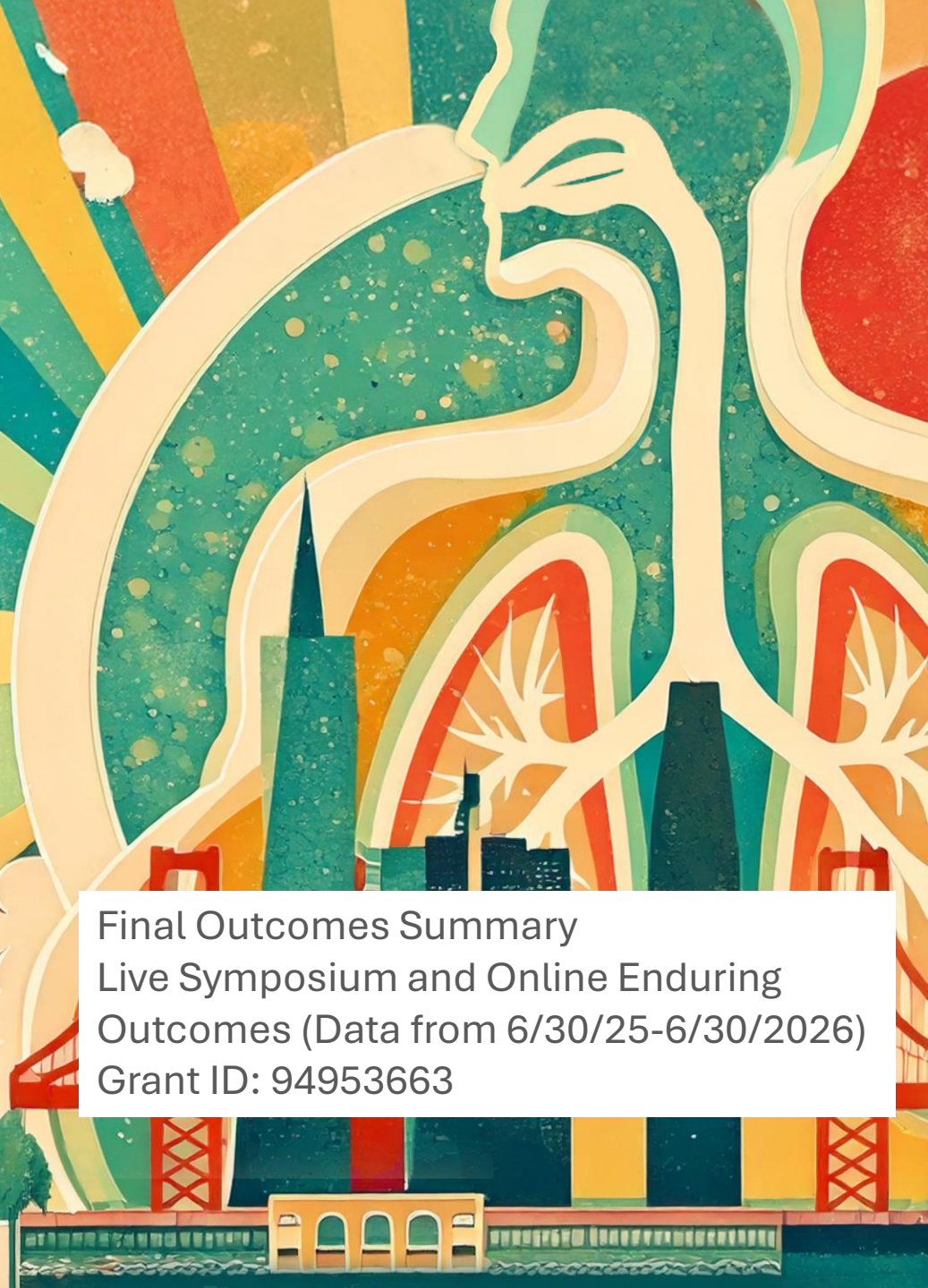
National Jewish Health®

Breathing Science is Life®

Managing Upper and Lower Airway Diseases

The Role of Epithelial-Driven Inflammation



Final Outcomes Summary
Live Symposium and Online Enduring
Outcomes (Data from 6/30/25-6/30/2026)
Grant ID: 94953663

This program was independently developed with financial support from AstraZeneca and is neither sponsored by nor endorsed by ATS.

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Executive Summary

Final Outcomes Summary – Live Symposium and Online Enduring

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Program Overview

This activity was presented as a live CME Satellite Symposium on May 18, 2025, during the American Thoracic Society Annual Meeting (ATS 2025), and a recording of the live symposium was endured on Healio.com. The program focuses on the complex nature of epithelial-driven inflammatory airway diseases and explores the pivotal role of epithelial cytokines as key orchestrators in the airway immune response.

Special features include animation clips on the pathophysiology of the upper and lower airways and case scenarios with expert panel discussion highlighting current treatment and the evolving landscape. Additionally, use of Array® technology allowed for audience engagement in the live symposium, giving attendees the option to participate in interactive polling, submit questions for faculty, and take notes directly on slides for future reference.

Activity Formats and Dates

Live activity: May 18, 2025
San Francisco Marriott Marquis, San Francisco, CA 94103
Enduring material: June 30, 2025 – June 30, 2026
https://www.healio.com/cme/pulmonology/20250623/managing-upper-and-lower-airway-diseases

Learning Objectives

1. Identify the features in the pathophysiology of upper and lower airways associated with epithelial-driven inflammatory airway diseases.
2. Assess the role of epithelial cytokines in the inflammatory pathways in upper and lower airway diseases.
3. Analyze the impact of current and emerging treatments in the management of epithelial-driven inflammatory airway diseases.

Outcomes Levels and Methodology

- Level 1 (Participation): Learner demographic data
- Level 2 (Satisfaction): Post-activity evaluation
- Level 3 (Knowledge): Pre- and post-test comparison
- Level 4 (Competence): Pre- and post-test comparison, post-activity evaluation
- Level 5 (Performance): Follow-up survey*

**The live symposium follow-up survey yielded no responses. We conducted a follow-up assessment in the online enduring activity instead.*

Target Audience

Live symposium: Pulmonologists (attendees of ATS)
Enduring activity: Pulmonologists, allergists, immunologists, otolaryngologists, rhinologists, and advanced practice providers

Grant Details

Therapeutic area: Respiratory
Approved grant amount: $336,840

Accreditation

National Jewish Health designates the live and enduring activities for a maximum of 1.5 *AMA PRA Category 1 Credits™ and 1.5 ABIM MOC points*.

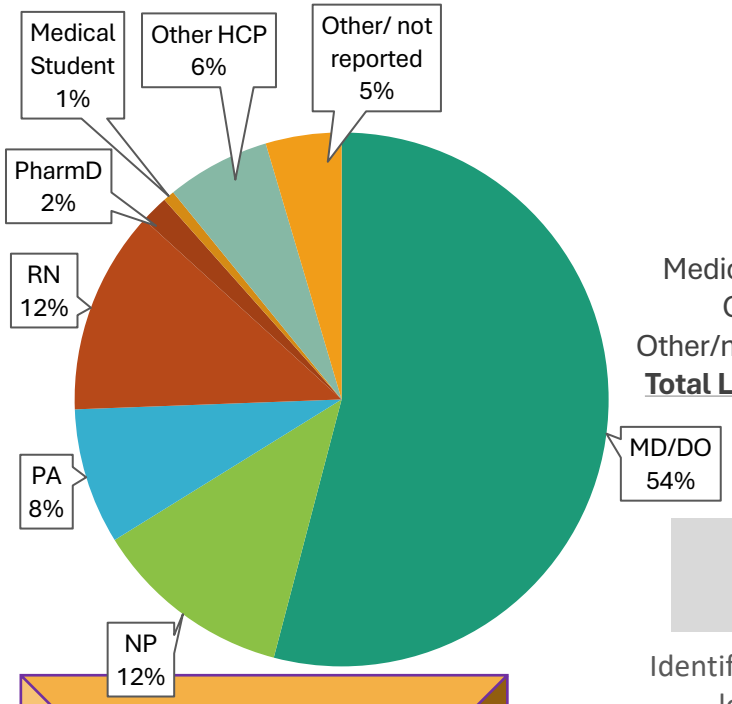
Keywords

Asthma, COPD, CRS, CRSwNP, epithelial alarmins, inflammatory airway disease, biologics

Educational Impact Summary

Final Outcomes Summary –Online Enduring

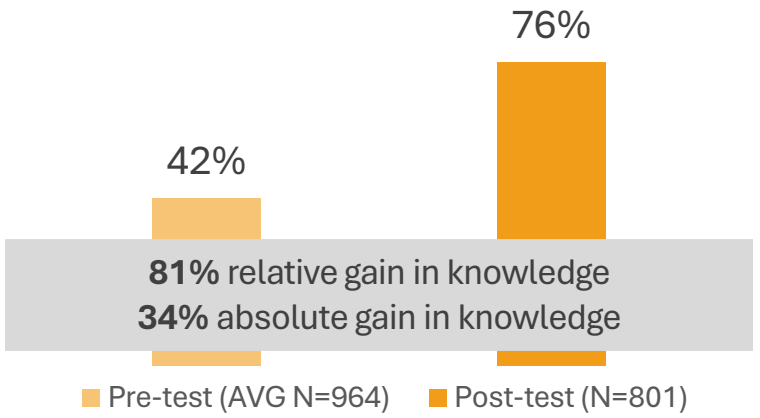
Participation



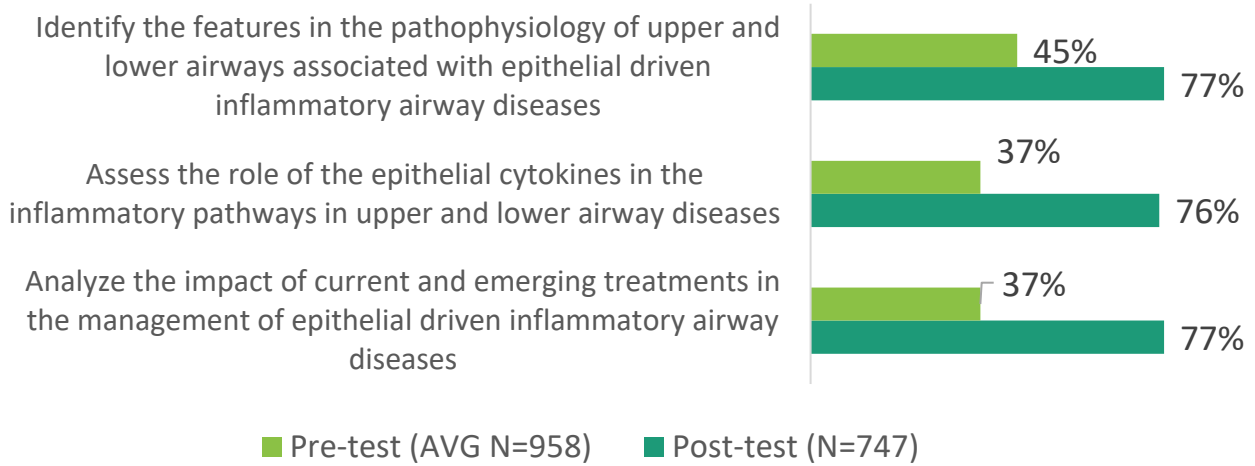
MD/DO=1025
NP=229
PA=156
RN=234
PharmD=32
Medical Student= 13
Other HCP=119
Other/not reported=87
Total Learners =1895

Potential Impact To 20,076 Patient Visits Each Month

Learning Gain Across Objectives



Confidence Across Objectives
(very to somewhat confident)



Evaluation

Met their educational needs **(98%)**

Reinforced or improved current skills **(99%)**

Gave tools and strategies to apply in practice **(99%)**

N AVG =749

94%

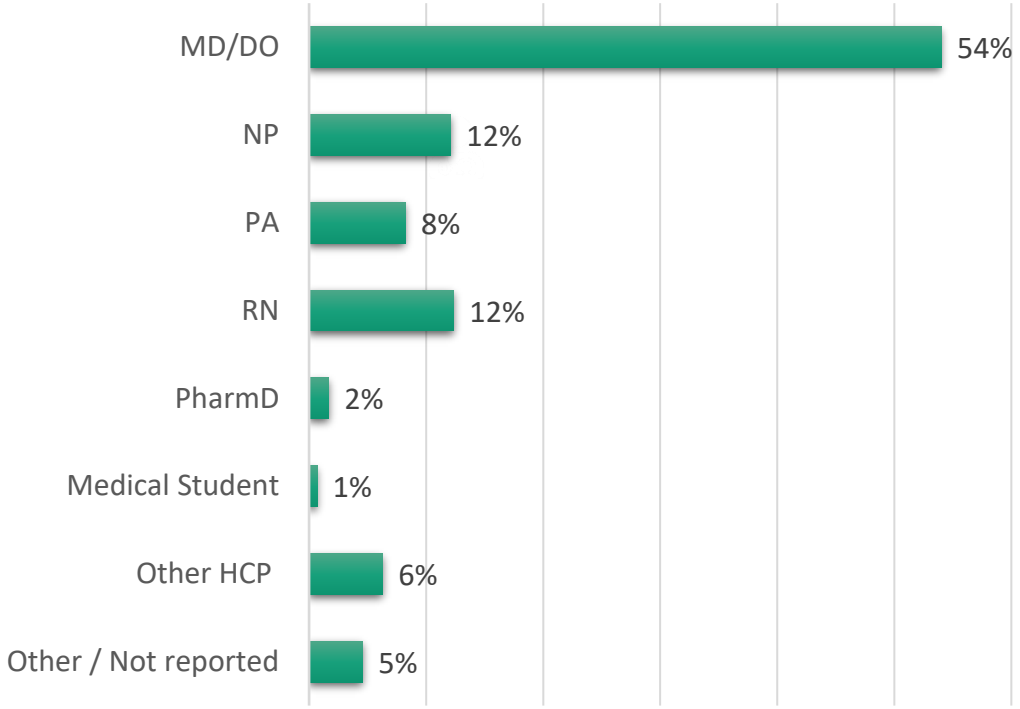
N=642

Evaluation respondents that intend to make changes in their practice

Level (1) Outcomes: Participation (Degree)

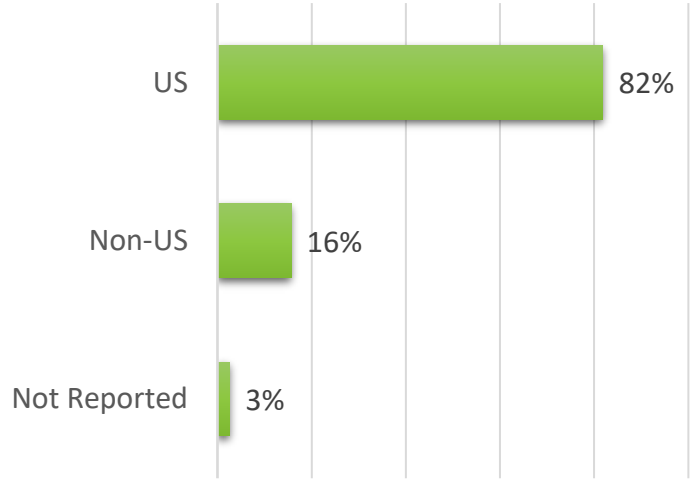
Final Outcomes Summary –Online Enduring

Overall Learner Breakdown
N=1895

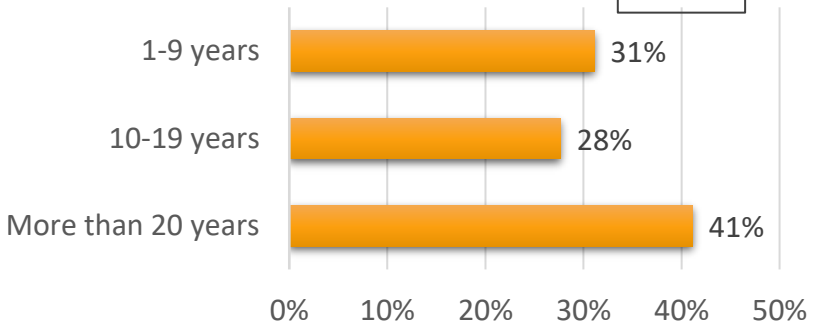


74% of learners were physicians and APPs

Geographic Distribution
N=1895



Years in Practice
N=639

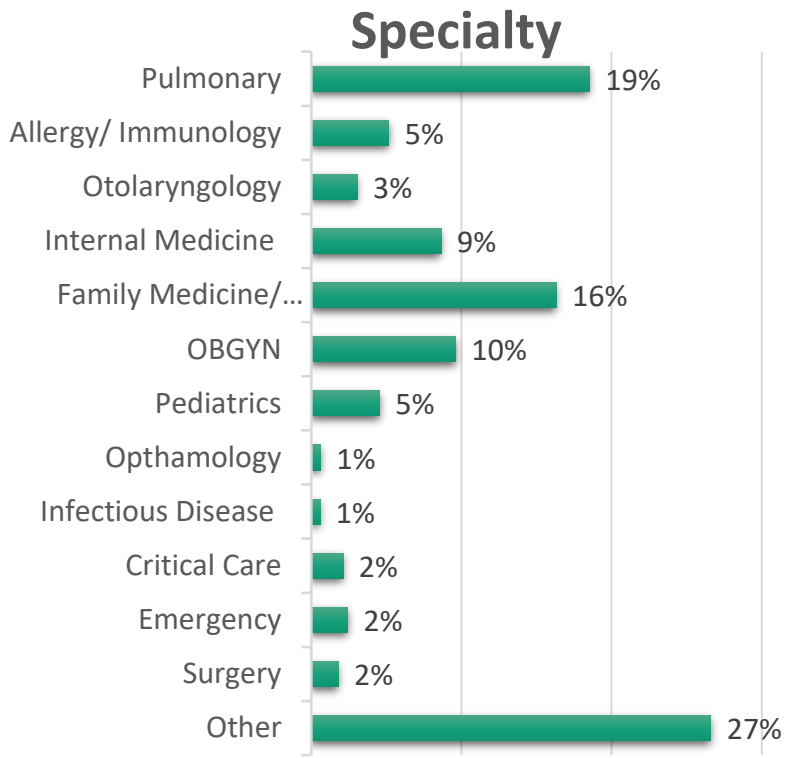


Degree	Number of Learners
MD/DO	1025
NP	229
PA	156
RN	234
PharmD	32
Medical Student	13
Other HCP	119
Other/ Not Reported	87
Total Learners	**1895**

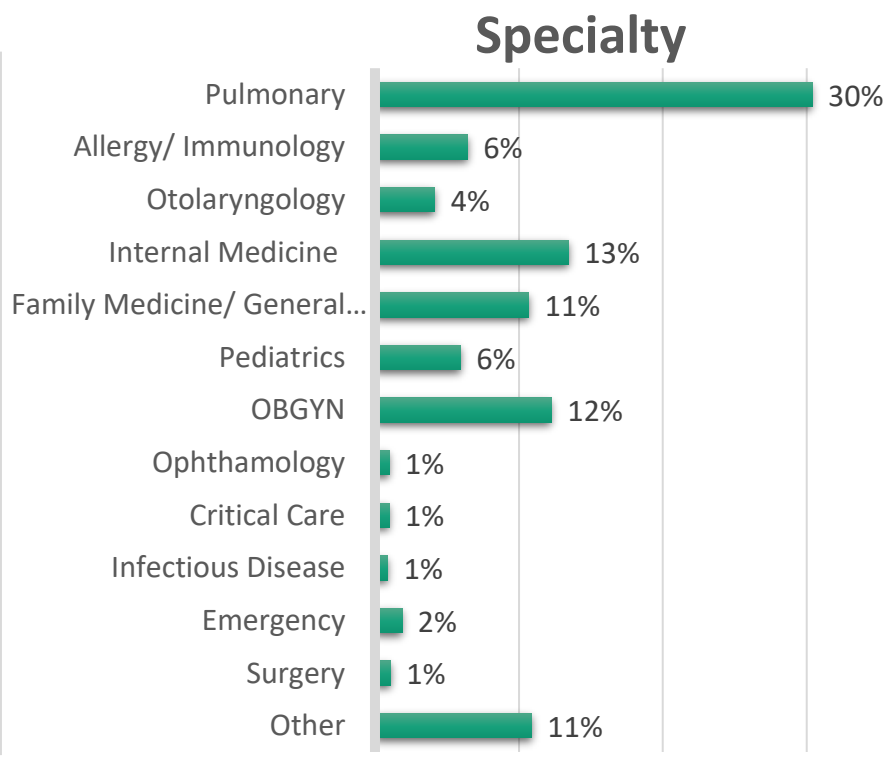
Level (1) Outcomes: Participation (Specialty)

Final Outcomes Summary –Online Enduring

Overall Learner Breakdown
N=1895



Physician Breakdown
N=1011



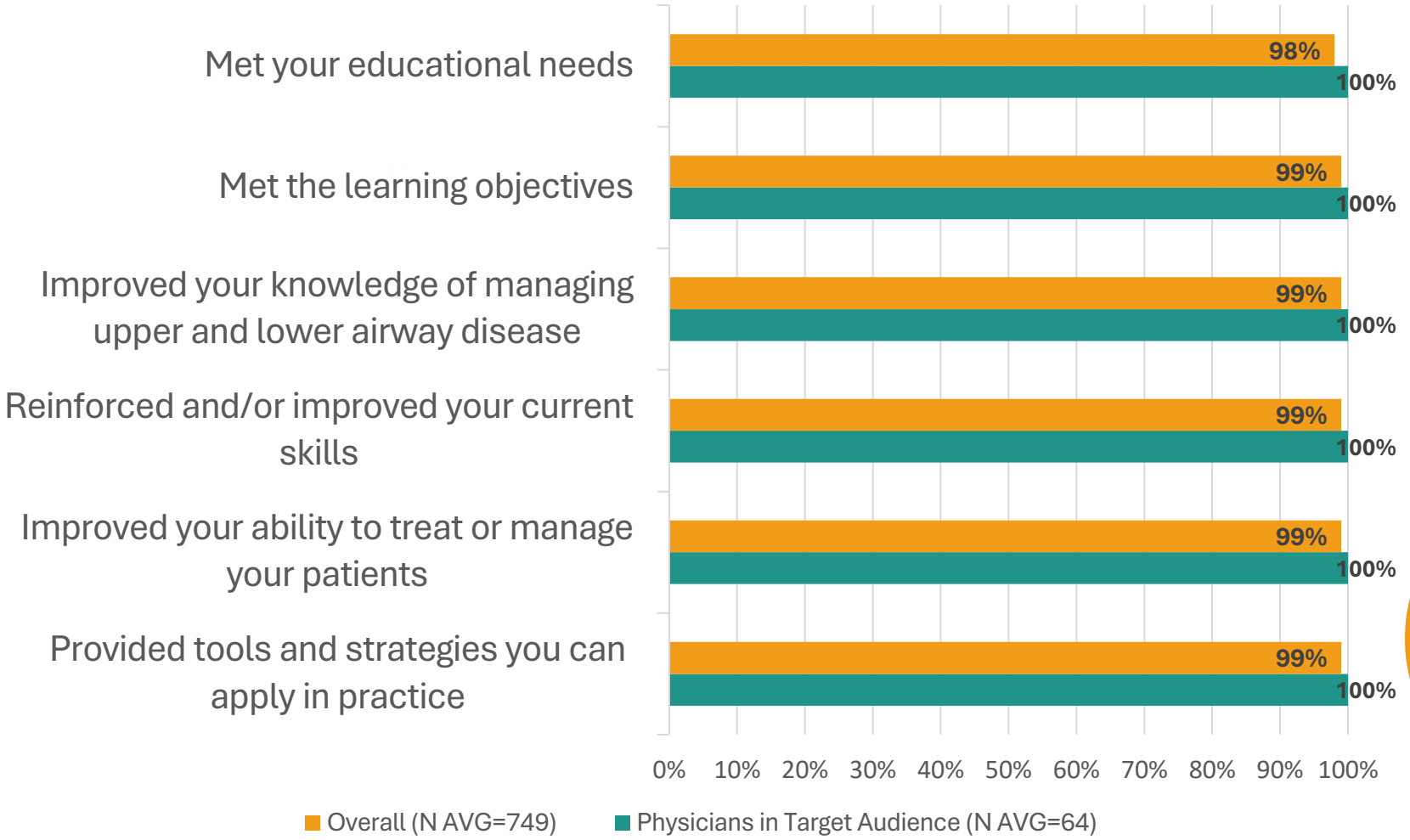
Specialty	Physicians	Overall Total
Pulmonary	307	351
Allergy/Immunology	65	98
Otolaryngology	42	58
Family Med/GP	108	309
Internal Medicine	136	164
OBGYN	124	182
Pediatrics	60	86
Ophthalmology	10	12
Infectious Disease	9	11
Critical Care	10	40
Emergency	19	46
Surgery	11	34
Other	110	504
Total Learners	**1011**	**1895**

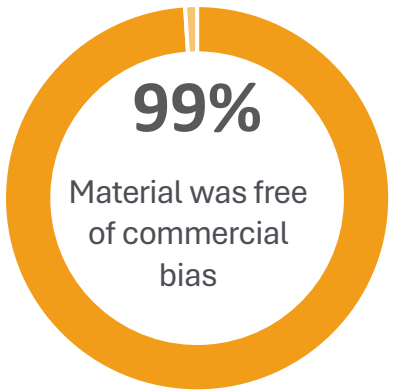
40% of physician learners were pulmonologists, allergists/immunologists and otolaryngologists!

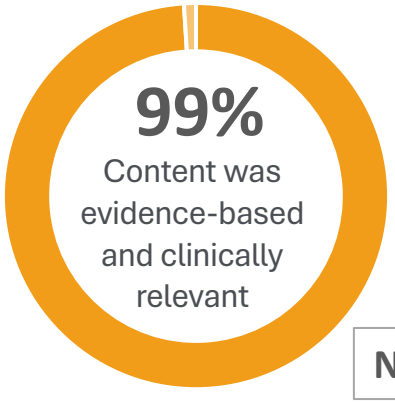
Level (2) Outcomes: Satisfaction

Final Outcomes Summary –Online Enduring

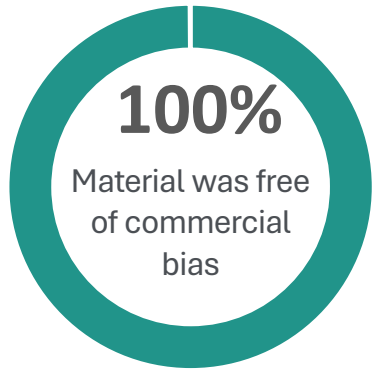
Evaluation Respondents reported that the activity:







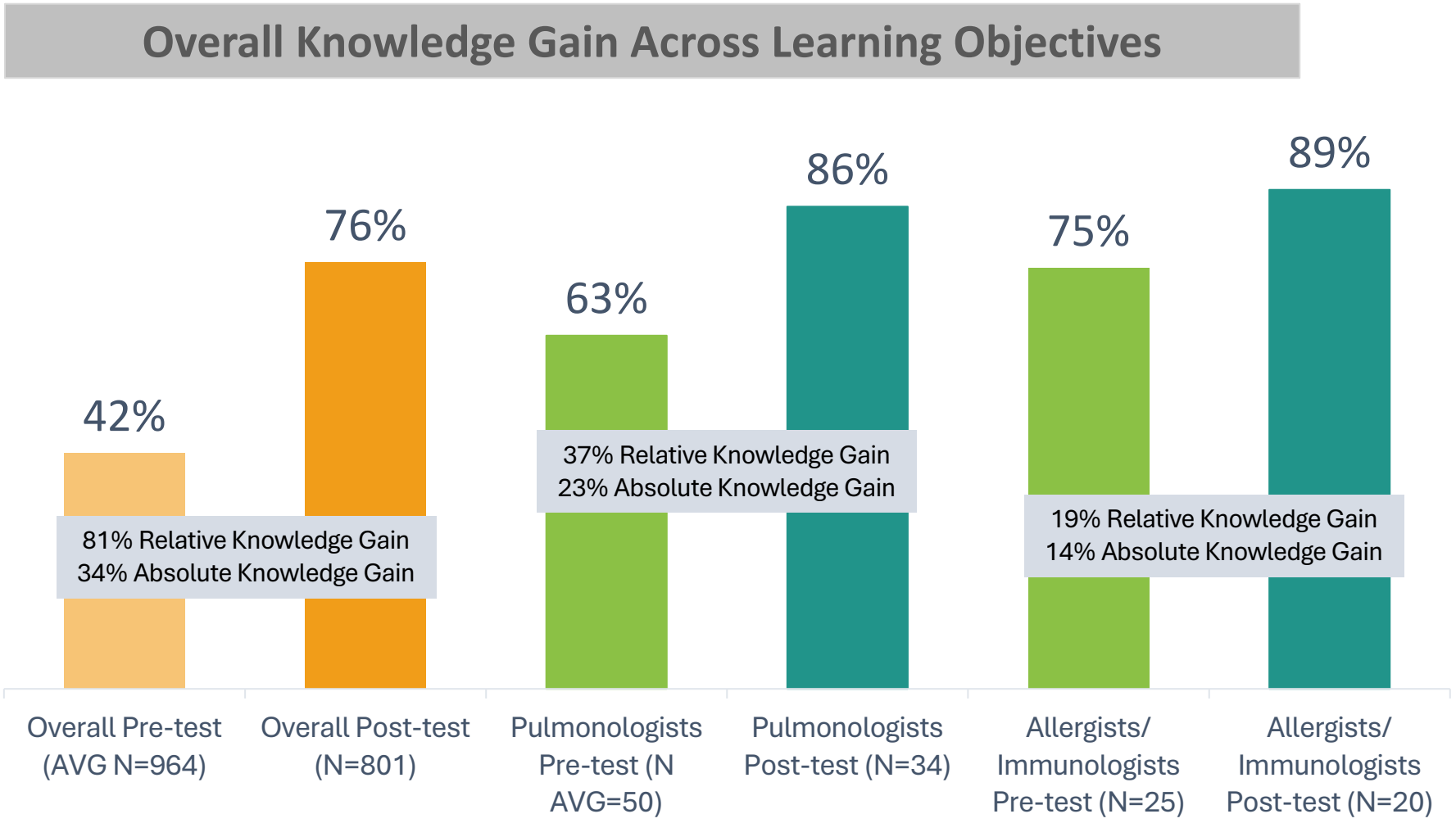
N=748



N=64

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary –Online Enduring



81%
Overall Relative Knowledge Gain

34%
Overall Absolute Knowledge Gain

28%
Target Audience MD Relative Knowledge Gain

19%
Target Audience MD Absolute Knowledge Gain

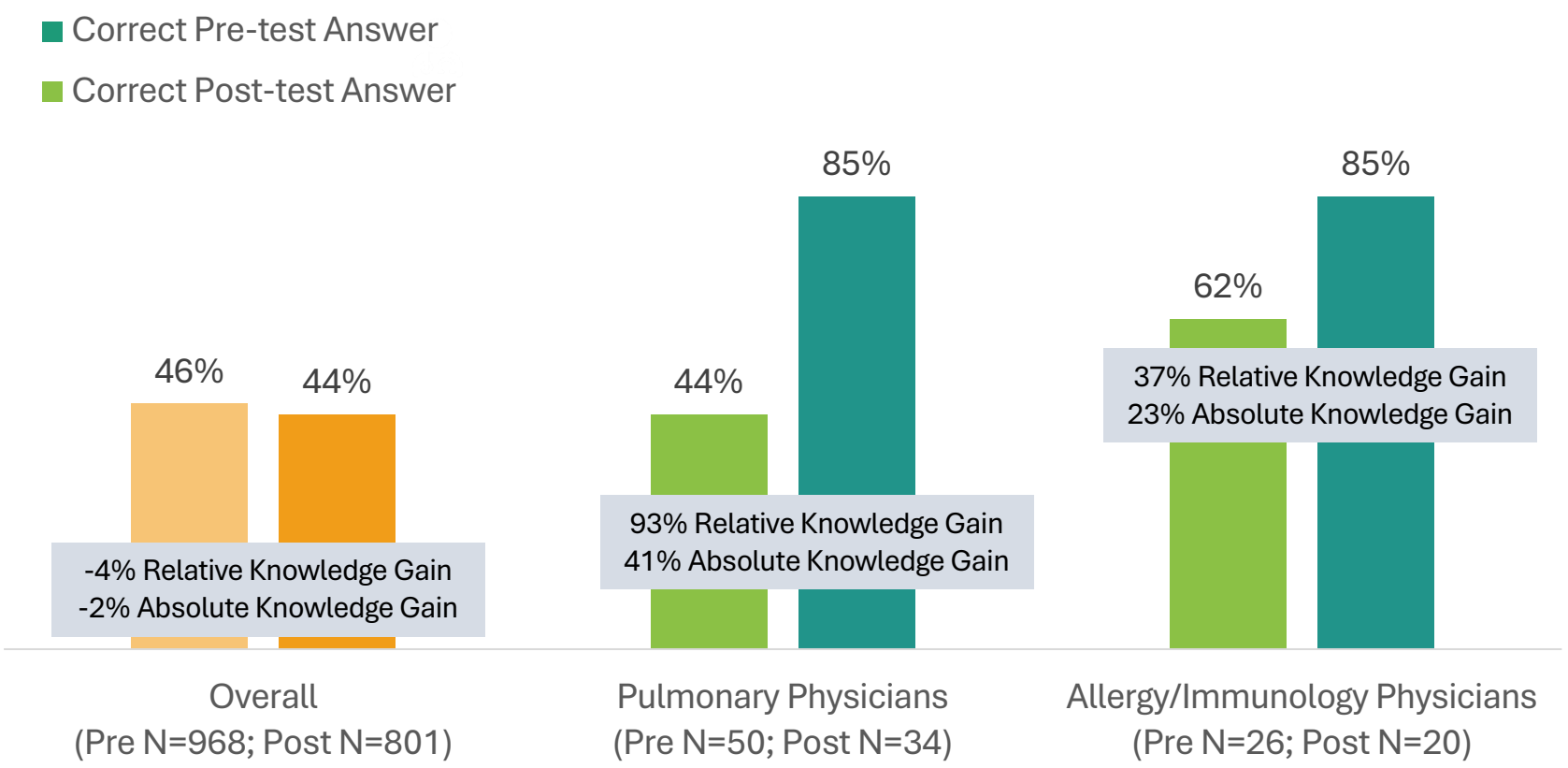
Note: There were not enough ENT test-takers to break down the data for each question in that audience segment.

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary –Online Enduring

Learning Objective: *Identify the features in the pathophysiology of upper and lower airways associated with epithelial-driven inflammatory airway diseases.*

Question 1: Which of the following statements best describes the role of airway epithelial cells in the pathophysiology of asthma and chronic obstructive pulmonary disease (COPD)?



Answer Choices:

A. Airway epithelial cells in asthma primarily contribute to disease progression through the release of interleukin-4 and interleukin-5, which promote eosinophilic inflammation and mucus hypersecretion.

B. In COPD, airway epithelial cells are primarily involved in the pathogenesis through the release of transforming growth factor-beta (TGF-β), which leads to fibroblast proliferation and tissue remodeling.

C. Both asthma and COPD involve airway epithelial cells contributing to disease progression through the disruption of tight junctions, leading to increased permeability and chronic inflammation.

D. In asthma, airway epithelial cells primarily contribute to disease progression through the release of interleukin-17, which promotes neutrophilic inflammation and airway remodeling.

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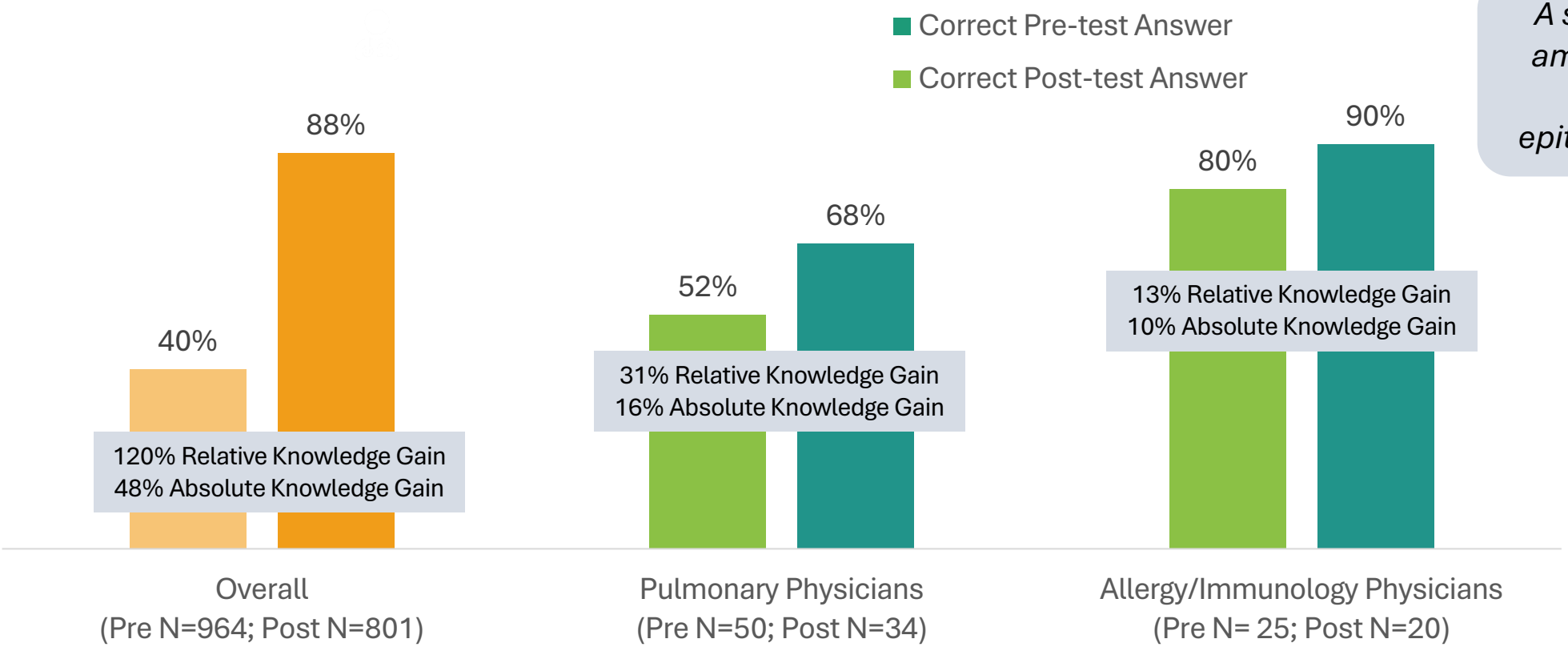
Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary –Online Enduring

Learning Objective: *Assess the role of epithelial cytokines in the inflammatory pathways in upper and lower airway diseases*

Question 2: Which of the following immune cells are primarily activated by the release of epithelial cytokines such as thymic stromal lymphopoietin (TSLP), interleukin-25 (IL-25), and interleukin-33 (IL-33) in the context of chronic rhinosinusitis with nasal polyps (CRSwNP)?



A significant gap still remains among pulmonary physicians with regard to the role of epithelial cytokines in CRSwNP

Answer Choices:

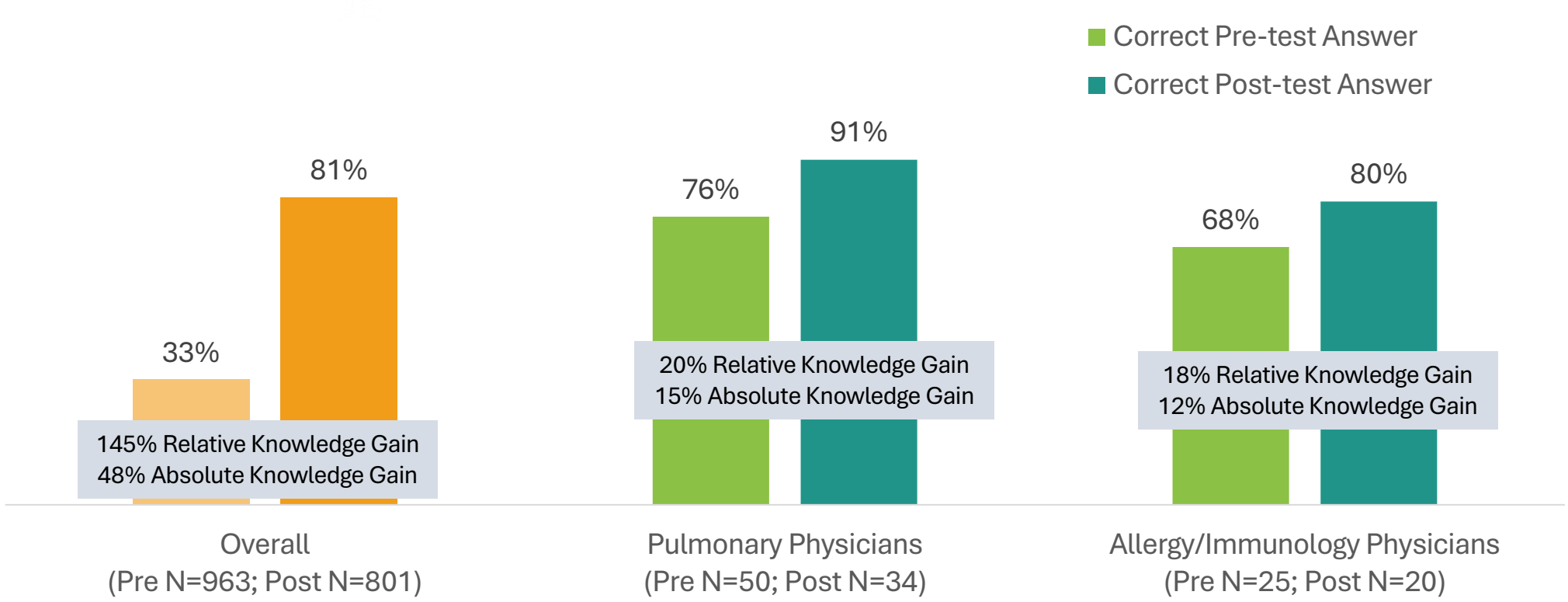
A. Neutrophils
B. Group 2 innate lymphoid cells (ILC2s)
C. T regulatory cells
D. Natural killer cells

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary –Online Enduring

Learning Objective: *Assess the role of epithelial cytokines in the inflammatory pathways in upper and lower airway diseases*

Question 3: A 45-year-old female with a history of moderate persistent asthma presents with chronic rhinosinusitis with nasal polyps (CRSwNP) post sinus surgery. Despite being on high-dose inhaled corticosteroids (ICS), nasal steroids and long-acting beta-agonists (LABA), she continues to experience frequent asthma exacerbations and nasal congestion. Which of the following emerging treatments is most appropriate for managing her condition?



Answer Choices:

A. Omalizumab
B. Tezepelumab
C. Montelukast
D. Azithromycin

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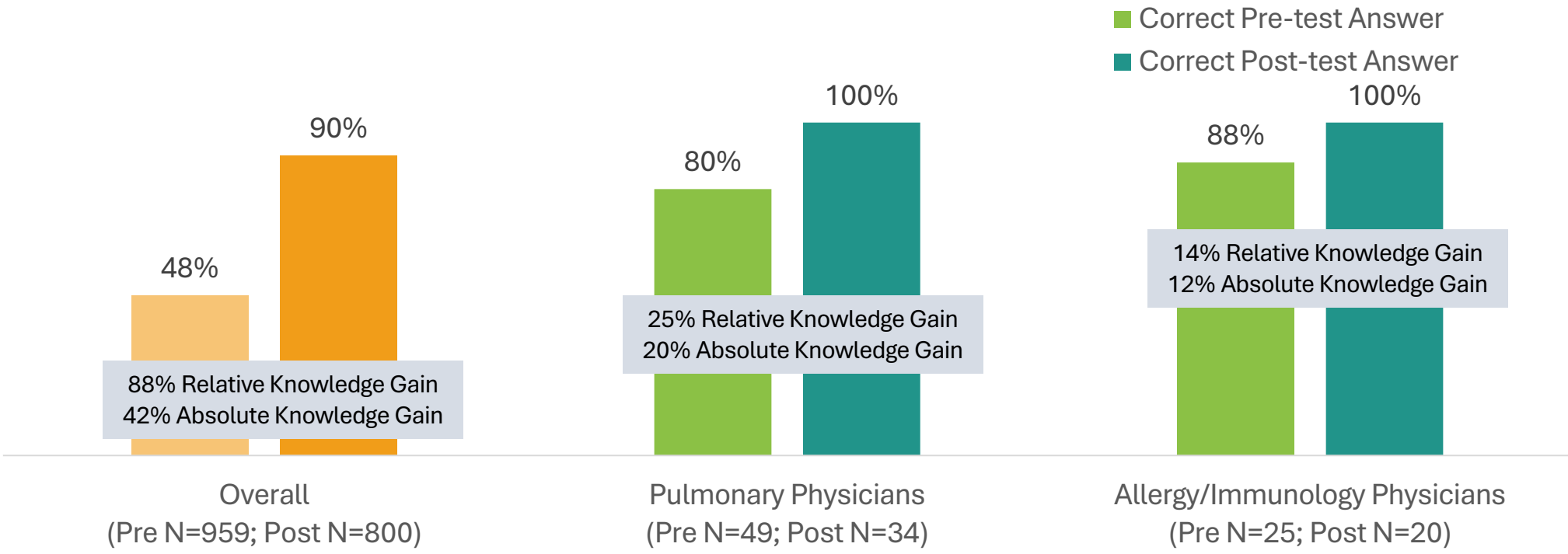
Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary –Online Enduring

Learning Objective: *Analyze the impact of current and emerging treatments in the management of epithelial-driven inflammatory airway diseases.*

Question 4: A 60-year-old male with a 40-pack-year smoking history and a diagnosis of CRSsNP and COPD presents with chronic bronchitis and frequent exacerbations. His current regimen includes a long-acting muscarinic antagonist (LAMA) and a long-acting beta-agonist (LABA). His blood eosinophil count is 350 cells/µL. Which of the following treatments should be considered to address his type 2 inflammation and reduce exacerbations?



Answer Choices:

A. Roflumilast
B. Azithromycin
C. Dupilumab
D. Theophylline

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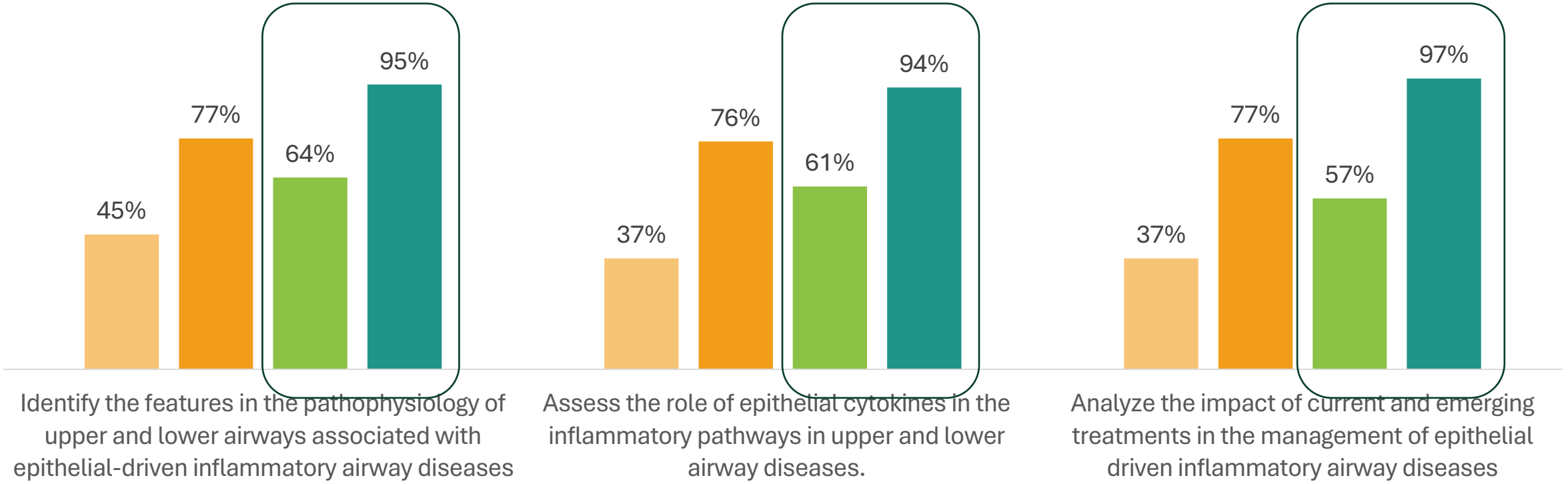
Level (4) Outcomes: Competence

Final Outcomes Summary –Online Enduring

Evaluation respondents reported their confidence as it relates to the learning objectives after the activity (Very confident – confident)



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Level (4) Outcomes: Competence

Final Outcomes Summary –Online Enduring

Top changes evaluation respondents intend to make in practice after participating in this activity:

Overall Audience:

- ❑ Adopt biologic therapy protocols for severe asthma with CRSwNP.
- ❑ Identify patients uncontrolled on high-dose ICS/LABA and nasal steroids and initiate appropriate biologics, improving both asthma control and nasal polyp outcomes.
- ❑ Enhance patient education on inhaler technique and adherence: Conduct demonstrations and follow-ups on proper inhaler and nasal spray use at each visit.
- ❑ Be more wary about the cytokine pathways, use appropriate medication and if symptoms are not improving.
- ❑ Implement screening w NO in the lab
- ❑ Change in approach to asthmatics with chronic recurrent sinus infections.
- ❑ Check in more on chronic medication to see if they are controlled to help with coordination of specialist.
- ❑ Refer more for uncontrolled COPD/asthma.

Target Audience:

- ❑ Somewhat increased use of endotype and phenotypes in addressing patient care needs / optimizing therapies.
- ❑ A more aggressive approach to surgery and increase use of biologics.
- ❑ Check IgE and eos as well as FeNO.
- ❑ More aggressive diagnosis of co-morbid sinus disease with airway disease.

Evaluation respondents who stated they intend to make changes in practice as a result of this activity:

94%

Overall Learners (N=642)

96%

Target Audience (N=55)

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Evaluation Survey Results

Final Outcomes Summary –Online Enduring

What is your most important take-away from this activity?

Overall Audience:

- ❑ Remembering that sinus surgery is not curative but a way to open the nasal passages and utilize multiple approaches at once to treat lower airway inflammation.
- ❑ The complexity of chronic obstructive and allergic airway pathogenesis and its importance for designing appropriate treatment regimens.
- ❑ The idea of identifying endotypes for patients with asthma, COPD, and chronic rhinosinusitis in treating with endotype specific therapies.
- ❑ That the respiratory tract epithelial cells, inflammatory cells, and cytokines play a very important role in upper and lower airway diseases.
- ❑ A key takeaway is the importance of distinguishing asthma and COPD by underlying inflammatory endotypes (especially Type 2 inflammation) and using biomarkers such as blood eosinophils and FeNO to guide personalized treatment, including appropriate use of biologic therapies.
- ❑ I really like that this was even an option for continuing education. I'm a fairly new nurse and understanding the research and evidence-based practice is really important to me. When I give certain nebulizers, I am always wondering why the doctor chose that one.

Target Audience:

- ❑ Assess patient pheno and endotypes to appropriately manage their conditions and be able to lessen their steroid use.
- ❑ Good summary update of role of phenotypes and on current biologic therapies; also will look more carefully at type of ENT surgeries patients with CRS with and without nasal polyps actually undergo (i.e. Endoscopic vs. ESS).
- ❑ The importance of multi-disciplinary input to treat these patients.

Evaluation respondents who stated that the activity addressed strategies for overcoming barriers to optimal patient care:

84%
Overall Learners (N=744)

82%
Target Audience (N=61)

Level (5) Outcomes: Performance

Final Outcomes Summary –Online Enduring

100%

N=4

of learners reported the activity provided new ideas or information they have used in practice

100%

N=4

of learners reported they were committed to making changes to their practice in the future

35+ patients have already benefited from the information learned in the activity

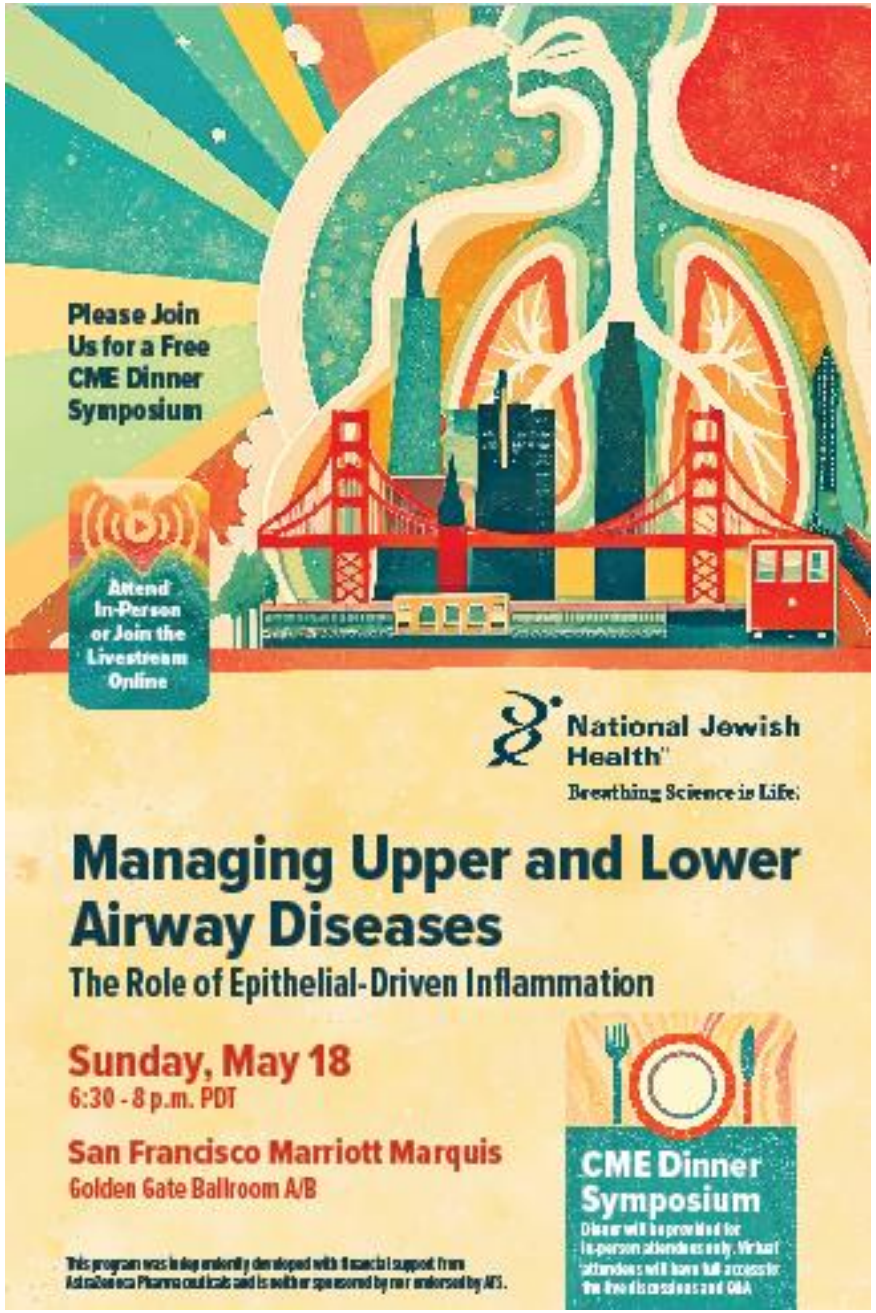
100%

N=4

of learners reported the activity provided information, education, tools and resources to address barriers in practice

Learners reported the the following changes were made in practice:

- Better team communication
- Listen to patient's concern for better assessment of their individual situation and complaints for better treatment modalities



CME Dinner Symposium

Sunday, May 18

6:30-8:00 PM

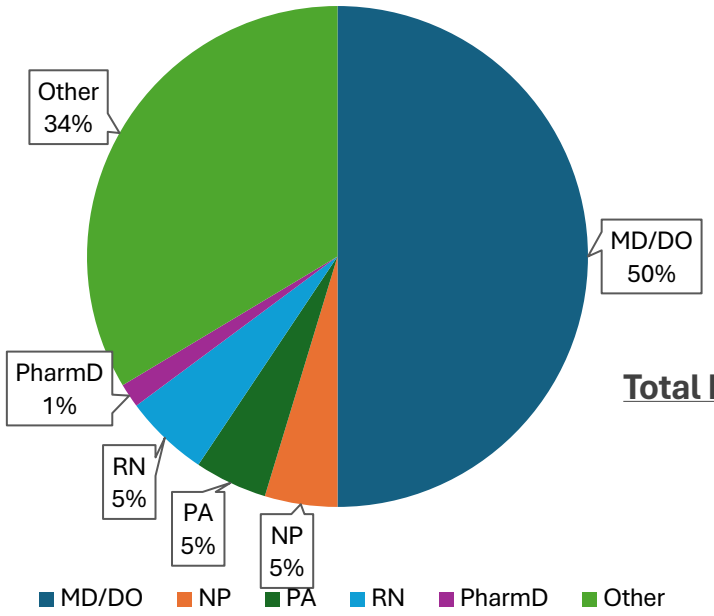
San Francisco Marriott Marquis

National Jewish Health

Educational Impact Summary

Final Outcomes Summary – Live Symposium

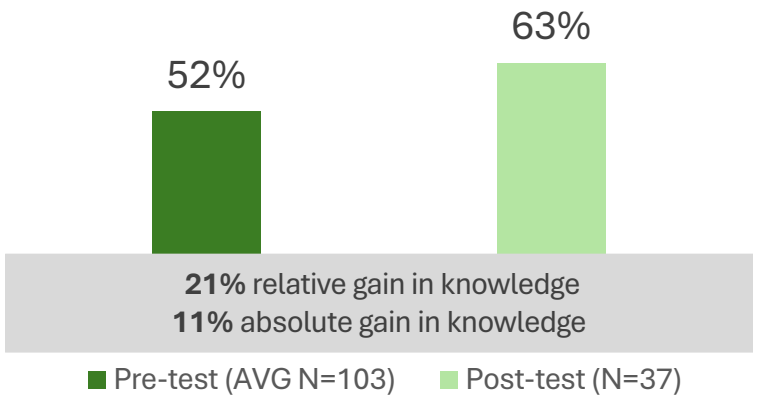
Participation



MD/DO=64
NP=6
PA=6
PharmD=2
RN=7
Other=43

Total Learners =128

Learning Gain Across Objectives



Evaluation

Met their educational needs **(92%)**

Reinforced or improved current skills **(84%)**

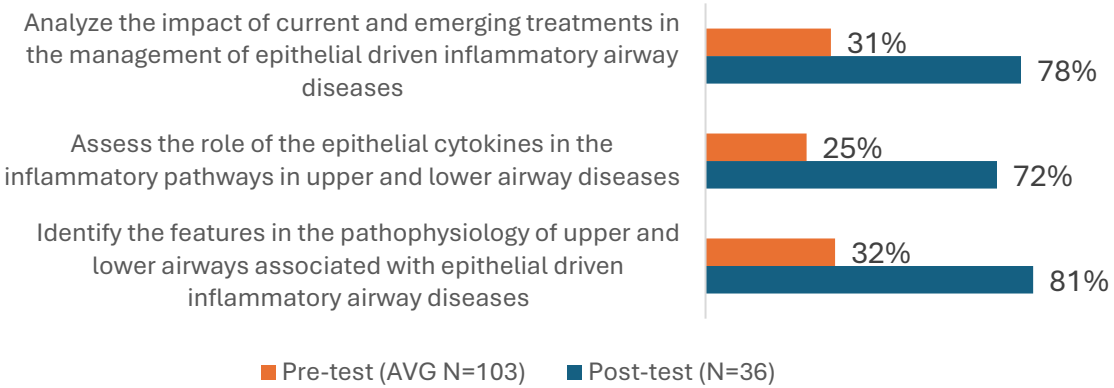
Improved ability to treat patients **(84%)**

N=37

Potential Impact To 14,688 Patient Visits This Year

Confidence Across Objectives

(somewhat to very confident)



90%

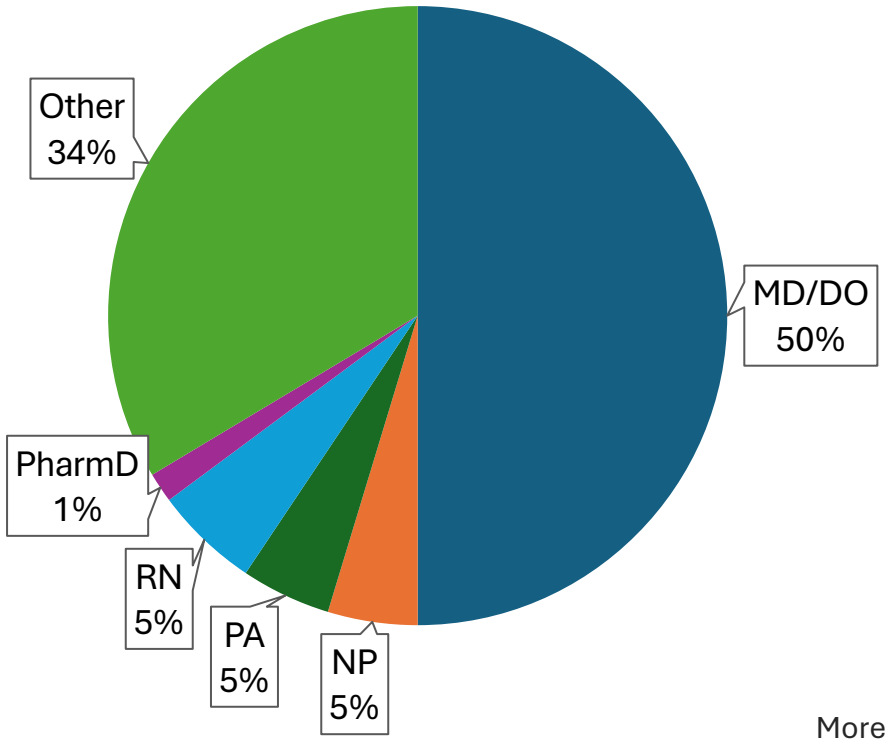
N=30

Evaluation respondents that intend to make changes in their practice

Level (1) Outcomes: Participation (Degree)

Final Outcomes Summary – Live Symposium

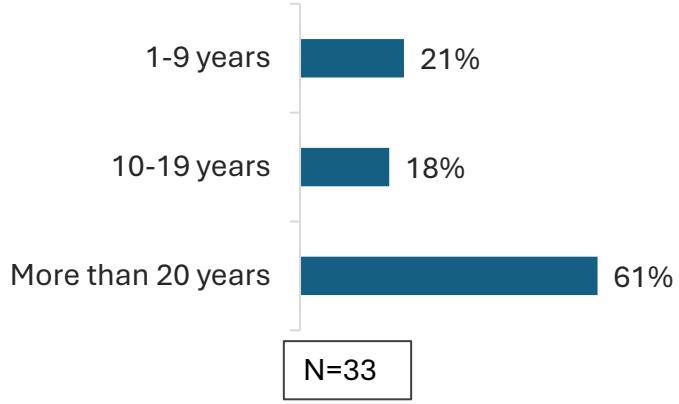
Total Participation (Degree): Live and Virtual Attendees



50% of learners were physicians

60% of learners were physicians and advanced practice providers

Years in Practice

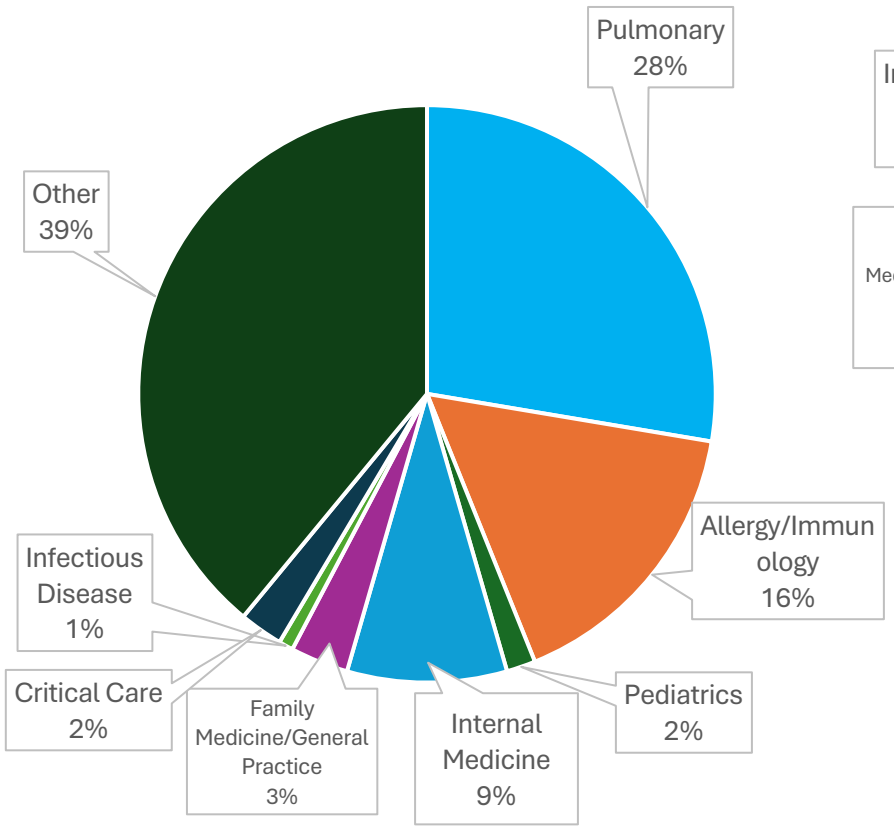


Degree	Live	Virtual	Combined
MD/DO	29	35	64
NP	1	5	6
PA	0	6	6
RN	2	5	7
PharmD	2	0	2
Other	33	10	43
Total Learners	**67**	**61**	**128**

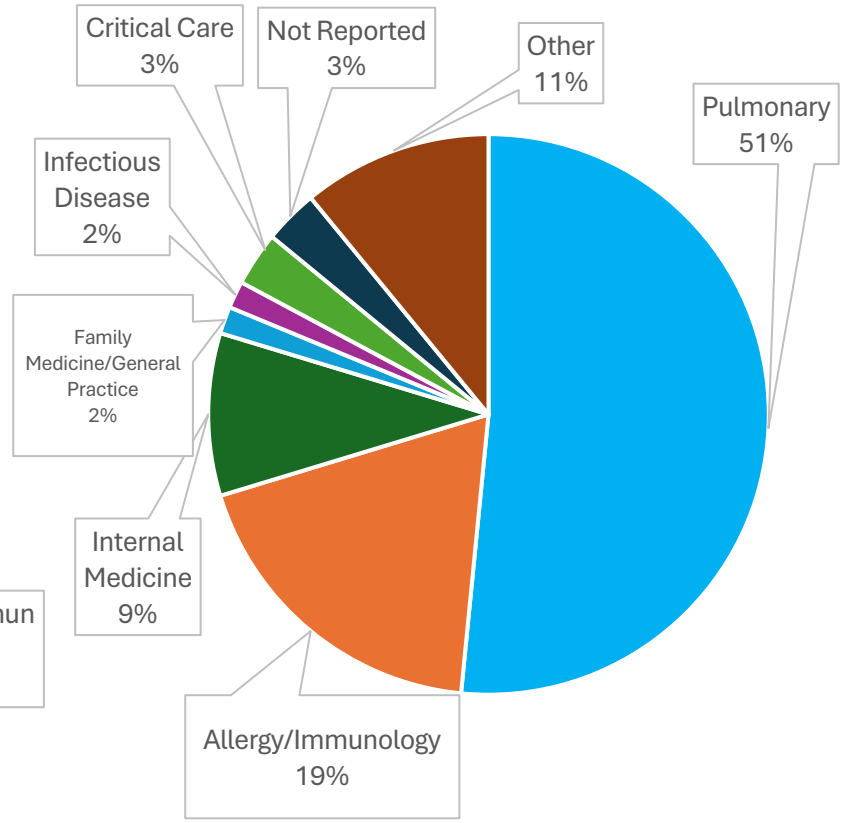
Level (1) Outcomes: Participation (Specialty)

Final Outcomes Summary – Live Symposium

Overall Learner Breakdown (N=128)



Physician Breakdown (N=64)

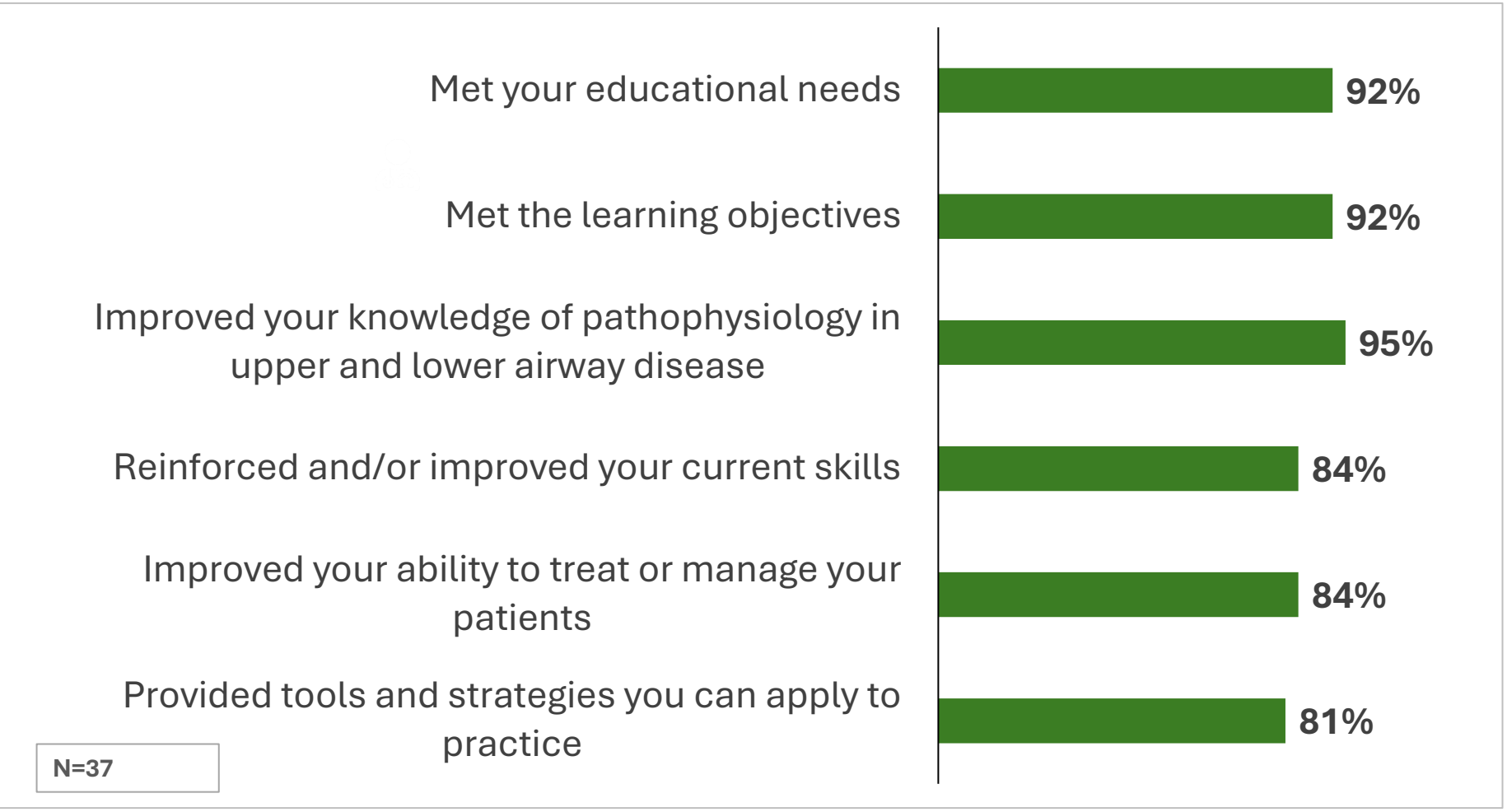


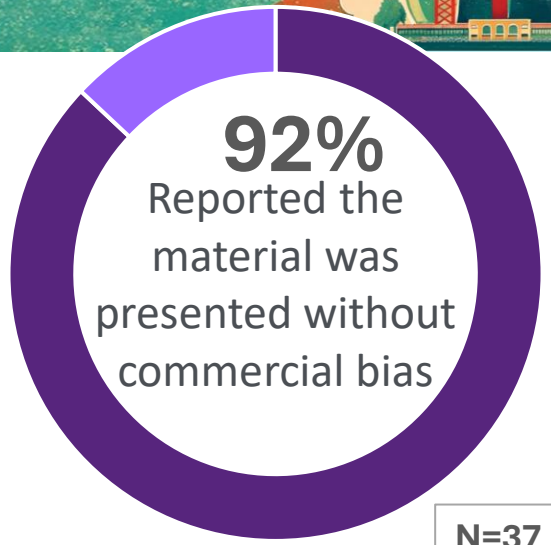
Degree	Live	Virtual	Total
Pulmonary	21	13	34
Allergy/ Immunology	5	15	20
Pediatrics	0	2	2
Family Medicine/ General Practice	1	3	4
Internal Medicine	1	10	11
Infectious Disease	1	0	1
Critical Care	2	1	3
Not Reported	5	0	5
Other	31	17	48
Total Learners	**67**	**61**	**128**

Level (2) Outcomes: Satisfaction

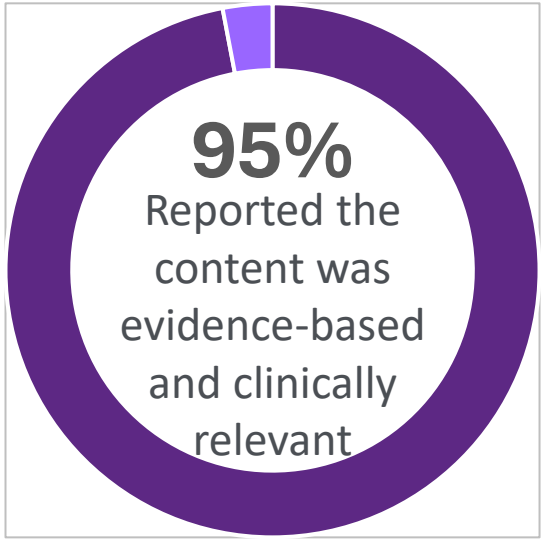
Final Outcomes Summary – Live Symposium

Evaluation Respondents reported they "Strongly Agree" or "Agree" that the activity:





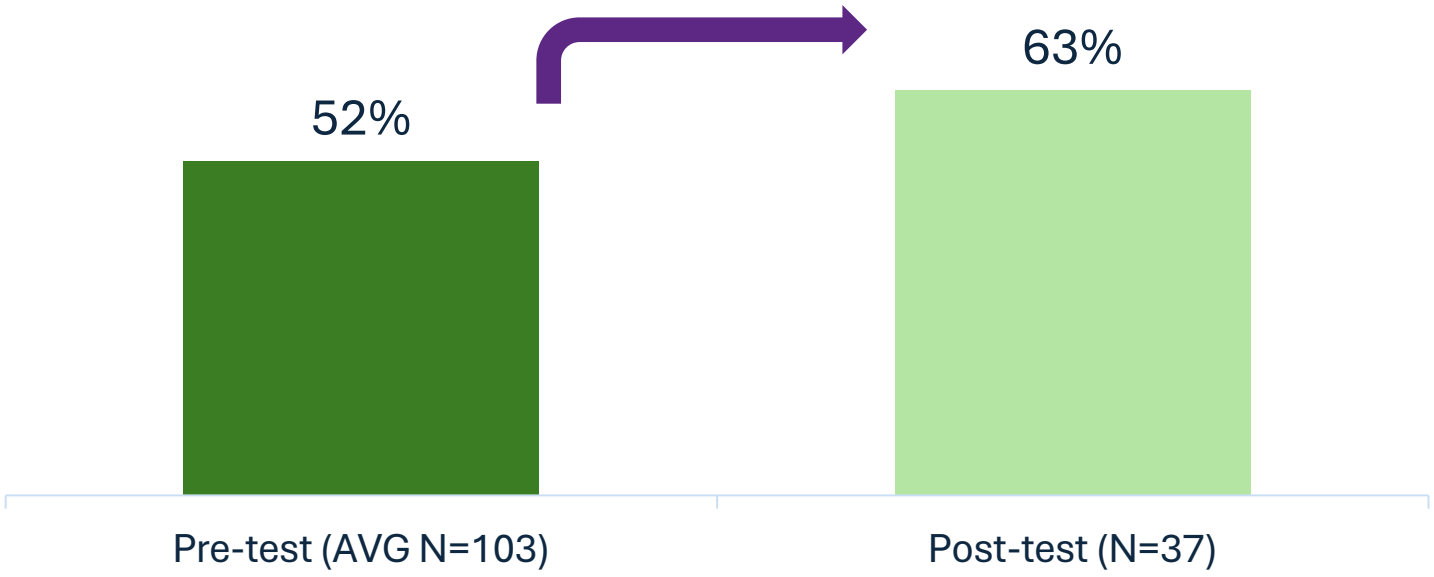
N=37



Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Live Symposium

Overall Knowledge Gain Across Learning Objectives



21% Overall Relative Knowledge Gain

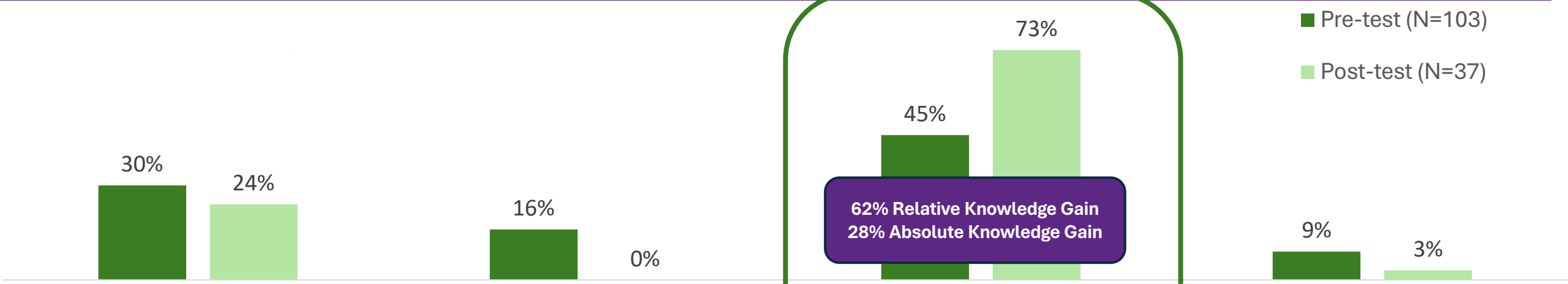
11% Overall Absolute Knowledge Gain

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Live Symposium

Learning Objective: *Identify the features in the pathophysiology of upper and lower airways associated with epithelial-driven inflammatory airway diseases.*

Question 1: Which of the following statements best describes the role of airway epithelial cells in the pathophysiology of asthma and chronic obstructive pulmonary disease (COPD)?



Airway epithelial cells in asthma primarily contribute to disease progression through the release of interleukin-4 and interleukin-5, which promote eosinophilic inflammation and mucus hypersecretion.

In COPD, airway epithelial cells are primarily involved in the pathogenesis through the release of transforming growth factor-beta (TGF-β), which leads to fibroblast proliferation and tissue remodeling.

Both asthma and COPD involve airway epithelial cells contributing to disease progression through the disruption of tight junctions, leading to increased permeability and chronic inflammation.

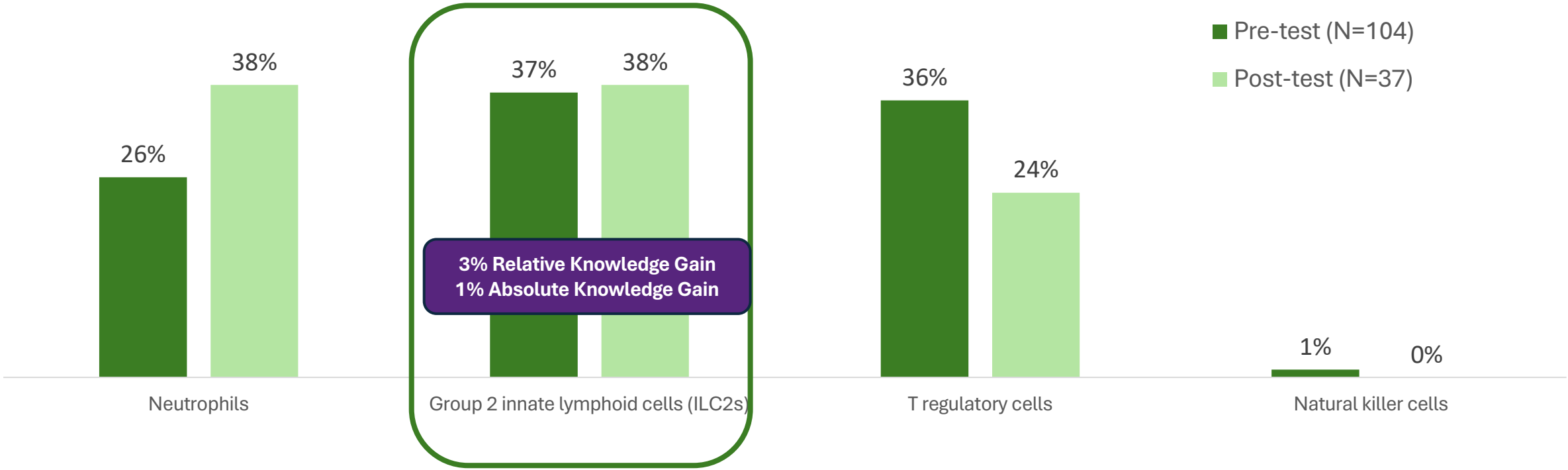
In asthma, airway epithelial cells primarily contribute to disease progression through the release of interleukin-17, which promotes neutrophilic inflammation and airway remodeling.

Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Live Symposium

Learning Objective: *Assess the role of epithelial cytokines in the inflammatory pathways in upper and lower airway diseases*

Question 2: Which of the following immune cells are primarily activated by the release of epithelial cytokines such as thymic stromal lymphopoietin (TSLP), interleukin-25 (IL-25), and interleukin-33 (IL-33) in the context of chronic rhinosinusitis with nasal polyps (CRSwNP)?



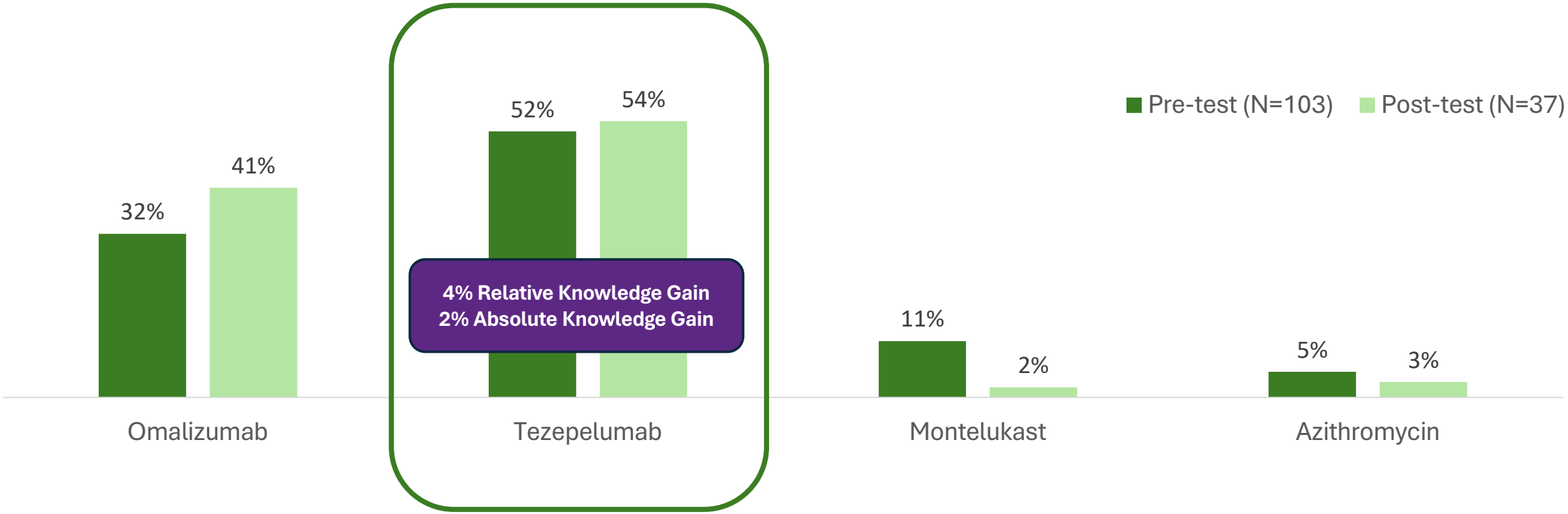
Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Live Symposium

National Jewish Health

Learning Objective: *Analyze the impact of current and emerging treatments in the management of epithelial-driven inflammatory airway diseases.*

Question 3: A 45-year-old female with a history of moderate persistent asthma presents with chronic rhinosinusitis with nasal polyps (CRSwNP) post sinus surgery. Despite being on high-dose inhaled corticosteroids (ICS), nasal steroids and long-acting beta-agonists (LABA), she continues to experience frequent asthma exacerbations and nasal congestion. Which of the following emerging treatments is most appropriate for managing her condition?

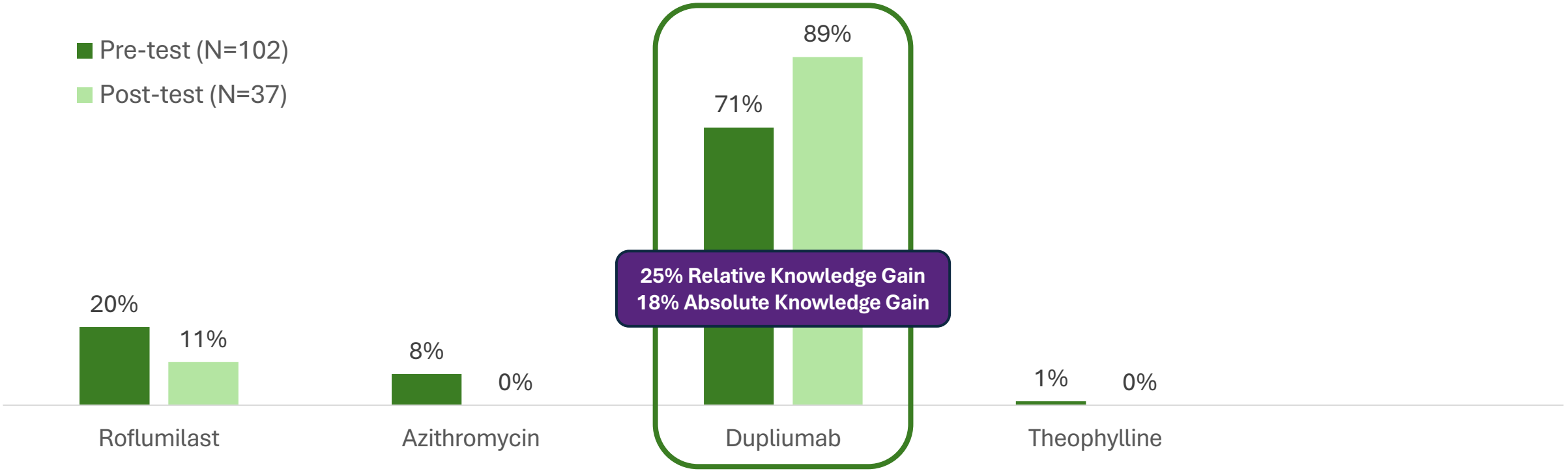


Level (3 & 4) Outcomes: Knowledge & Competence

Final Outcomes Summary – Live Symposium

Learning Objective: *Analyze the impact of current and emerging treatments in the management of epithelial-driven inflammatory airway diseases.*

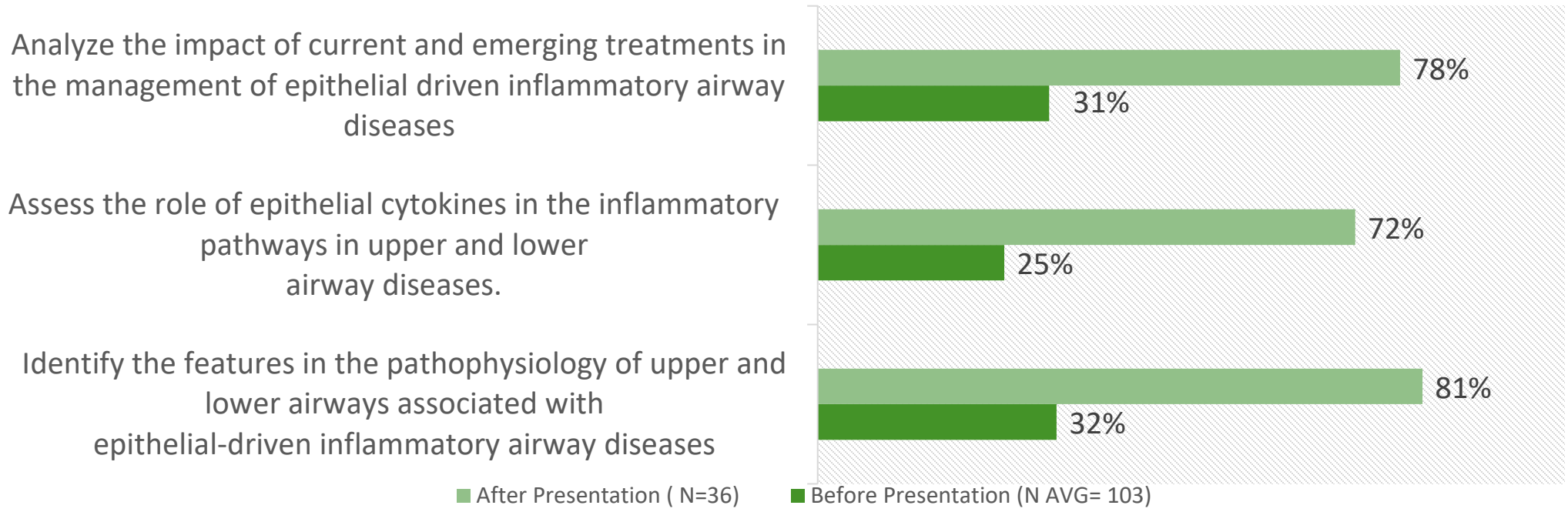
Question 4: A 60-year-old male with a 40-pack-year smoking history and a diagnosis of CRSsNP and COPD presents with chronic bronchitis and frequent exacerbations. His current regimen includes a long-acting muscarinic antagonist (LAMA) and a long-acting beta-agonist (LABA). His blood eosinophil count is 350 cells/µL. Which of the following treatments should be considered to address his type 2 inflammation and reduce exacerbations?



Level (4) Outcomes: Competence

Final Outcomes Summary – Live Symposium

Evaluation respondents reported their confidence as it relates to the learning objectives after the activity (Very confident – confident)



Level (4) Outcomes: Competence

Final Outcomes Summary – Live Symposium

Top changes evaluation respondents intend to make in practice after participating in this activity:

90%

N=30

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

- Consider biologics other than dupilumab when appropriate.
- This class was superb at reminding me of the disparity between those of us in family practice with few diagnostic tools at our disposal, vs what the specialists have available. Your knowledge base is mind blowing. I will continue to push LABA/ICS inhalers most of the time, and use the triple med inhalers as they are available.
- I am motivated to learn more about biologics. I have too many asthma patients on steroids.
- Awareness of endotyping
- Better knowledge & understanding
- Will consider using azithromycin and tezepelumab
- Consider the use of tezepelumab in patients with low eosinophilic blood level with asthma resistant to ICS or other biologic agents.
- See patients with polyps differently
- Probably the main thing that I learned, is how ignorant I am. I should attend at least a semester of class to retain this info (I'm a slow learner). Honestly, this won't change what I already do, as your institution's CME courses have taught me significant principles in the past. I lean toward triple med inhalers for many of my patients
- More likely to consider the treatment options with biologics in the management of asthma and COPD
- Target therapy according to immunology

Evaluation Survey Results

Final Outcomes Summary – Live Symposium

Key Take-Aways

- Use of Biological drugs for COPD and Asthma Management
- Expanding my knowledge on treatment options
- biologic treatment
- Understanding uses for biologics and imaging as relates to the diagnostic testing I do in the outpatient setting on asthma/COPD patients. The imaging was very interesting! Great visuals presented!
- I need to learn more about biologics. This was an excellent CME activity.

Medications used to treat airways inflammation

- New ways to approach polyps and asthma
- Reconsider surgery for patients with polyps
- Chronic rhinosinusitis may be an active player in the exacerbations of asthma and COPD
- Improved understanding of immune pathways and effective treatment.
- United airway approach

"All the presenters were great. I appreciated it. Thanks for having me there. "

- ATS Attendee

Appendix

Final Outcomes Summary – Live Symposium

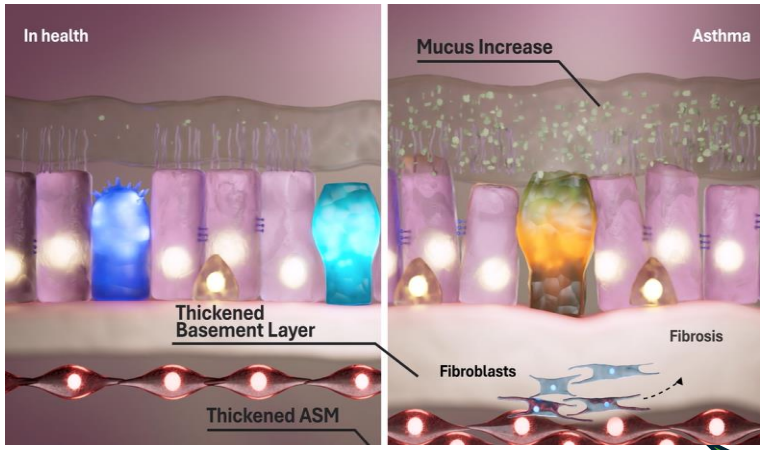
- Program Features (Slide 17)
- Array Audience Engagement Metrics (Slides 18-19)
- Audience Generation (Slide 20)
- Accreditation (Slide 21)

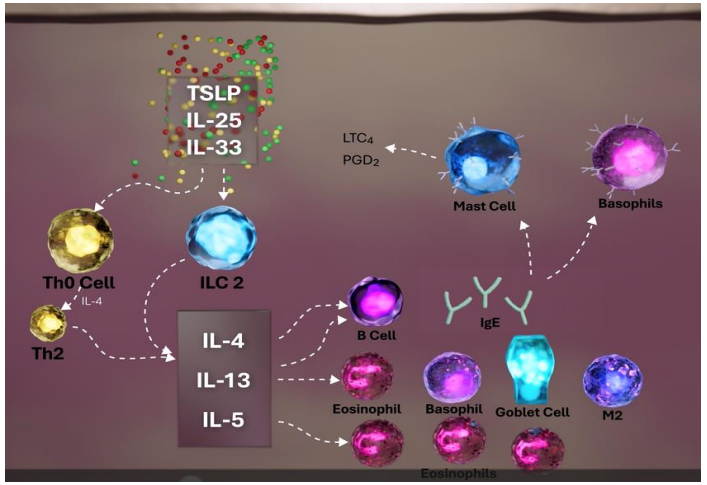
Program Features

Interim Outcomes Summary – Live Symposium

National Jewish Health

Animations





Panel discussion

87%

evaluation respondents in the live symposia and online activity reported the animation increased their understanding of pathophysiology in upper and lower airway disease.
(N= 783)

- Gamification
- Interactive polling
- Save and take notes on slides
- Submit questions for expert faculty

Case scenarios with interactive polling

Case #1: Sally, 45-year-old woman

- 45-year-old woman presents with nasal obstruction, decreased sense of smell, pressure over cheeks and forehead x 2 years; significant impact on QoL
- Exacerbation with each URI that lasts 2-3 weeks, requires antibiotics and prednisone to clear
- Minimal improvement on high volume budesonide sinus irrigations x 6 months; no improvement with balloon sinuplasty last year
- Clinic endoscopy demonstrates bilateral polyposis hanging into the nasal cavity

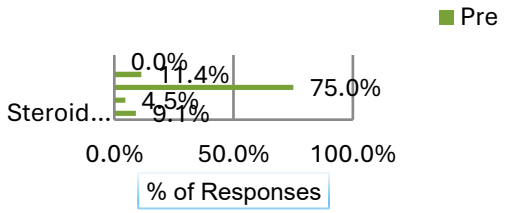
Audience Engagement via the Array® Platform (Live Symposium)

Poll Question

What would be your management strategy?

A. Initiate biologic therapy
B. Continue budesonide sinus i
C. Offer endoscopic sinus surge medical management
D. Prescribe long-term low-dos

What is the phenotype/endotype of Sally's asthma?



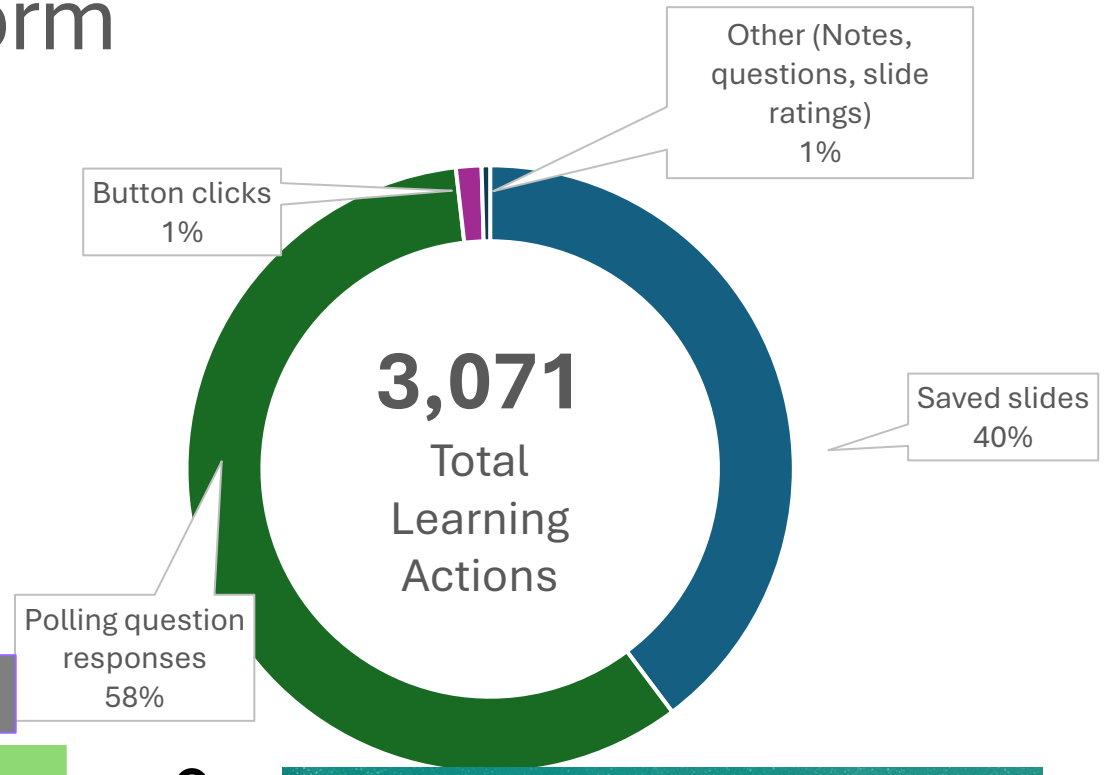
Audience Engagement: Array® Platform

Final Outcomes Summary – Live Symposium

111 learners logged into platform

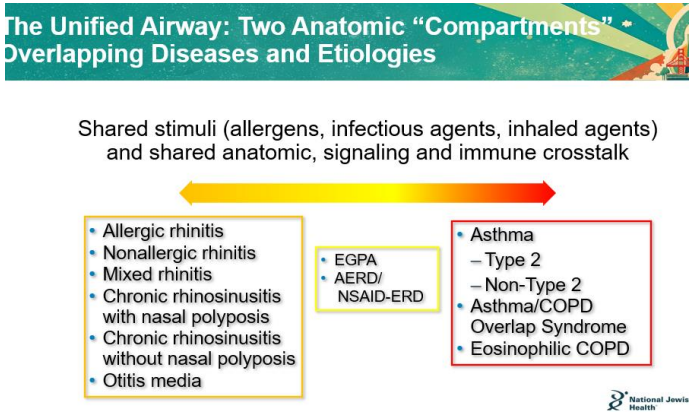
99% engaged (saved content, responded to polling, etc)

4% highly engaged (asked questions or took notes)



Top 3 most engaging slides

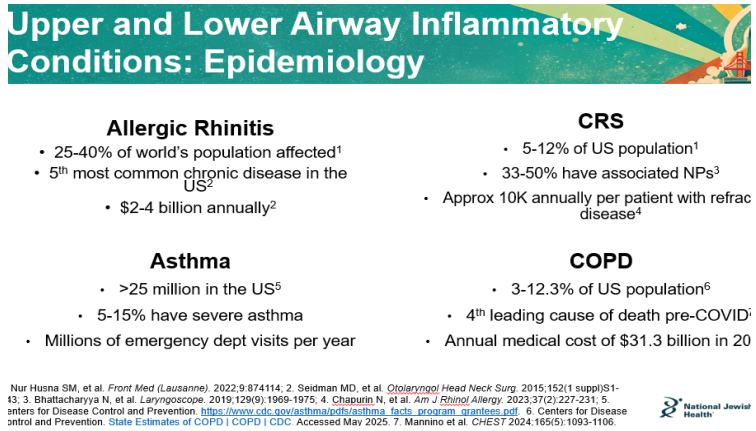
❶



11 slide saves

❷

11 slide saves



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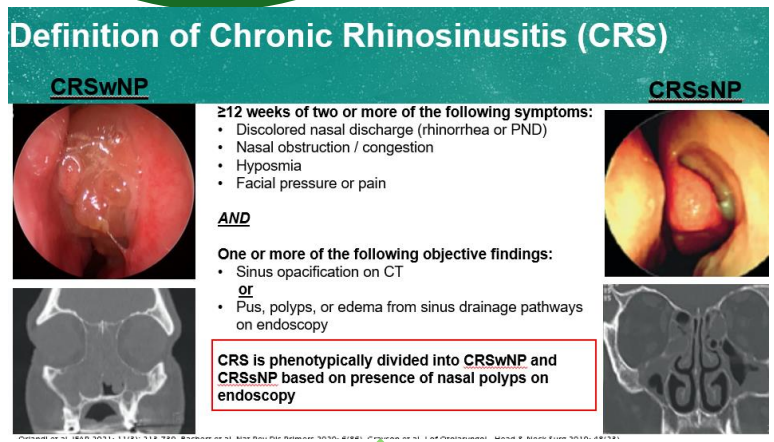


11 slide saves

Audience Engagement: Self-Reflection Questions in Array® Platform

Final Outcomes Summary – Live Symposium

What are you hoping to gain from this educational program?

- Assessment of airway epithelial recovery in asthma
- Deeper insight into the role of epithelial cytokines in airway diseases.
- How to better manage the varying types of RAD I encounter
- Learn about pathophysiology and new treatments available for inflammatory airway diseases.

“What barriers are you still facing?”

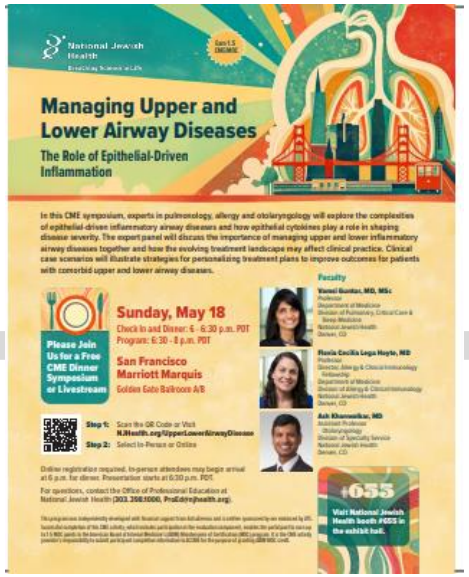
- How to manage the cost of combination inhalers
- Access to medications according to government funding
- Cost of biologics and insurance coverage/denials were not discussed specifically and it is a huge problem.

Audience Generation

Final Outcomes Summary – Live Symposium

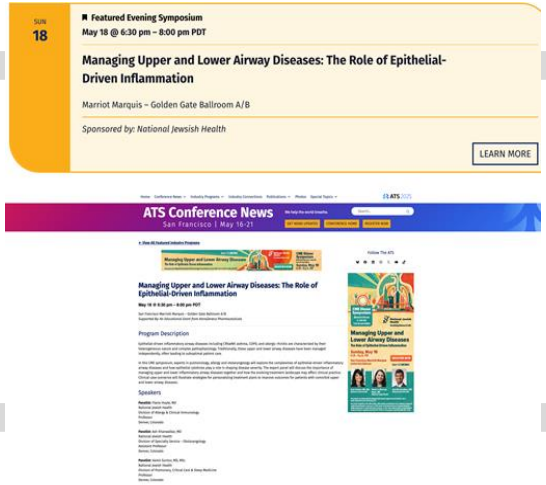
Personalized targeting tools across numerous tactics reach HCPs by leveraging demographic data (such as location, profession, specialty) and behavioral data (such as learner participation history, areas of interest).

Personalized emails sent to ATS registrants & National Jewish Health Faculty



Brochure mailed to ATS registrants and potential attendees

Digital and print ads on ATS website



Dedicated landing page on National Jewish Health website and on Healio platform

Social media ads and posts

Featured Industry Event Listing for ATS

Accreditation Details

Final Outcomes Summary – Live Symposium

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.

National Jewish Health designates the live and enduring activities for a maximum of 1.5 *AMA PRA Category 1 Credit*™ and *1.5 ABIM MOC point*.

ACCME™
ACCREDITED WITH COMMENDATION