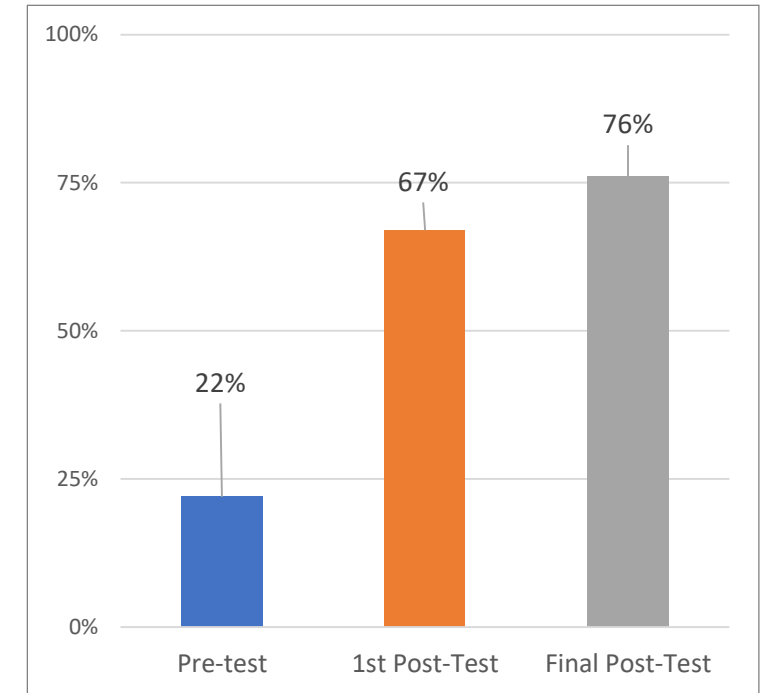


Level (3 & 4) Outcomes: Confidence Based Assessment (CBA)

Final Outcomes Summary – Online Enduring Outcomes



Aggregate Assessment Scores



643%

RISE IN MASTERY

Relative Increase in participants who show **High Confidence and Correctness**



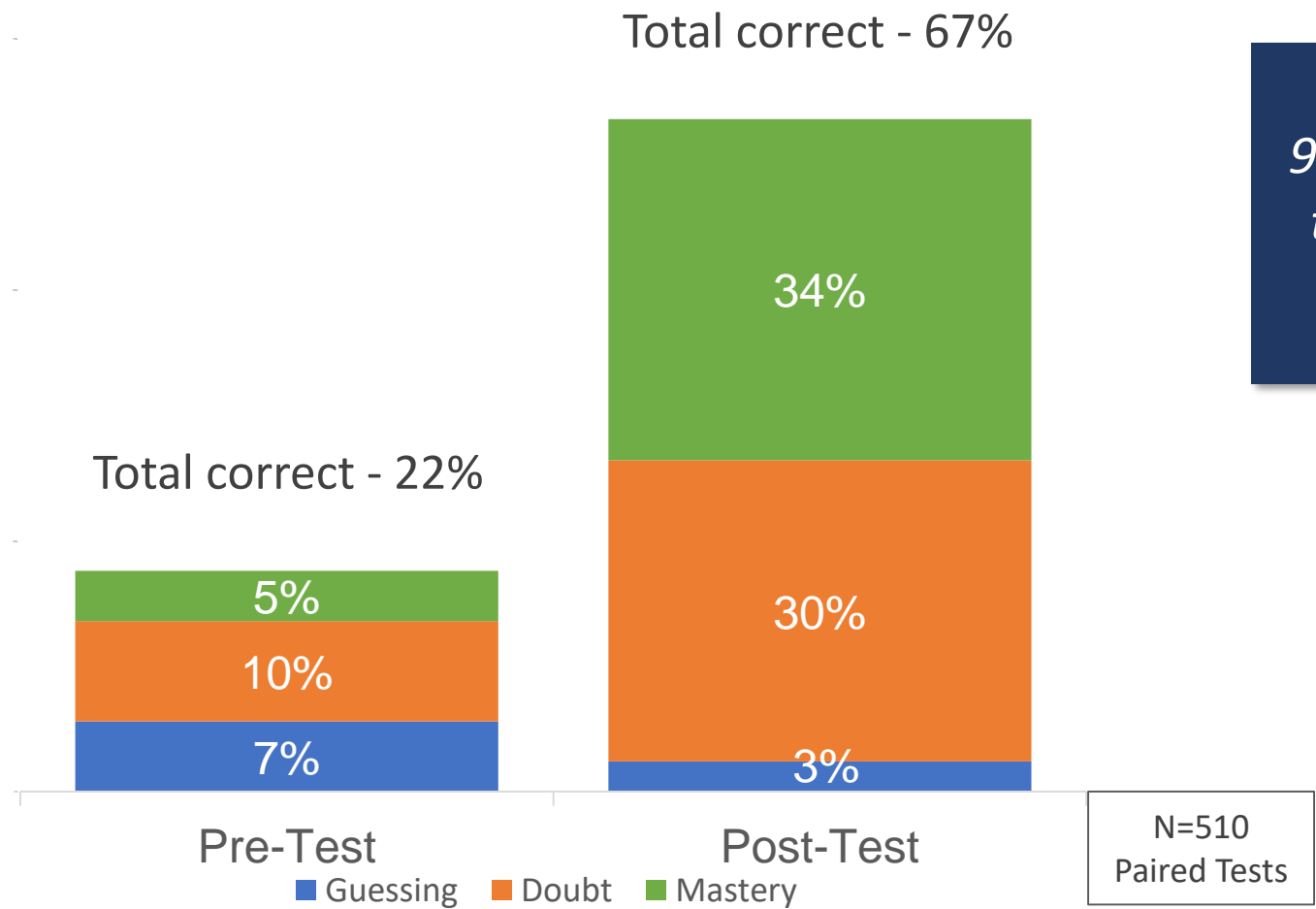
1.38

AVERAGE NUMBER OF POST-TEST ATTEMPTS

N=510
Paired Tests

Confidence-based Assessment goes beyond measuring correctness and dives deep into understanding a learner's belief (confidence) in their knowledge and competence, specifically looking at each question and requiring the learner to indicate the confidence in their answers.

Participant Correctness by CBA Category



“Highly Confident learners retained 91% of their learned knowledge while those with Doubt retained only 25% after a week”
Hunt (2003)

Excluding participants who guessed on the pre-test shifts the relative change from 205% to 327%

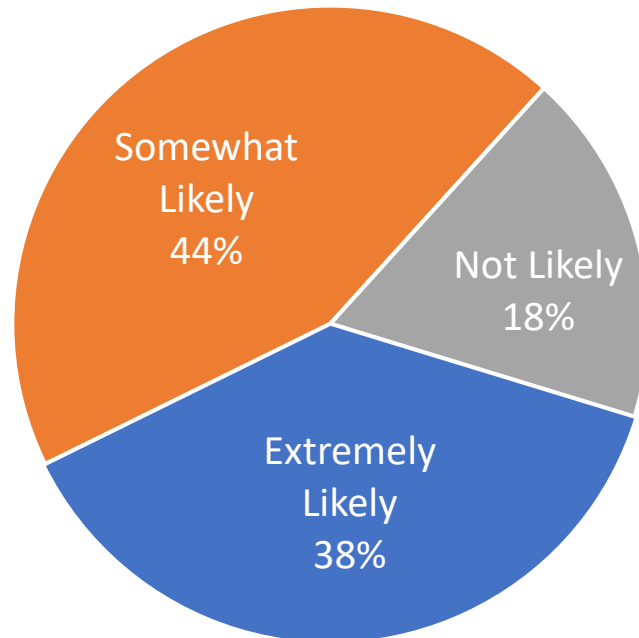
Level (4) Outcomes: Competence

Final Outcomes Summary – Online Enduring Outcomes

82%

Evaluation respondents indicated they were extremely or somewhat likely to make changes in their practice.

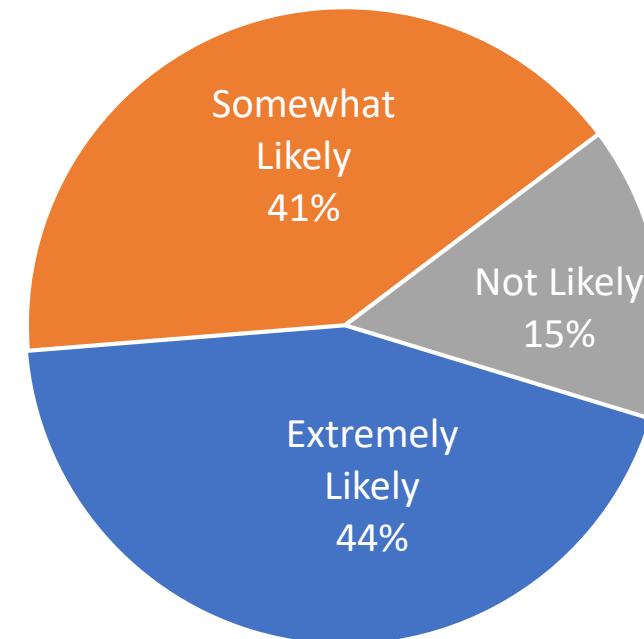
As a result of what I learned, I intend to make changes in my practice



85%

Evaluation respondents indicated they were extremely or somewhat likely to use the clinical reference aid in their practice.

How likely are you to use the clinical reference aid in practice?



N=472

Level (4) Outcomes: Competence

Final Outcomes Summary – Online Enduring Outcomes



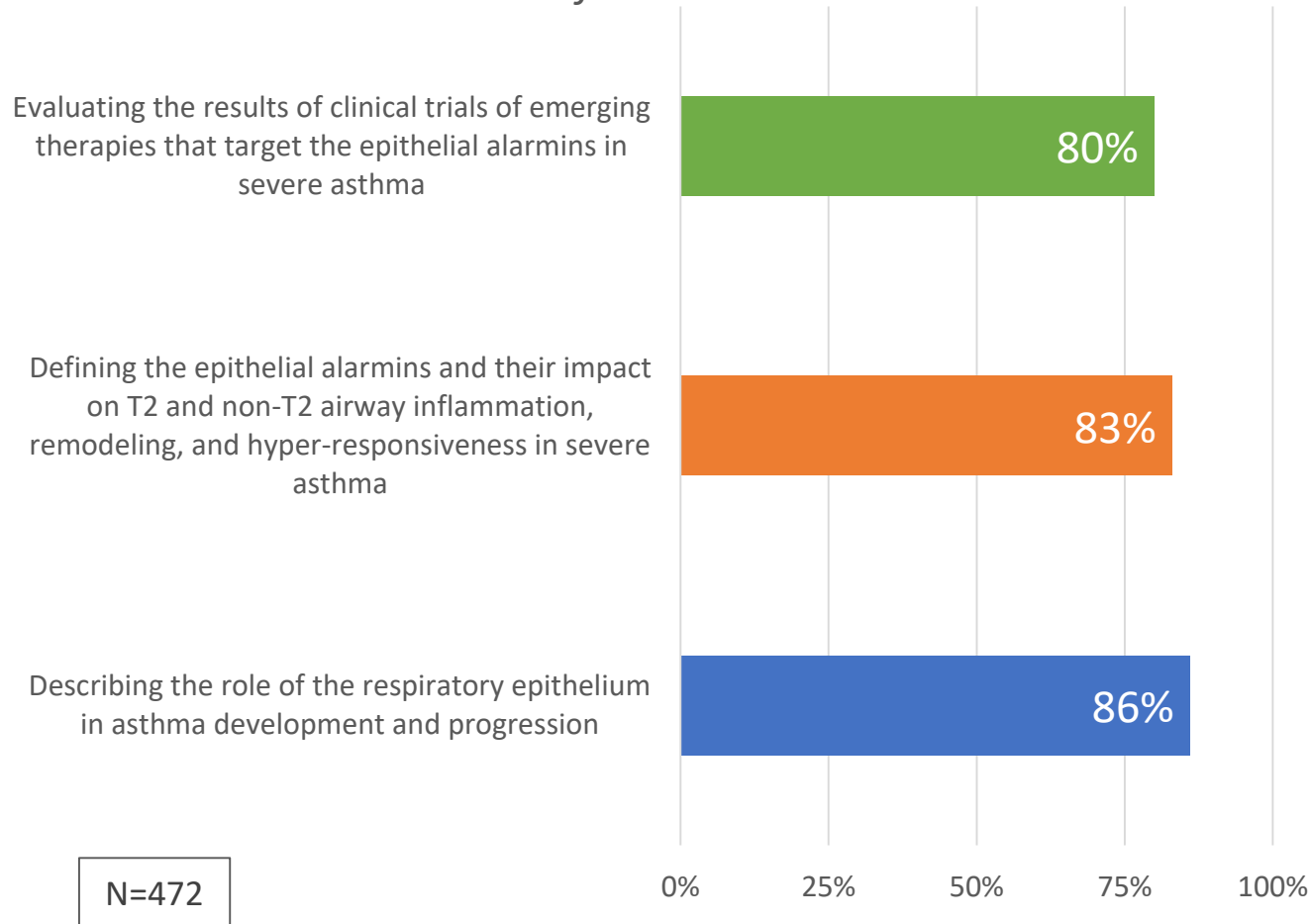
Qualitative Practice Change

Consider biologics that target upstream inflammatory markers	Use more specialized medications for uncontrolled asthma
Better educating patients to improve understanding and compliance	Consider biologics in non eosinophilic asthma
More frequently encourage patients to try tezepelumab, especially those who have T2-low type of asthma	Closely consider different medication use
As my knowledge increases of the available biologics, my ability to recognize alternative treatments is improved.	Consider the asthma phenotype and endotype
Discuss respiratory issues on patients I consult on with internists to maximize patient outcomes	Consideration of severe and recurrent cases of asthma under review as allergic or non-allergic and suggestion for biologic therapies
Consider trial of tezepelumab in patients with incomplete response to ICS or dupilumab	Better comprehension of trigger factors and therapy
Consider biologics that act at a higher/earlier part of the inflammatory cascade to broaden the intervention	More likely to consider biologics
Better understanding of patients with unmet needs who have been on full strength treatment	Earlier referral to pulmonary specialists for treatment and discussion of biologics
Apply individualized therapy for patients with severe asthma	Assess biomarkers more often

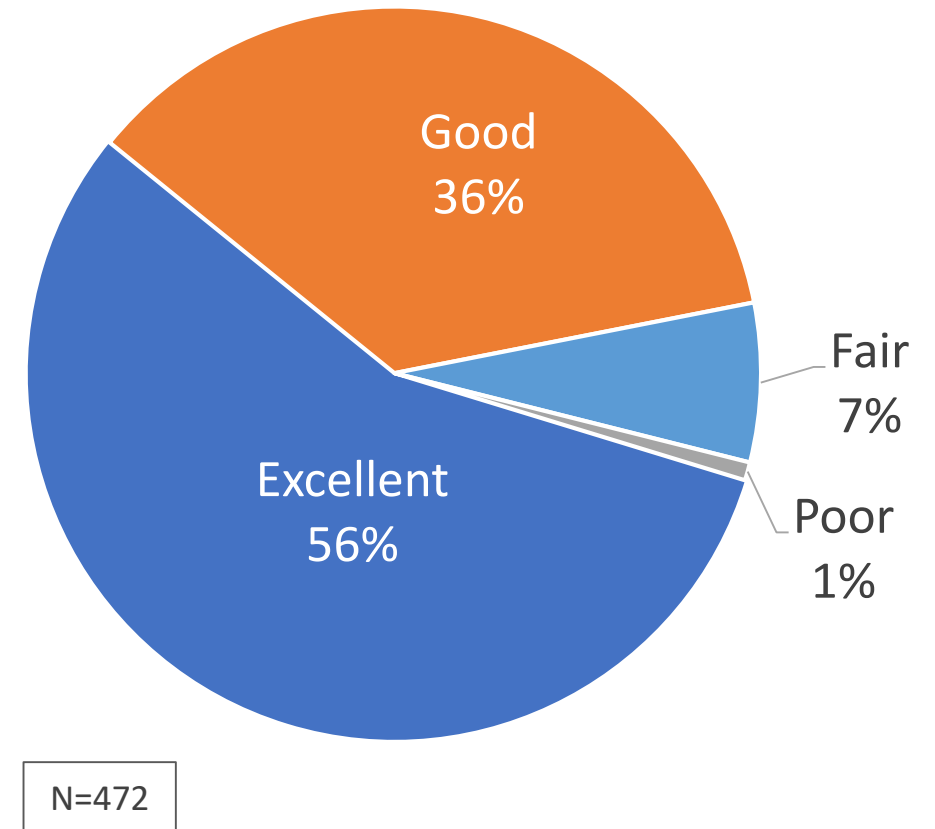
Level (4) Outcomes: Competence

Final Outcomes Summary – Online Enduring Outcomes

After having participated in this activity, participants report they are “somewhat” to “very confident” in...



How well did the activity improve your ability to treat or manage your patients?





Key Takeaways

- Understanding of the mechanism of activity of the epithelial barrier helps me better understand the options that I have in treating these patients.
- There are up and coming options for the non T2 asthmatics, although not widely available currently except maybe at large tertiary care centers.
- Must keep current on available and upcoming biologic agents to manage hard-to-control asthma.
- There is hope for severe asthmatic patients. Upstream targets can be potential game changers and there are more therapies in the pipeline.
- There is a possibility to treat asthma high up in the response chain – possibly at the epithelium, which could lead to a broader response and take some of the guesswork out of which medications to start with.
- Good monitoring and quick interventions can improve quality of life for patients with asthma.



Future Topics

- How this applies to other major lung diseases, such as COPD
- Endotypes and phenotypes of asthma and treatment options
- Side effects of the new biologics and if the benefit outweighs the risk
- Identification, management and prevention of exacerbations
- Chronic vs acute care of asthma and exacerbations
- An update on airway remodeling and bronchial hyperreactivity and how these are affected by biologic treatments
- Pediatric asthma
- Algorithms to guide asthma treatment

“Excellent presentation that was clear, easy to understand and educational. Excellent use of a ½ hour.”
– Online enduring learner

Accreditation Details

Final Outcomes Summary – Online Enduring Outcomes

National Jewish Health is proud to be 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.

National Jewish Health designates the enduring material for a maximum of 0.5 *AMA PRA Category 1 Credit*™.

