



Rethinking CRSwNP:

A Comprehensive Learning Experience for Optimized Patient Care

Final Outcomes Report

September 2026

OUTCOMES ANALYZED BY:



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Rethinking chronic rhinosinusitis with nasal polyps

Rethinking CRSwNP: A Comprehensive Learning Experience for Optimized Patient Care was designed to use a multi-format approach that integrates interactive learning, clinical decision-making tools, and expert-led discussions to enhance knowledge retention, clinical confidence, and application in real-world patient care.

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 CRSwNP.
- 3. Evaluate emerging biologic therapies, targeting epithelial cytokines, for the management of CRSwNP.
- 4. Implement multidisciplinary collaboration strategies in the management of CRSwNP.

National Jewish Health designated the enduring material and live activities for a maximum of 4.0 AMA PRA Category 1 Credits™.



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“Chronic rhinosinusitis with nasal polyps is an important topic for clinicians because these patients often have complex, persistent disease and multiple potential treatment pathways, including medical therapy, surgery, and biologic therapies. As treatment options continue to evolve, clinicians need to recognize how to incorporate disease characteristics, comorbidities, prior treatment response, and patient preferences into decision-making. Education that brings ENT and allergy/immunology perspectives together is particularly valuable because optimal care often requires collaboration across specialties.” – Eileen Wang, MD, MPH

“Given the complexity of the disease, a multidisciplinary approach is often preferable, and these resources highlight the importance of that collaboration. The activities ranged from thoughtful conversations on seemingly routine to complex cases - where we can all learn something more, including the panelists - to practical interactive tools to assist participants with the management of patients in their own practice. These tools move the needle from theoretical conversations to directly actionable takeaways.” – Ashoke Khanwalkar, MD

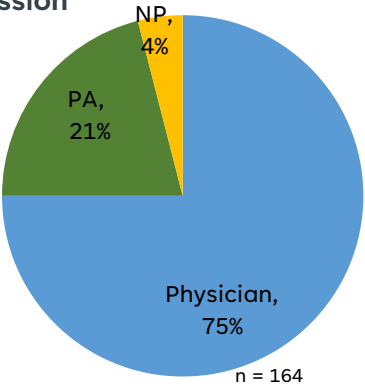
RETHINKING CRSwNP– OUTCOMES SUMMARY

	Total Participation	Target Audience
Mobile Swiper	385	73
Point of Care Tool	1,036	142
Live Virtual Webinars	73	25
Total	1,494	240

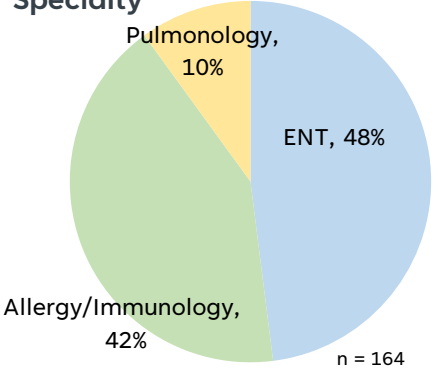
*Some participants engaged with more than one activity

A TOTAL OF 1,375 UNIQUE LEARNERS PARTICIPATED IN THE PROGRAM. 164 LEARNERS WERE IN THE INTENDED PROGRAM US TARGET AUDIENCE.

Profession



Specialty



96%

Improved CRSwNP knowledge

99%

Evidence-based and relevant

93%

Likely to change practice

94%

Met educational needs

99%

Free of commercial bias

LEVEL 3

LEVEL 4

Pre-post knowledge impact

$d = 1.04$

77% probability of outperformance

LEVEL 5

Performance impact

$d = 0.78$

71% probability of outperformance

WITHIN THE TARGET AUDIENCE, THERE WERE ABSOLUTE KNOWLEDGE GAINS OF 13-30 PERCENTAGE POINTS ACROSS SIX ASSESSED QUESTIONS. ONE MONTH LATER, LEARNERS OUTSCORED MATCHED CONTROLS BY 14-31 POINTS ON THE SAME ITEMS

“It was definitely new for me to see the data [on surgery + biologics]... that's probably the biggest takeaway for me. I would say that would be practice changing for me too.” Allergy PA

KEY TAKEAWAYS FROM PERFORMANCE ASSESSMENT

Learners are more likely to properly sequence biologics: Learners were less likely than control to consider biologics at initial diagnosis or after first-line therapy alone, while matching or exceeding controls in every guideline-supported scenario.

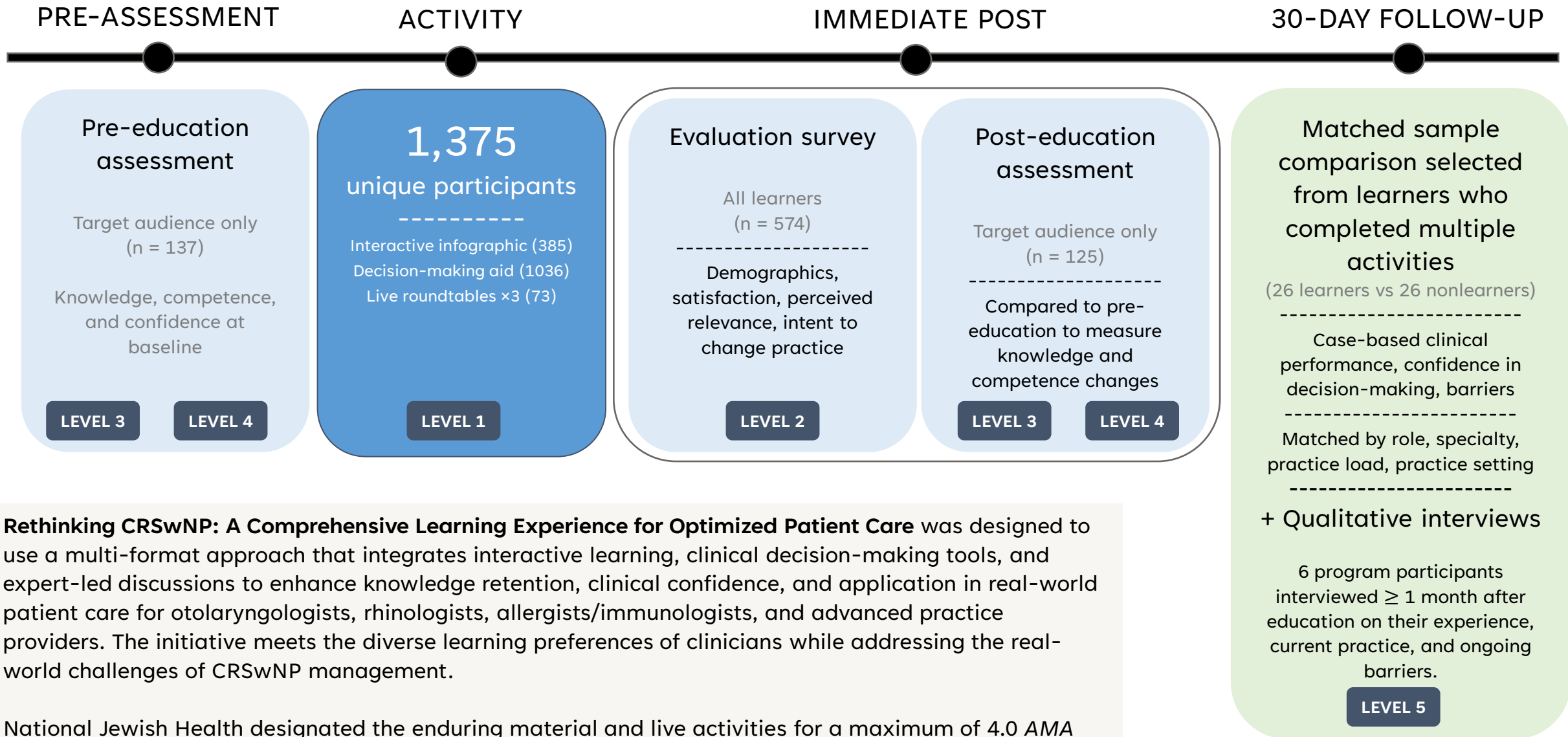
Interviewees discussed concrete practice changes: Following the education, interviewed participants reported adopting clinical tools, applying an appropriate treatment algorithm, and citing specific data presented.

Learners escalated appropriately after failed first-line therapy: At this point, 85% chose surgery or a biologic and reassessed on guideline-based timelines. Only 12% waited beyond 6 weeks vs 23% of controls.

Education reduced barriers, but systemic issues persist: Learners indicated that the education reduced barriers to care, but insurance coverage gaps and patient access barriers remain.

“I'm more aggressively looking for those folks... Questions about sense of smell and taste have really been introduced into my interview of all patients with upper airway complaints. It's definitely no longer an exclusive area of ENT expertise.” Allergist

OUTCOMES METHODOLOGY



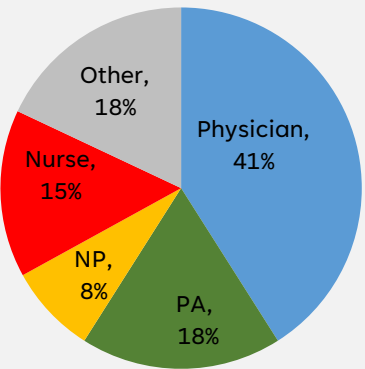
Rethinking CRSwNP: A Comprehensive Learning Experience for Optimized Patient Care was designed to use a multi-format approach that integrates interactive learning, clinical decision-making tools, and expert-led discussions to enhance knowledge retention, clinical confidence, and application in real-world patient care for otolaryngologists, rhinologists, allergists/immunologists, and advanced practice providers. The initiative meets the diverse learning preferences of clinicians while addressing the real-world challenges of CRSwNP management.

National Jewish Health designated the enduring material and live activities for a maximum of 4.0 AMA PRA Category 1 Credits™.

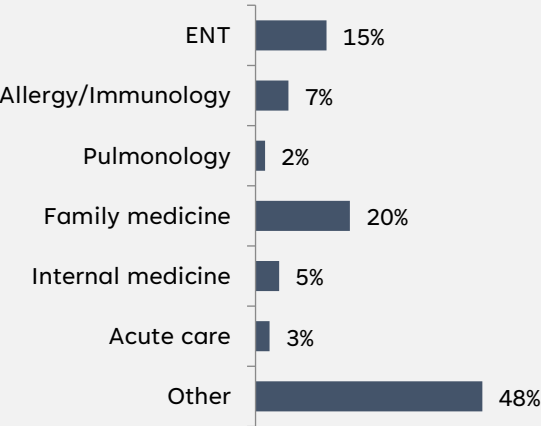
STUDY DEMOGRAPHICS – TOTAL LEARNERS AND TARGET AUDIENCE

Total Learners in Evaluation (n = 574)

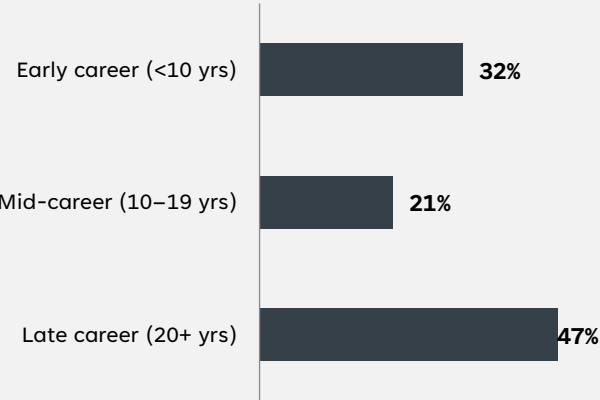
Profession



Specialty



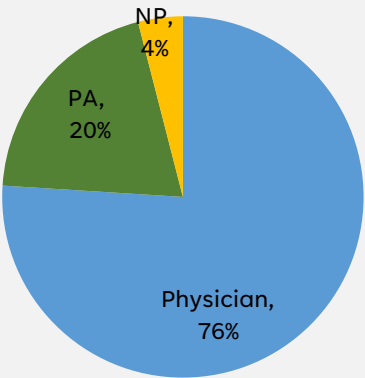
Years in Practice (n = 490)



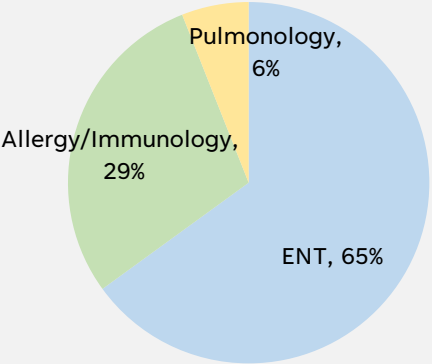
CRSwNP
Patients/Week:
36% see <5
26% see 5–15
8% see 16+
31% none
n = 423

Target Audience (n = 125)

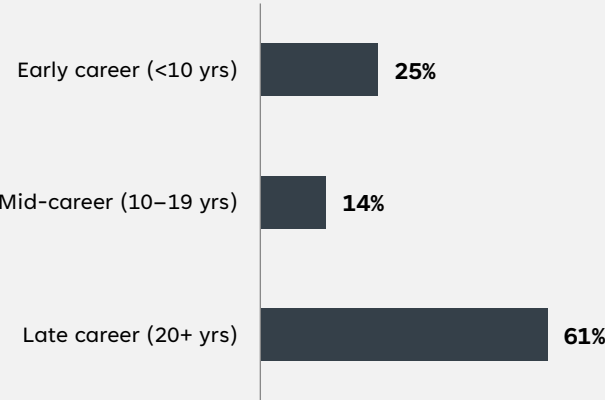
Profession



Specialty



Years in Practice (n = 118)



CRSwNP
Patients/Week:
42% see <5
39% see 5–15
10% see 16+
9% none
n = 104

LEARNER SATISFACTION AND EVALUATION — ALL ACTIVITIES

LO1

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

LO2

Assess the role of epithelial cytokines in the inflammatory pathways in CRSwNP.

LO3

Evaluate emerging biologic therapies, targeting epithelial cytokines, for the management of CRSwNP.

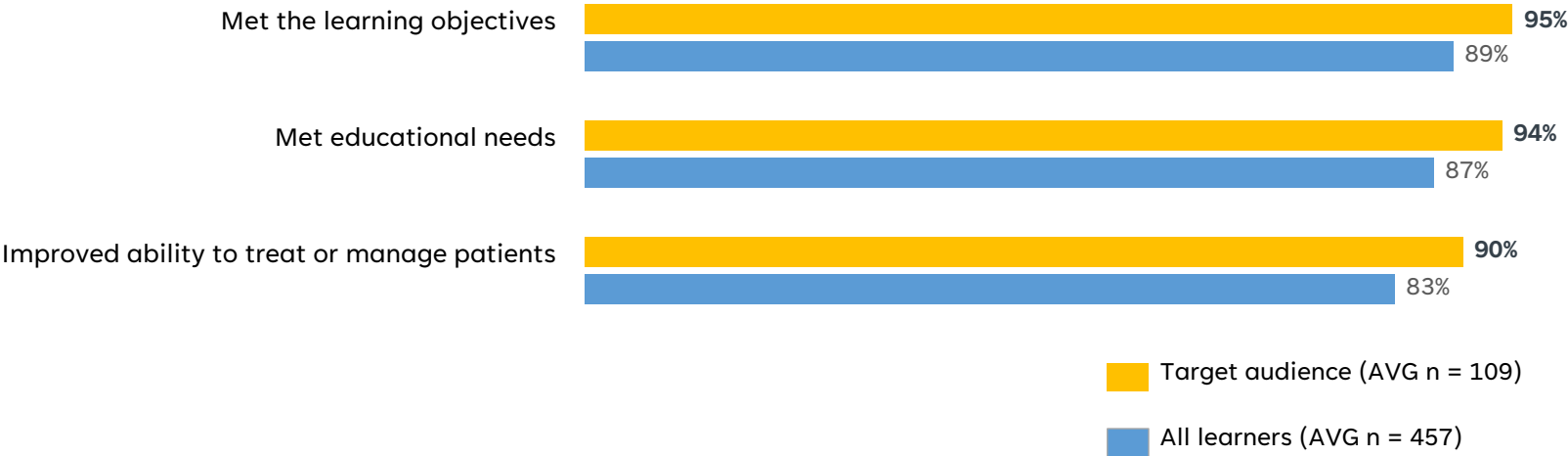
LO4

Implement multidisciplinary collaboration strategies in the management of CRSwNP.

Combined evaluation across the interactive infographic, decision-making aid, and roundtables (all learners N = 457; target audience n = 109).



AGREEMENT WITH STATEMENTS ABOUT THE ACTIVITY (agree / strongly agree)



"I loved the format! It was very informative and engaging. I am a 'visual' learner, so seeing the animations and images will help me remember the information for a long time."

— Evaluation respondent

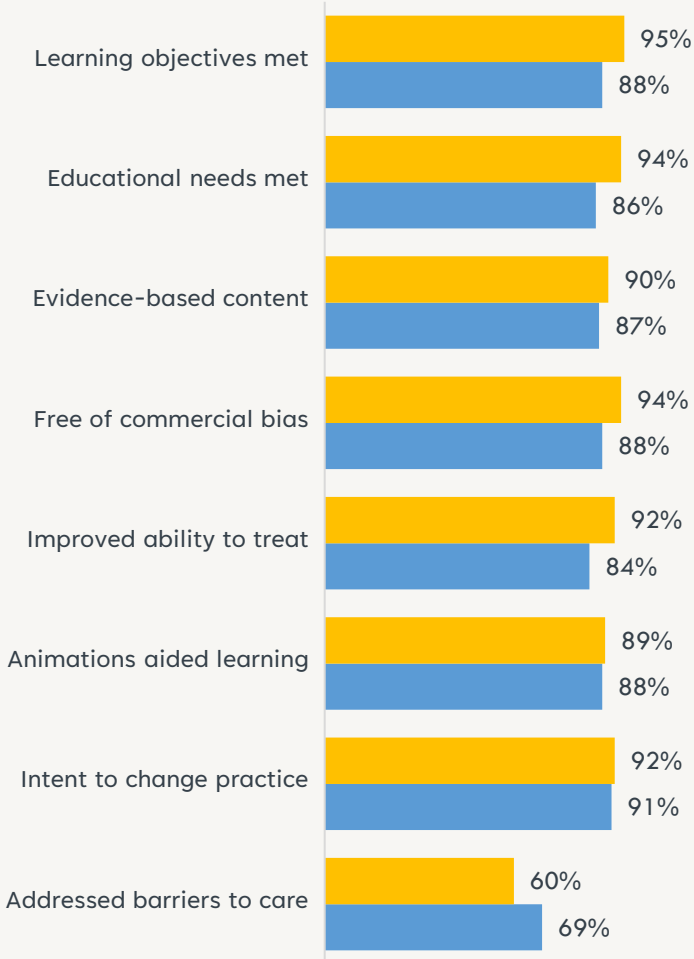
"Thank you. It felt very interactive with being able to click on things I thought were interesting."

— Evaluation respondent

INFOGRAPHIC



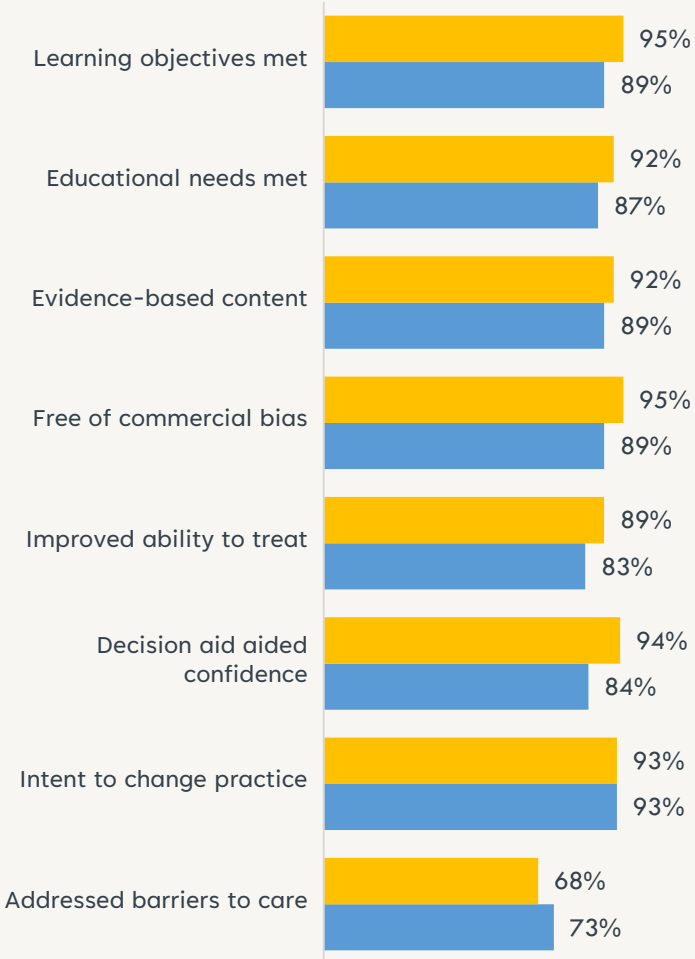
All learners n = 252 · Target audience n = 62



DECISION-MAKING AID



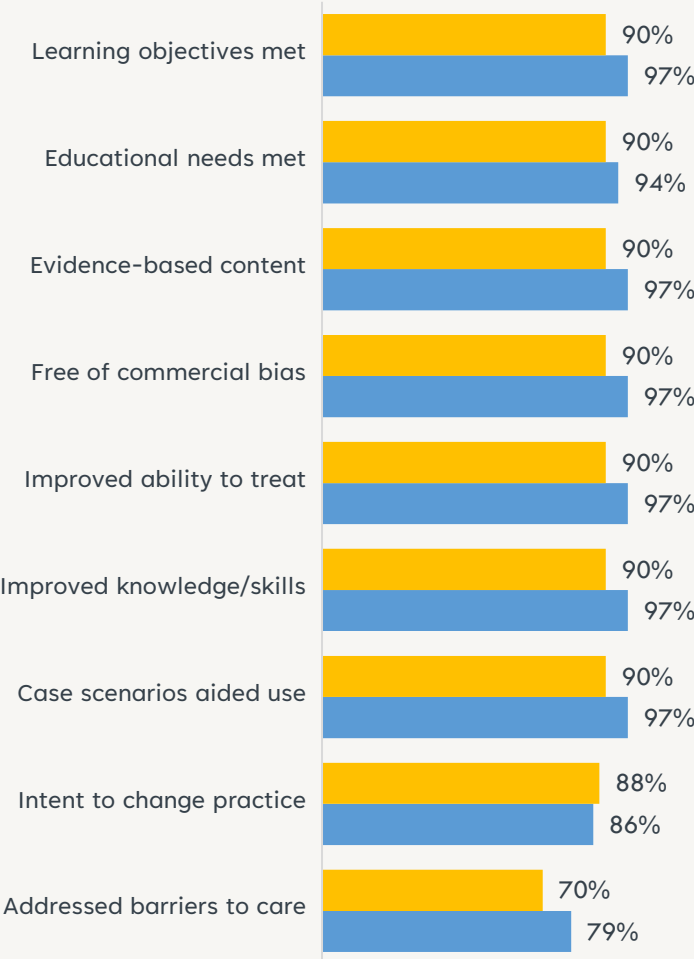
All learners n = 289 · Target audience n = 63



LIVE ROUNDTABLES



All learners n = 33 · Target audience n = 10



Target audience All learners

[INTERVIEW] What prompted you to participate in the education?



“I wanted to see if there's anything else [new and emerging treatments], and I wanted to see which biologic is National Jewish's favorite biologic.”

UZ, Allergist



“It's National Jewish... that reputation was enough for me to know that this is going to be good content.”

AM, Allergist PA



“I like to be current as a teacher...I like to be current for myself, for my patients, for the team. I'm interested in patients with nasal polyps, and I'm always interested if there's something new that I don't know yet.”

AW, Allergist



“[CRSwNP is] something that I come across a lot, and they can be very difficult patients to manage. I want to make sure that I'm practicing in a way that's up to date... using the most current guidelines.”

MM, Allergist NP

[INTERVIEW] Were there any particular issues about the topics or specific patients you wanted to learn about?



“I'm getting more and more interested in it because it's so intimately associated with other T2 diseases, primarily asthma, which is my biggest interest.”

SB, Allergist



“I was hoping that if there's anything new or anything different from the way that I practice, that I would learn from the team at National Jewish... Patients [with] aspirin-exacerbated respiratory disease”

NE, Allergist



“I was mostly interested in how much biologics prevent sinus surgeries — to see if there is some information on how the biologics actually work to avoid relapse from sinus surgeries.”

AW, Allergist



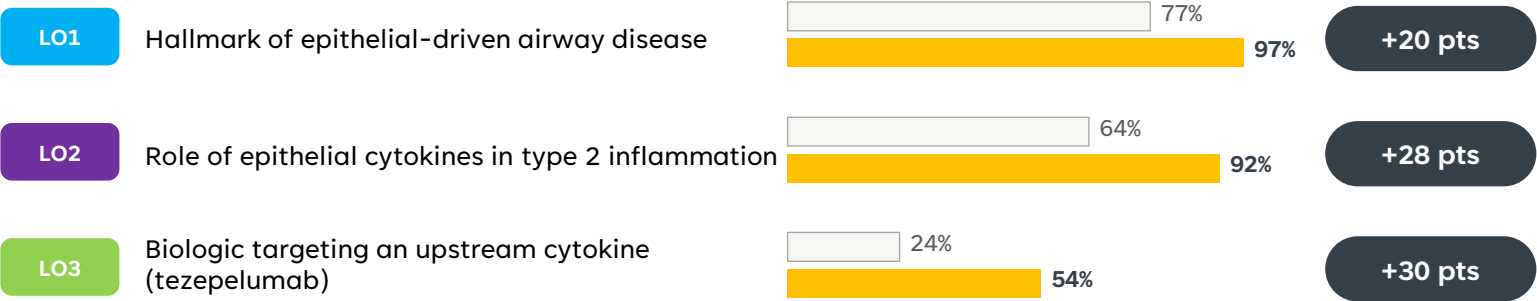
“Sometimes they're coming to me before they've seen an ENT physician or surgeon... so just trying to find tools to diagnose is really helpful. Knowing what diagnostic tests to order, like biomarkers, and when I need to be referring and getting help from other specialties. I might need to work with ENT to come up with a plan — if it's surgery, if it's biologics, if it's both, who manages that, who follows up.”

MM, Allergist NP

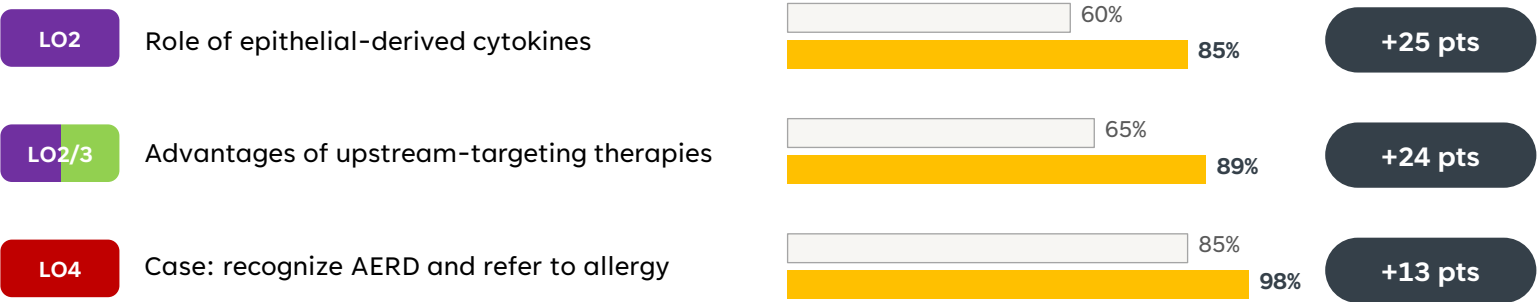
PRE-POST KNOWLEDGE, COMPETENCE, AND CONFIDENCE — IMMEDIATE CHANGE

Target-audience clinicians, % answering correctly before → after each activity (infographic n = 75 → 63; decision aid n = 62 → 54); confidence on a 5-point scale.

INTERACTIVE INFOGRAPHIC



DECISION-MAKING AID + POC TOOL



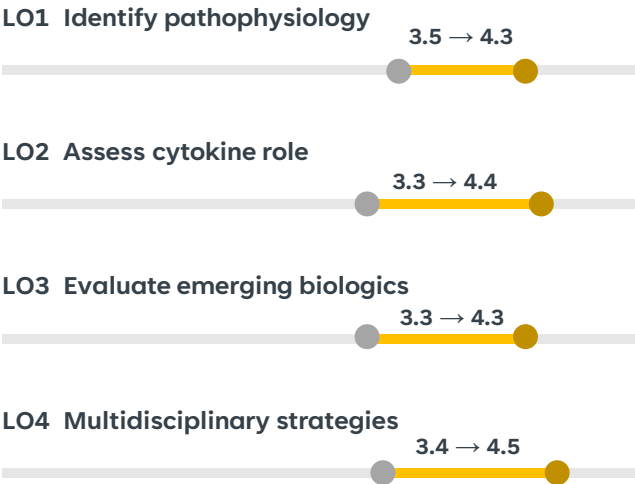
Pre-test Post-test



“I loved the cases. They were very real-world patients and the physicians presenting brought those cases themselves... I loved how it was like a conversation back and forth between two colleagues who clearly have worked together.”
AM, Allergist PA

CONFIDENCE BY OBJECTIVE

Mean confidence, 5-point scale, pre → post



IMPROVEMENT IN ALL FOUR OBJECTIVES

Clinicians improved on every knowledge, case, and confidence measure. The one incomplete gain, naming the upstream biologic (24% pre → 54% post), is the same content area where controls lagged furthest at follow-up.

A learner sample was collected by contacting clinicians in the target audience who participated in at least 2 of the CRSwNP activities. The demographics from the learner sample were used to recruit a matched nonlearner sample (n = 26) by role, specialty, patient load, location, and practice setting. This comparison shows not only what a group of learners is taking away from the activity, but also how their performance compares to a group of their peers who did not attend the education.

SAME SURVEY, TWO GROUPS

Learners and non-learner controls completed the identical case-based survey. Any difference in evidence-based decisions reflects the education, not the instrument.

MATCHED SAMPLE	Learners (n = 26)	Controls (n = 26)
Specialty (A&I / ENT)	16 / 10	16 / 10
Role (physician / NP, PA)	18 / 8	18 / 8
Years in practice (median)	21	18.5
Patients per week (median)	60	53
CRSwNP patients per month (median)	10	10

THE CASE

A 46-year-old woman presents with a 4-month history of discolored nasal discharge and congestion, pressure behind the eyes and forehead, and loss of sense of smell.

The case unfolds across the full arc of CRSwNP management, with decisions at each step:

- Diagnosis and initial workup
- First-line medical therapy
- Persistent symptoms and escalation
- Sinus surgery
- Biologic initiation
- Managing a biologic responder

Qualitative interviews were conducted with 6 program participants (of multiple activities) at least one month following their educational engagement to understand current practices and use of education. These interviews focused on their experiences with the education, current management approach, ongoing barriers to care, and topics for future initiatives. Quotes from the interviews were coded by theme and interspersed through this outcomes report to provide additional context to the quantitative results.



UZ: Allergist/Immunologist physician provider in a suburban community seeing 80-100 patients a week, 35-40 patients with CRSwNP, has been practicing for 26 years.



SB: Allergist physician provider in a suburban clinic seeing 80 patients a week, 2% with CRSwNP, has been practicing 27 years.



NE: Allergist physician provider in a community suburban clinic seeing 30-50 patients a week, fewer than 10 with CRSwNP, has been practicing 17 years.



AW: Allergist physician provider in an urban clinic seeing 200 patients a week, 10% with CRSwNP, has been practicing 34 years.



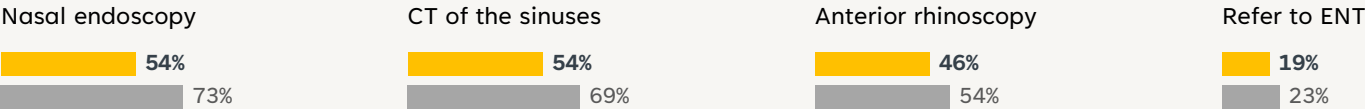
AM: Allergist PA provider in a suburban private practice seeing 70-75 patients a week, 3-5 with CRSwNP, has been practicing 15 years.



MM: Allergist NP provider in an urban clinic seeing 60 patients a week, 5-10 with CRSwNP, has been practicing 8 years.

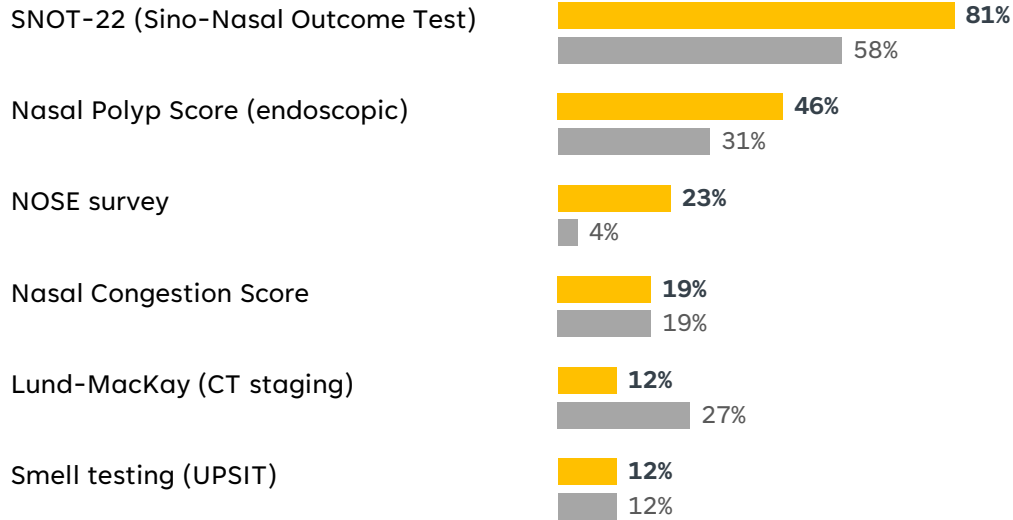
CASE: A 46-year-old woman presents with a 4-month history of discolored nasal discharge and congestion, pressure behind the eyes and forehead, and loss of sense of smell.

WHAT WOULD YOU DO OR ORDER TO ASSESS HER? (select all)



Similar approach to initial assessment: 100% of both groups pursued objective assessment (CT and/or endoscopy 85% vs 92%). The groups enter the case the same way, but the differences that follow are what the education changed.

WHICH STANDARDIZED TOOLS WOULD YOU USE? (select all)



LIKELIHOOD OF USING STANDARDIZED TOOLS

46% vs 31% very/extremely likely +15 pp

0% of learners said “not at all likely” — vs 15% of controls.

Learners were more likely to use trackable, patient-reported and endoscopic tools (SNOT-22, NPS) while controls leaned on CT-based staging (Lund-MacKay).



“I started using that [SNOT-22]... something that I can score and track over time.”

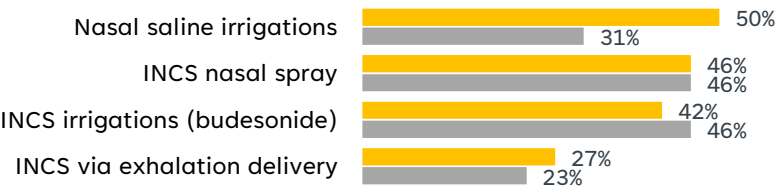
MM, Allergist NP

THE CASE CONTINUES: CT shows pansinusitis. Endoscopic NPS 5, Lund-MacKay 14, SNOT-22 64, anosmic on smell testing — poorly controlled CRSwNP, no prior surgery.

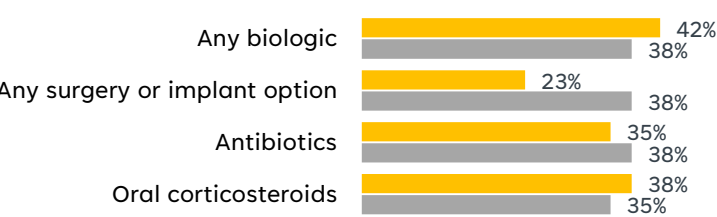
WHICH OF THE FOLLOWING OPTIONS WOULD YOU SELECT AT THIS TIME TO MANAGE THIS PATIENT? (select all)

59% (L) vs 53% (C) evidence-based first-line approach +6 pp

GUIDELINE FIRST-LINE COMPONENTS



PREMATURE OR NOT INDICATED AT THIS STEP



Learners were more likely to use the guideline combination — most notably saline irrigations (+19 pts) — and were less likely to escalate prematurely to surgery (23% vs 38%).

Early biologic appetite was comparable in both groups (42% vs 38% chose a biologic at first-line) — an opportunity for future education across the board rather than a learner-specific behavior.

LO3 LO4

COMFORT IN MANAGING A PATIENT LIKE THIS

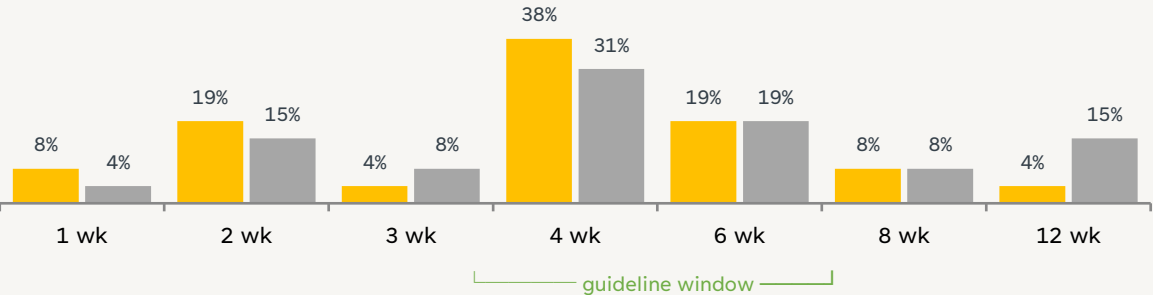
Very/extremely comfortable managing this patient:

62% of controls vs 50% of learners

Comfort tracks experience, not evidence: the more-comfortable control clinicians went on to make fewer guideline-concordant choices at the steps that follow.

REASSESSMENT TIMING

58% vs 50% would reassess within the guideline 4–6-week window.

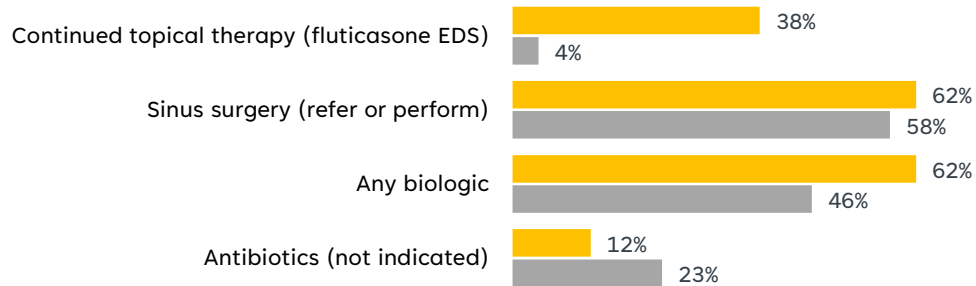


“[the education provided] the algorithm of treatment; the discussion of inhaled nasal steroids used on nebulized medication and surgery for polyps versus using a biologic.”
AW, Allergist physician

THE CASE CONTINUES Symptoms remain poorly controlled after 4 additional weeks of step-up therapy (intranasal fluticasone via exhalation delivery added).

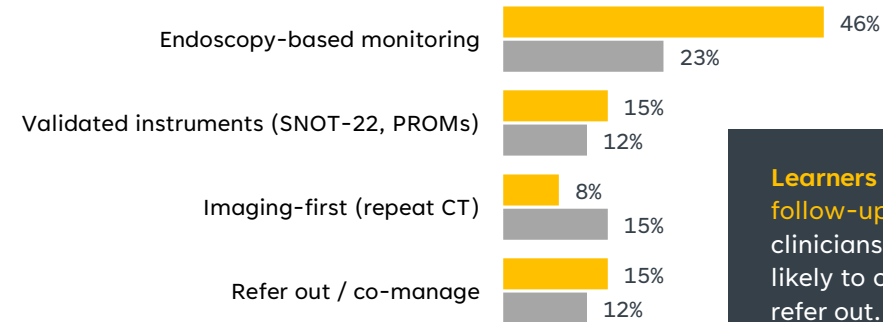
WHICH OF THE FOLLOWING OPTIONS WOULD YOU SELECT AT THIS TIME TO MANAGE THIS PATIENT? (select all)

85% vs 77% escalated appropriately **+8 pp**
surgery and/or biologic selected (select all)



The signature learner behavior: escalate without abandoning the foundation — learners were more likely to continue topical therapy 38% vs 4%, and fewer non-indicated antibiotics.

HOW WOULD YOU MONITOR RESPONSE? (free text, coded)



Learners use endoscopy-based follow-up twice as often as control clinicians, while controls are more likely to order repeat imaging or refer out.



“...having both [ENT and allergy] perspectives was awesome because... it makes total sense, I don't know why it didn't click — probably because we don't think surgery in my practice — but realizing that these patients do better with surgery if they're already on a biologic.”

AM, Allergist PA

THE CASE CONTINUES She undergoes sinus surgery; excised polyps show 60 eosinophils/HPF. Polyps recur postoperatively despite saline and INCS — type 2 criteria met.

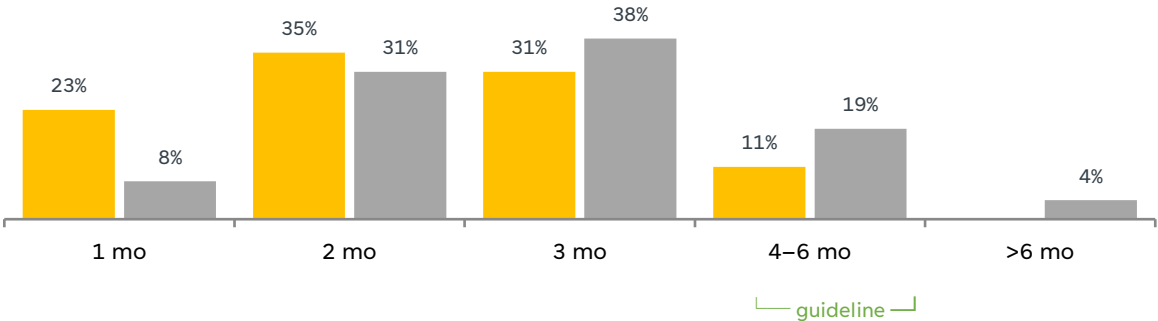
At this point in the case, initiating a biologic for post-surgical recurrence with type 2 markers is universal — **88% in both groups** chose a biologic; surgery/implant 12% vs 15%.

LO3

LO4

THE CASE CONTINUES A biologic is initiated. Six months later: quality of life and sense of smell improved; polyps reduced but still present — treatment-response criteria met.

HOW SOON WOULD YOU JUDGE BIOLOGIC RESPONSE? (open response)



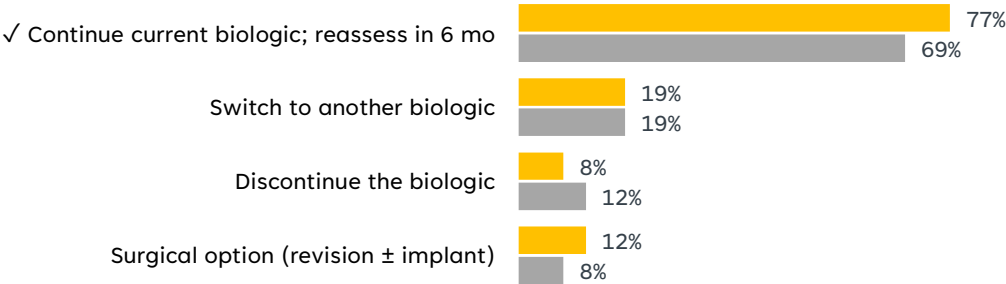
The shared gap is patience: 88% of learners and 77% of controls would judge biologic response before month 4 (median 2 vs 3 months), indicating some confusion on use of biologic therapies and a need for future reinforcement in this area.

“I would like more clarity on long-term outcomes and safety data for biologics targeting epithelial cytokines.”

Roundtable participant

77% vs 69% continue the current biologic and reassess **+8 pts**
Q10 · managing a 6-month responder (select all)

WHICH OF THE FOLLOWING OPTIONS WOULD YOU SELECT AT THIS TIME TO MANAGE THIS PATIENT? (select all)



For continued management of a responder to biologic treatment, learners stay the course: more learners than control continued the effective biologic (+8 pts) and fewer stopped it (8% vs 12%); switching was identical in both groups (19%).

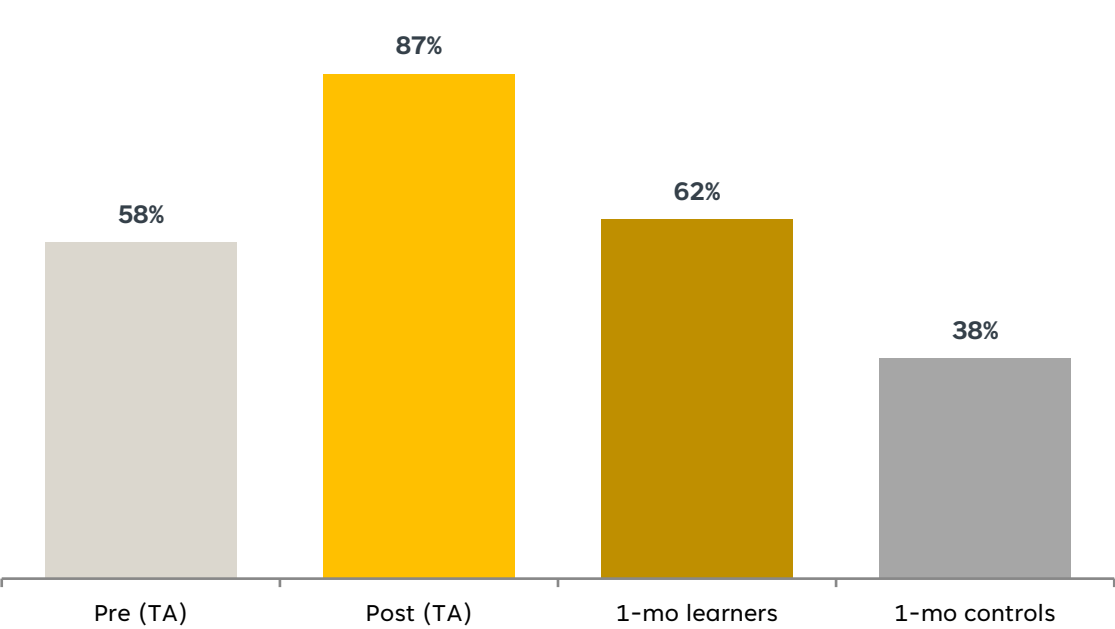


“I tell my patients, if you stop treatment, you go right down to Ground Zero again. Until something better comes along, this is a life-long treatment.”

UZ, Allergist/Immunologist

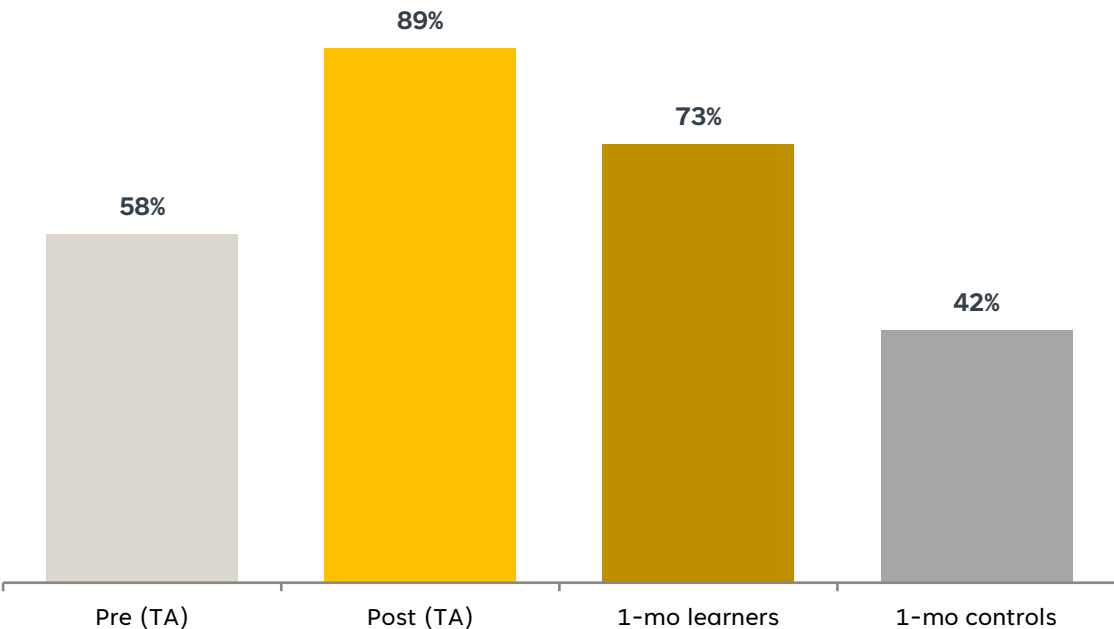
Which of the following best describes the role of epithelial-derived cytokines in the inflammatory pathways of CRSwNP?

Correct: They initiate and amplify type 2 immune responses



Which of the following best reflects the potential advantages of therapies targeting epithelial cytokines (eg, TSLP, IL-33, IL-25)?

Correct: Acting upstream, they may broadly suppress multiple inflammatory pathways



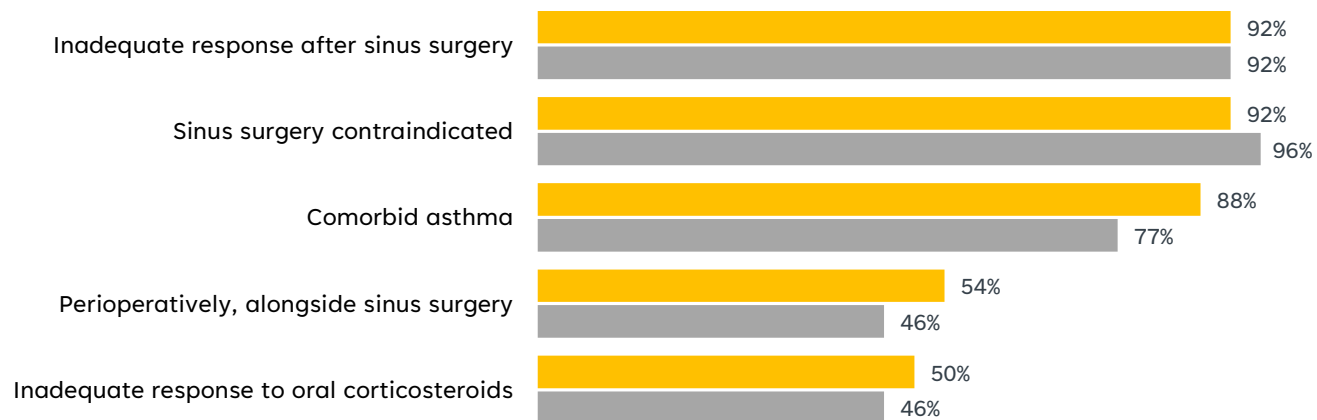
KNOWLEDGE PERSISTED AT ONE MONTH Post-test gains of roughly 30 points were still evident a month later: learners outscored non-learner controls by 24 and 31 points on the same items, while the most common control answer was “unsure.”

Comparison	Q11	Q12
Pre → post gain	P <.001	P <.001
Learners vs controls at 1 month	P = .18	P = .057

PERFORMANCE ASSESSMENT — BIOLOGIC THERAPY ACROSS CLINICAL SCENARIOS

HOW LIKELY ARE YOU TO CONSIDER INITIATING BIOLOGIC THERAPY IN EACH OF THE FOLLOWING SCENARIOS OF PATIENTS WITH CRSWNP? (% very/extremely likely)

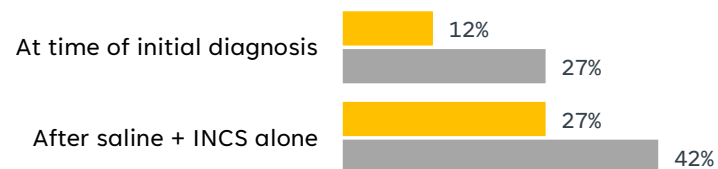
GUIDELINE-SUPPORTED SCENARIOS



“...they went through a few cases with different patients with nasal polyps, asthma and talked through a lot of scenarios on when to advise surgery, when to advise biologics... it was super helpful for things in my practice.”

MM, Allergist NP

PREMATURE SCENARIOS



“the recommendations are that we should still do the asthma evaluation on patients with CRSwNP even if they don't have lower respiratory symptoms.”

NE, Allergist

Willingness to use biologics where guidelines support them is high and equal in both groups — what distinguishes learners is not enthusiasm for biologics but placement of them in the treatment sequence.

[INTERVIEW] Since participating in the education, has there been a patient encounter where you were able to use the information?



“A patient that I saw just a couple weeks ago, that I perhaps in the past would have considered switching to a biologic — I actually said, let's just see ENT first and see what they say. When normally I would just switch them. I think it does impact that decision making.”

AM, Allergist PA



“Yes — I saw the patient shortly after the session, and even though the patient did not seem to have lower airway disease or symptoms of lower airway disease, I was sure to make sure that we actually did the testing to evaluate for lower airway disease.”

NE, Allergist



“I would say without a doubt I use the information. It's information I have reviewed, heard, and continue to use. I'm always trying to be proactive, learning what's on the market and what will be helping my patients.”

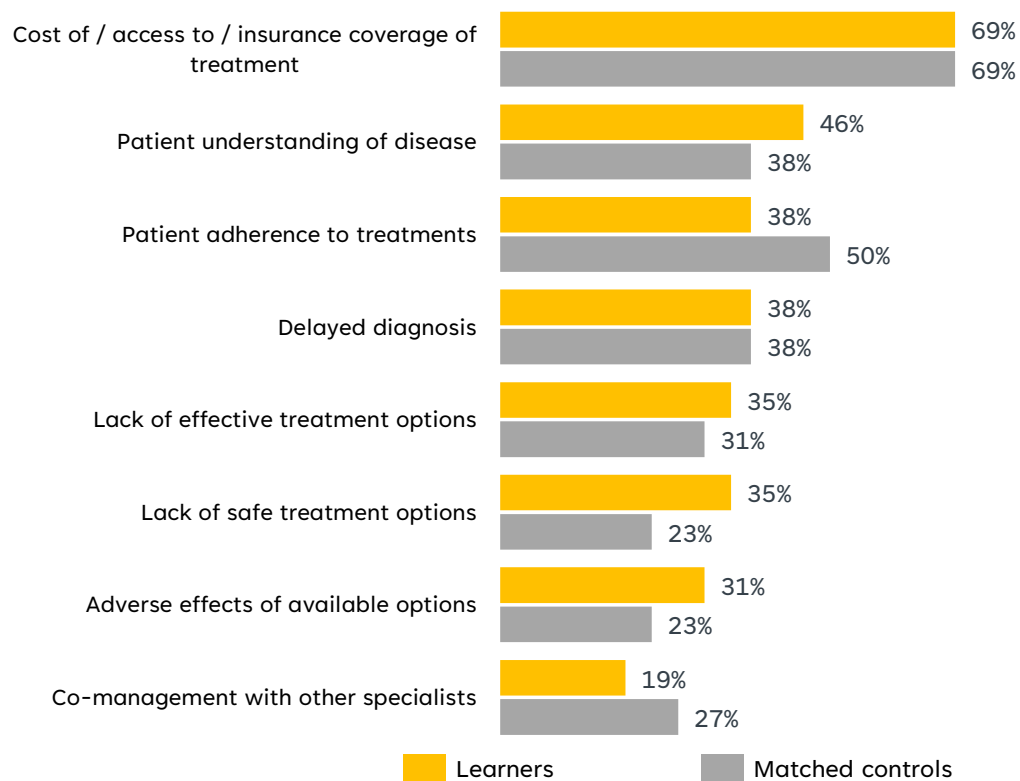
AW, Allergist



“What was presented in the program to a large extent was not new to me. However, it was an endorsement of my approach with patients — discussion of biologics as the viable approach to management of chronic sinusitis.”

SB, Allergist

HOW SIGNIFICANT ARE THE FOLLOWING BARRIERS TO THE OPTIMAL MANAGEMENT OF PATIENTS WITH CRSWNP? (% very/extremely significant)



THE TOP BARRIER IS SHARED Cost, access, and insurance coverage are the most significant barriers for both groups (69% each), and most interviewed clinicians named it first.



“A lot of these patients actually end up in urgent care and the emergency room for quote-unquote sinus infections... it takes a long time before they actually see a specialist who gives them the right diagnosis.”

NE, Allergist



“It’s the insurance issue mostly when trying to get them on a biologic. They will be denied. Also, I’ve never understood, that once a patient starts to feel better, they discontinue treatment and then relapse.”

UZ, Allergist/Immunologist



“Insurance. You’ve heard that before, right? I would also say that the most trouble is the constant use of medication, the fact that the nasal polyps often regrow, the chronic nasal congestion leading to elevated SNOT scores, and generalized uncomfortableness of the patient. As soon as the medication works, the patients stop using the medication.”

AW, Allergist physician



“With shared decision making, the biggest block to implementation of biologic therapy is predicated on insurance. ...it’s a very cumbersome process of application of forms. A generous supply of samples...increases pressure.”

SB, Allergist



“I get tons of primary care doctors that think that these medications are unsafe....”

AM, Allergist PA

[INTERVIEW] What barriers did the education help to address?



[Adherence to medication] “a common problem in nasal polyps is that people feel better and they stop everything. I don’t think anything [about that] was mentioned in the education.”

UZ, Allergist/Immunologist



[Patient communication and education] “I know they talked about the aspirin desensitization option, but that comes with some risks and side effects. You have to talk that through with patients, but for those people that can't afford biologics, it's definitely a good option that we have. As a nurse practitioner, I get no education on this specific condition — it's all been learning as I go... biologic choices and how to choose which one. In the nurse practitioner world, that is really missing.”

MM, Allergist NP



[Flexibility with management] “They talked about some of these barriers... and they don't go a straight path every single time. So, I don't either, and it's not because we don't know what we're doing. It's because it's so complex in the decision-making.”

AM, Allergist PA



[Encouraging and promoting biologic therapy] “When whatever biologic therapy is prescribed, we very rarely fail. It may be an uphill battle, but the end result is good.”

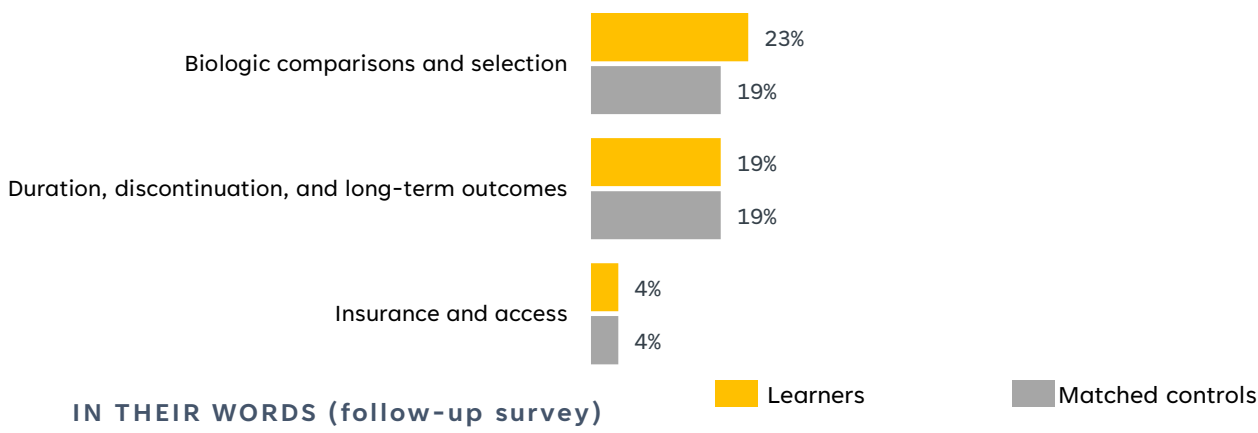
SB, Allergist

100%

of interviewees found the education to help with confidence and validation, but systemic barriers (insurance/cost or patient adherence) were outside the scope of these activities.

LOOKING AHEAD — FUTURE EDUCATION PRIORITIES

WHAT TOPICS ON CRSWNP WOULD YOU LIKE TO SEE ADDRESSED IN FUTURE EDUCATION?
(free text, coded into themes)



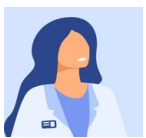
“Specific indications for one biologic vs another” — learner
“Data in length of therapy” — learner
“Safety data, as well as data on relapsing when discontinuing biologics” — learner
“Management of recurrence and navigation/updates of the insurance authorizations/step therapy requirements” — learner
“When to wean/discontinue biologics” — control
“Comparisons among the multiple indicated biologics” — control

AND FROM THE INTERVIEWS



Head-to-head evidence and switching guidance

“I think we would need some trials that are head-to-head to really help... the uncertainty that could exist around monitoring and defining the response and when to switch.”
AM, Allergist PA



Patient-facing education resources

“...if there were educational resources and tools that we could give to patients each time that they come into the office, just reinforcing the education that they're receiving.”
NE, Allergist



Cross-specialty workup expectations

“...what they would like from their colleagues and other specialties... if I really should be getting a sinus CT before I refer them.”
MM, Allergist NP



Keep the science at the center

“I don't think CME should be dedicated to tools to overcome insurance resistance... we still need to put pathophysiology, immunology of the disease.”
SB, Allergist

PRIORITIES FOR THE NEXT ACTIVITY Head-to-head biologic comparison and selection · duration, reassessment, and de-escalation · patient-facing education and adherence resources · continued case-based, multi-specialty format.

OVERALL IMPACT OF EDUCATION

LEVEL 3

LEVEL 4

Pre-post knowledge impact

$d = 1.04$

Large effect size comparing all learners' knowledge before and after education (n = 661 pre, 529 post). This metric holds when observing only those in target audience as well (d = 0.97, pre n = 157, post n = 127)

77%

chance that a randomly selected post-education clinician outperforms a pre-education clinician on CRSwNP knowledge measures

LEVEL 5

Follow-up control performance impact

$d = 0.78$

Medium-to-large effect size comparing learners to matched nonlearners at 30-day follow-up on case-based clinical performance measures, including workup, selection of appropriate management, and timing for assessment.

71%

chance that a randomly selected learner outperforms a randomly selected peer on CRSwNP clinical decision-making

INTERPRETATION OF COHEN'S D EFFECT SIZE

Assessment researchers often use general guidelines to help interpret Cohen's d – small (0.2), medium (0.5), and large (0.8). However, this rule of thumb is applied to all kinds of assessments, from kindergarten students learning how to read to highly-skilled specialist clinicians applying new advances in their field.

For more information on effect size and interpretation, please visit

<https://rpsychologist.com/cohend/>

Key findings

Significant performance improvement when compared to control



Learners outperformed matched non-learner controls on the follow-up practice assessment, when scored for evidence-based decision-making, 69% vs 56% (P = .011).

Knowledge was retained weeks after attending the sessions



Post-test gains of ~30 points on the epithelial-cytokine items were still evident at 1 month, with learners outscoring controls by 24 and 31 points; the provision of an infographic, decision tool, and other materials likely aided retention.

Learners are more likely to properly sequence biologics



Learners were less likely than controls to consider biologics at initial diagnosis or after first-line therapy alone, while matching or exceeding controls in every guideline-supported scenario.

Learners escalated appropriately after failed first-line therapy



At this point, 85% chose surgery or a biologic and reassessed on guideline timelines. Only 12% waited beyond 6 weeks vs 23% of controls.

Interviewees discussed concrete practice changes



At least one month following the education, interviewed participants reported adopting the SNOT-22, applying an appropriate treatment algorithm, and citing specific data presented.

Insurance and access remain systemic barriers



Lack of insurance coverage and patient discontinuation of therapy are the most significant barriers but may require specifically targeted education to address.

CE Outcomes, LLC is an independent healthcare assessment company specializing in evaluating the impact of continuing medical education (CME). We partner with CME providers to assess outcomes aligned with the Accreditation Council for Continuing Medical Education (ACCME) standards and guidelines.

Founded in 2001, CE Outcomes is committed to delivering high-quality, objective evaluations of healthcare professional practice. Our team brings extensive experience working with medical education providers and healthcare services organizations to consult on performance-level outcomes—based on Moore’s seven levels of CME outcomes measurement—and support all aspects of outcomes assessment.

To learn more, visit www.ceoutcomes.com.

Please contact CE Outcomes with any questions or to request further analyses of this educational activity.

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APPENDIX

- Pre/Post questions
 - Interactive Infographic Pre/Post (Slide 24)
 - Decision aid Pre/Post (Slide 25)
- Roundtable Discussion Audience Polling Results
 - Roundtable Discussion 1 Polling (Slides 26-31)
 - Roundtable Discussion 2 Polling (Slides 32-36)
 - Roundtable Discussion 3 Polling (Slide 37)

% answering correctly before → after the activity. Target audience: ENT, allergy/immunology, or pulmonology AND physician, NP, or PA. Ns shown per group.

Q1 (LO1) · Which of the following is a hallmark feature of epithelial-driven inflammatory airway diseases in both the upper and lower airways?

- Increased smooth muscle mass without barrier dysfunction
- ✓ Disruption of epithelial tight junctions leading to epithelial barrier dysfunction
- Decreased mucus production and reduced immune cell recruitment
- Absence of immune cell involvement in airway inflammation

Rationale: Epithelial barrier dysfunction from disrupted tight junctions is the shared hallmark of epithelial-driven disease across the upper and lower airways.

Q2 (LO2) · Which of the following best explains the role of epithelial-derived cytokines in perpetuating type 2 inflammation in CRSwNP?

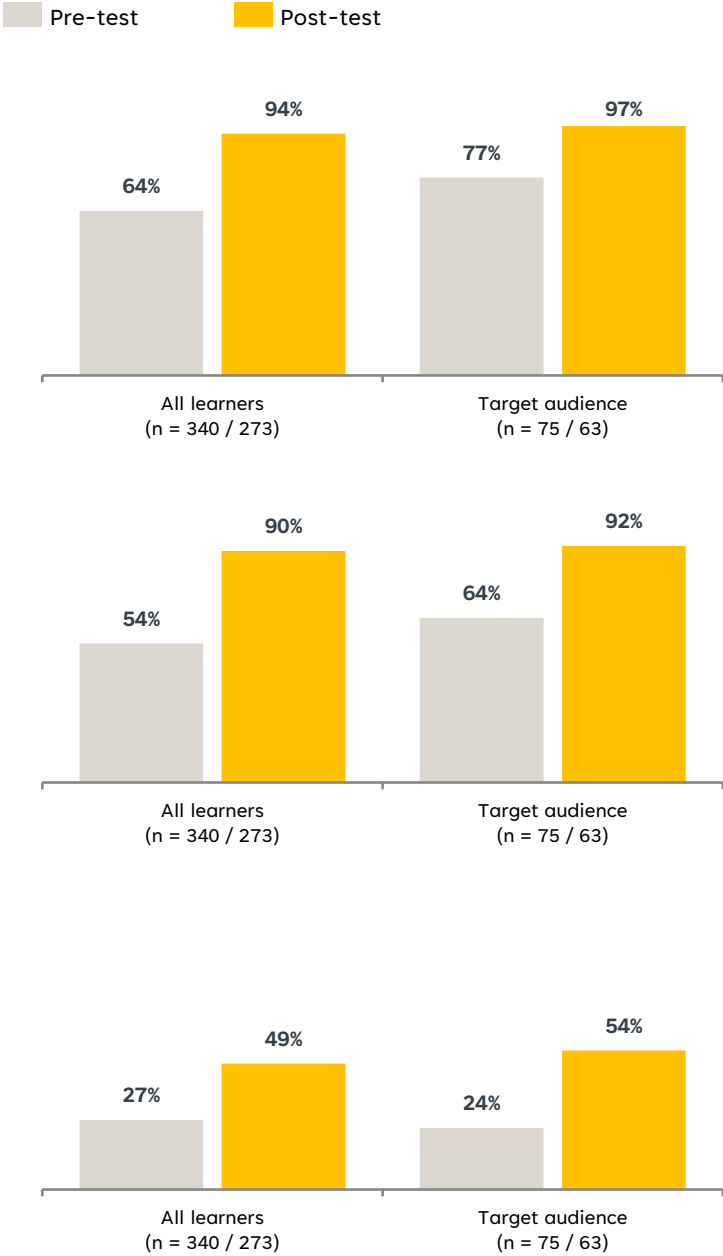
- Epithelial cells primarily release interferon-gamma, which recruits neutrophils and suppresses Th2 responses
- ✓ Epithelial cells secrete TSLP, IL-25, and IL-33, which activate downstream cytokines leading to eosinophilic inflammation and tissue remodeling
- Epithelial cells release TNF-alpha, which directly induces goblet cell hyperplasia and ciliary dysfunction
- Epithelial cells secrete IL-17, the main driver of eosinophilic inflammation in CRSwNP

Rationale: The epithelial alarmins TSLP, IL-25, and IL-33 sit at the top of the type 2 cascade, activating ILC2s and downstream cytokines that drive eosinophilic inflammation and remodeling.

Q3 (LO3) · Which of the following biologic agents targets an upstream epithelial cytokine and has demonstrated efficacy in recent phase 3 trials for the management of CRSwNP?

- Dupilumab
- Omalizumab
- Mepolizumab
- ✓ Tezepelumab
- Benralizumab

Rationale: Tezepelumab targets TSLP, an upstream epithelial cytokine, with phase 3 efficacy in CRSwNP (FDA-approved for CRSwNP in October 2025); the other agents act on downstream targets. Lowest-performing item — dupilumab was the leading distractor.



APPENDIX — PRE/POST ASSESSMENT QUESTIONS: DECISION-MAKING AID

% answering correctly before → after the activity. Target audience: ENT, allergy/immunology, or pulmonology AND physician, NP, or PA. Ns shown per group.

Q1 (LO2) · Which of the following best describes the role of epithelial-derived cytokines in the inflammatory pathways of CRSwNP?

- They suppress type 2 inflammation by inhibiting eosinophil recruitment
- They are involved in tissue remodeling and have little effect on immune cell activation
- ✓ **They initiate and amplify type 2 immune responses by activating innate lymphoid cells and promoting eosinophilic inflammation**
- They mediate neutrophilic inflammation without affecting type 2 pathways

Rationale: Epithelial cytokines initiate and amplify type 2 immune responses — the mechanism underlying upstream-targeting therapy. Repeated verbatim at 1-month follow-up (learners 62% vs matched controls 38%, n = 26 per group).

Q2 (LO2/3) · Which of the following statements best reflects the potential advantages of therapies targeting epithelial cytokines (eg, TSLP, IL-33, IL-25) in the management of CRSwNP?

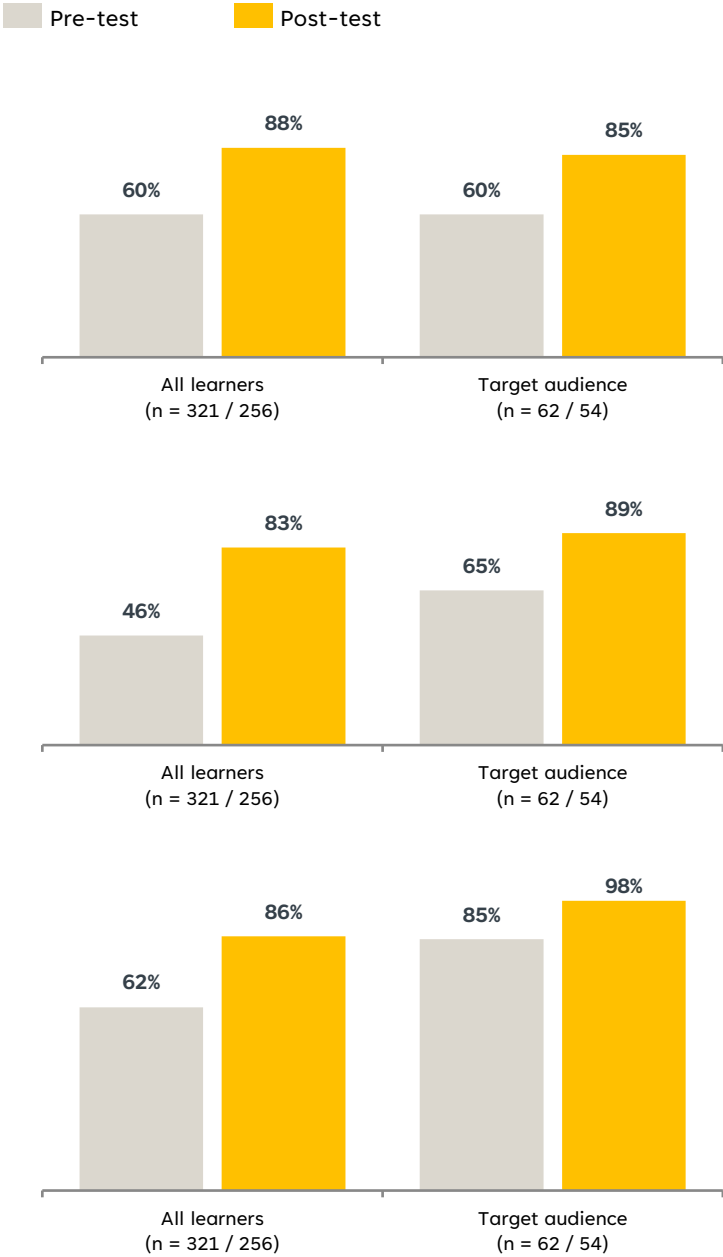
- They act downstream of type 2 inflammation to impede fibrin deposition, thereby decreasing polyp development
- They block epithelial barrier dysfunction through stimulation of enzymes involved in extracellular matrix degradation
- ✓ **By acting upstream, they may broadly suppress multiple inflammatory pathways, potentially improving outcomes in both CRSwNP and comorbid asthma**
- They have been shown to reduce subjective symptoms of nasal congestion but not polyp size

Rationale: Acting upstream, these therapies may broadly suppress multiple downstream pathways — relevant to CRSwNP and comorbid asthma. Repeated verbatim at 1-month follow-up (learners 73% vs matched controls 42%, n = 26 per group).

Q3 (LO4) · A 39-year-old woman with years of nasal obstruction, anosmia, and facial pressure; endoscopy shows bilateral polyps, CT diffuse opacification, no prior surgery. Saline and INCS give minimal improvement after 3 months. She reports wheezing and dyspnea that worsen with aspirin and NSAIDs. Best next step?

- Prescribe long-term oral corticosteroids to manage nasal polyp inflammation
- ✓ **Refer to allergy for evaluation of aspirin-exacerbated respiratory disease (AERD) and possible initiation of biologic therapy**
- Order repeat sinus CT imaging and initiate antimacrolide therapy
- Recommend allergen immunotherapy for perennial allergic rhinitis as primary treatment of polyposis

Rationale: Polyps plus asthma symptoms worsened by aspirin/NSAIDs and inadequate response to first-line topical therapy indicate AERD — refer to allergy for evaluation and consideration of biologic therapy (multidisciplinary management, LO4).



Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case Presentation 1: SJ is a 41-year-old female patient with adult-onset asthma, multiple asthma exacerbations over last few years, 1 requiring hospitalization last year. She reports > 5 OCS-requiring exacerbations/year. She presents for follow-up with uncontrolled upper and lower respiratory symptoms. Triggers include: URIs, gout flare, wildfire smoke.

- Gout triggering asthma story: typical gout flare. Came home from work and took prn pain medications. Began developing wheezing, severe nasal congestion. Went to ED and was treated for asthma exacerbation with nebs, systemic corticosteroids. Similar to another exacerbation when had menstrual cramping.
- + anosmia
- **PMH:** asthma, presumed chronic sinusitis, gout
- **PSH:** C-section x 2
- **FH:** father with CAD, HTN; mother with gout, HTN
- **SH:** minimal former smoker, 2 dogs in home, works as IT consultant
- **Medications:** High dose ICS/LABA, SABA prn, nasal sinus rinses daily, intranasal corticosteroid 2 sprays each nostril bid
- SNOT-22 score of 78
- NPS right 3, left 2
- Lund MacKay 8
- + NSAID sensitivity (respiratory exacerbations triggered by ibuprofen and naproxen)
- **VITAL SIGNS:** T 36.6, HR 85, RR 18, BP 111/64, O2 96%, BMI 24
- **GENERAL:** well-developed, well-nourished, well-groomed
- **SKIN:** no eczema, rashes, or urticaria
- **LYMPH:** no cervical, supraclavicular or submandibular LAD
- **HEAD/EYES:** normal conjunctivae, and lids; PERRL, EOMI
- **ENT:** nl EACs and TMs; **severely edematous inferior turbinates bilaterally with white discharge, possible polyp visualized anteriorly on right**, septum midline, oropharynx clear
- **RESPIRATORY:** **wheezing diffusely throughout, prolonged expiratory phase, no crackles or rhonchi**
- **CARDIOVASCULAR:** RRR, normal S1-S2, no M/R/G; 2+ pulses
- **ABDOMEN:** soft, nontender, nondistended, active bowel sounds

Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

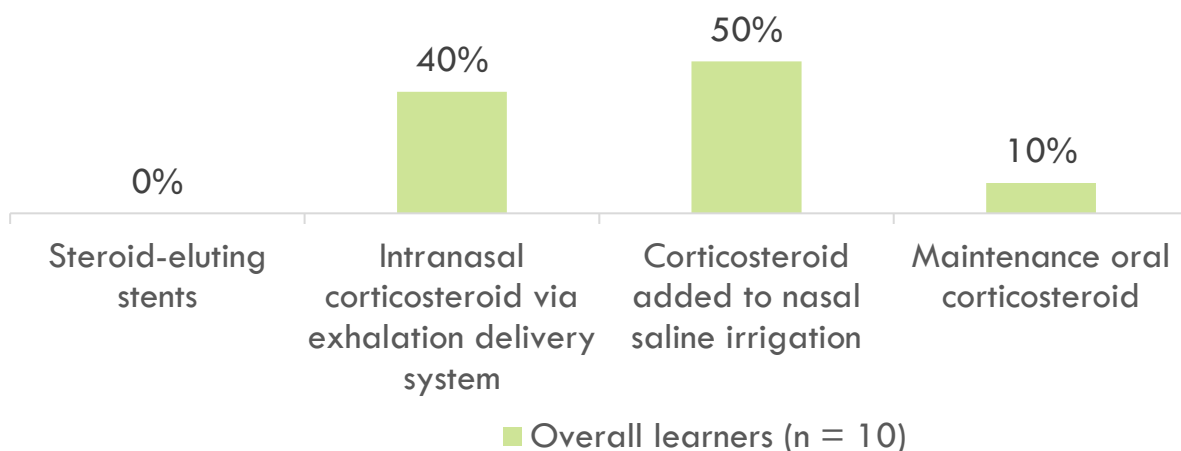
Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case presentation 1 continued:

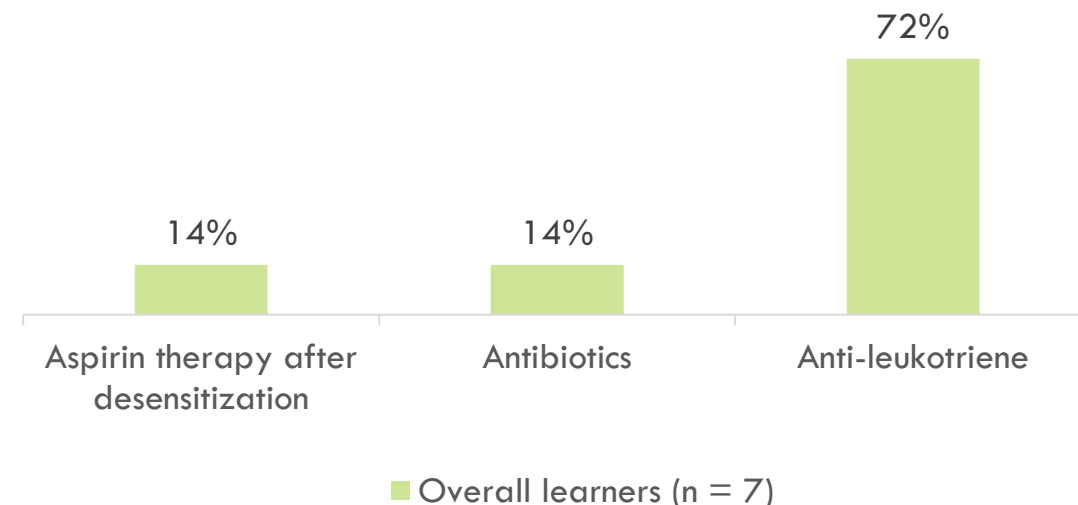
- Technique and adherence for medication regimen reviewed
- Added LAMA, albuterol/budesonide prn
- Discussion of treatment options for CRSwNP
- SJ is reluctant at this time to pursue surgery or biologic therapy

After 3 months, SJ has partial but incomplete response to treatment of CRSwNP with budesonide added to NSW twice daily. She would still not like surgery or biologic therapy.

Audience poll 1: Which treatment option would you pursue?



Audience poll 2: Which treatment options would you pursue?



Note: These questions do not have a single correct answer.

Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case Presentation 2: TM is a 64-year-old man with childhood-onset asthma. Previously well controlled but this year, had multiple asthma exacerbations triggered by perceived URIs/sinusitis over this past year. 3 OCS-requiring exacerbations this year. Triggers: URIs/sinusitis, pollen season. Notices sense of smell greatly diminished, some lessened taste. Spouse notices more nasal voice and increased snoring. They feel his uncontrolled rhinosinusitis trigger his otherwise well controlled asthma.

- **PMH:** asthma, chronic rhinosinusitis, HTN, GERD
- **PSH:** sinus surgery x 3 (last one 4 years ago), ankle surgery, Nissan fundoplication
- **FH:** mother and daughter with asthma
- **SH:** nonsmoker, works as mail carrier
- **Medications:** High dose ICS/LABA, ICS/SABA prn, corticosteroid added to nasal sinus rinses twice daily, proton pump inhibitor qam, H2 blocker qhs, HCTZ
- **VITAL SIGNS:** T 37.1, HR 66, RR 16, BP 125/84, O2 96%, BMI 29
- **GENERAL:** well-developed, well-nourished, well-groomed
- **SKIN:** no eczema, rashes, or urticaria
- **LYMPH:** no cervical, supraclavicular or submandibular LAD
- **HEAD/EYES:** normal conjunctivae, and lids; PERRL, EOMI
- **ENT:** nl EACs and TMs; **moderately edematous inferior turbinates bilaterally without significant discharge, polyps visualized anteriorly bilaterally**, septum midline, oropharynx clear
- **RESPIRATORY:** Occasional end expiratory wheezes appreciated at bases, otherwise clear to auscultation bilaterally. No rales or rhonchi.
- **CARDIOVASCULAR:** RRR, normal S1-S2, no M/R/G; 2+ pulses
- **ABDOMEN:** soft, nontender, nondistended, active bowel sounds

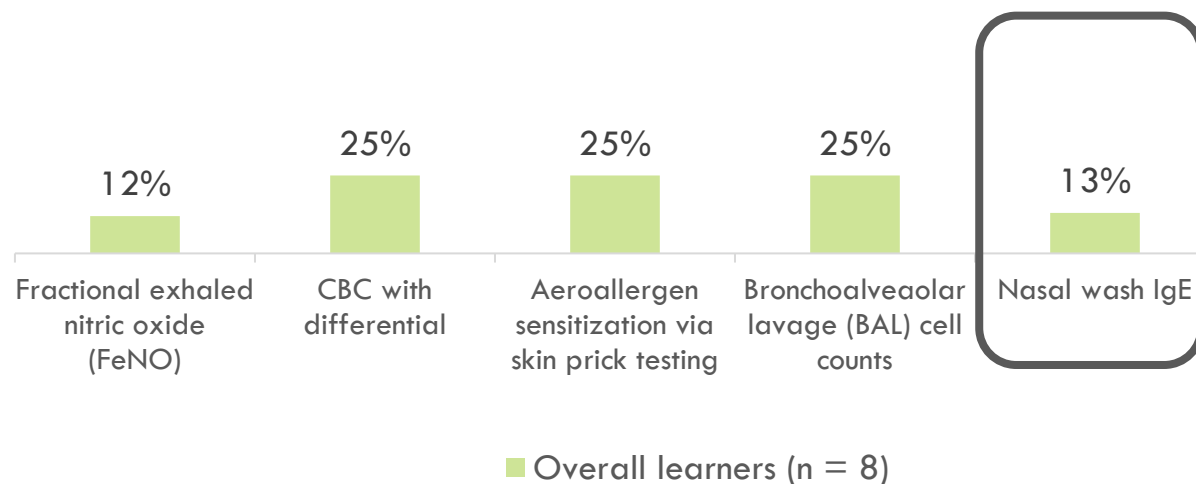
Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case presentation 2 continued:

Audience poll 1: All of these are clinically available biomarkers for asthma or CRSwNP except:

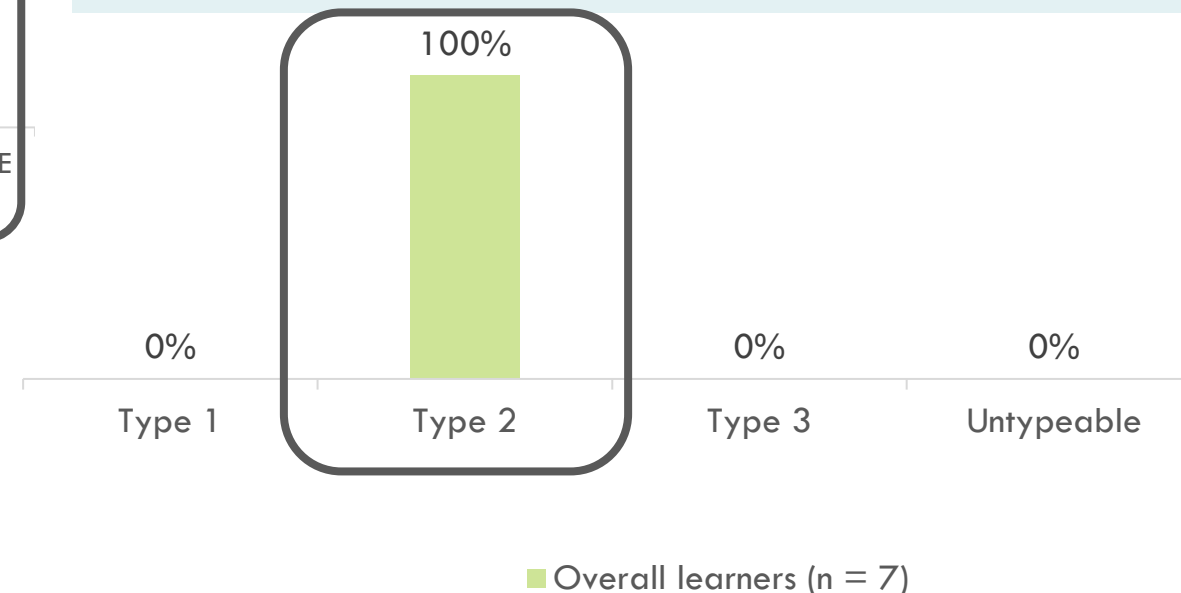


You opt to endotype and better characterize his asthma and CRSwNP.

TM's results:

- Blood eosinophil count (BEC) 550 cells/ μ L
- FeNO 65 ppb
- Aeroallergen skin prick testing: + trees, grasses, weeds
- Total serum IgE 400
- Spirometry with airflow obstruction: Pre-bronchodilator FEV₁ is 70% predicted with significant bronchodilator reversibility of 14%.

Audience poll 2: Based on testing results, TM most likely has which inflammatory subtype/endotype?



Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

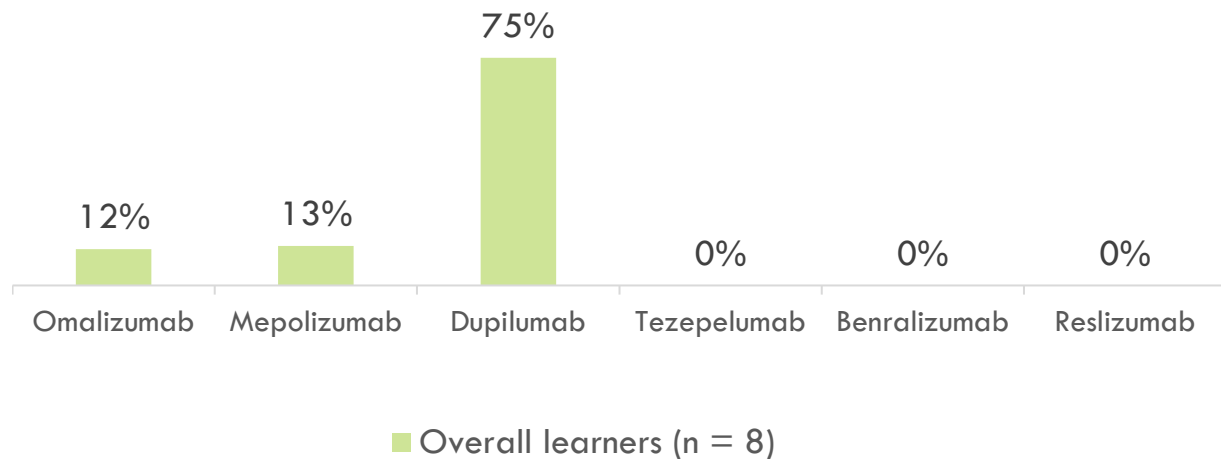
Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case presentation 2 continued:

TM is not interested in another surgery and would like to pursue biologic therapy.

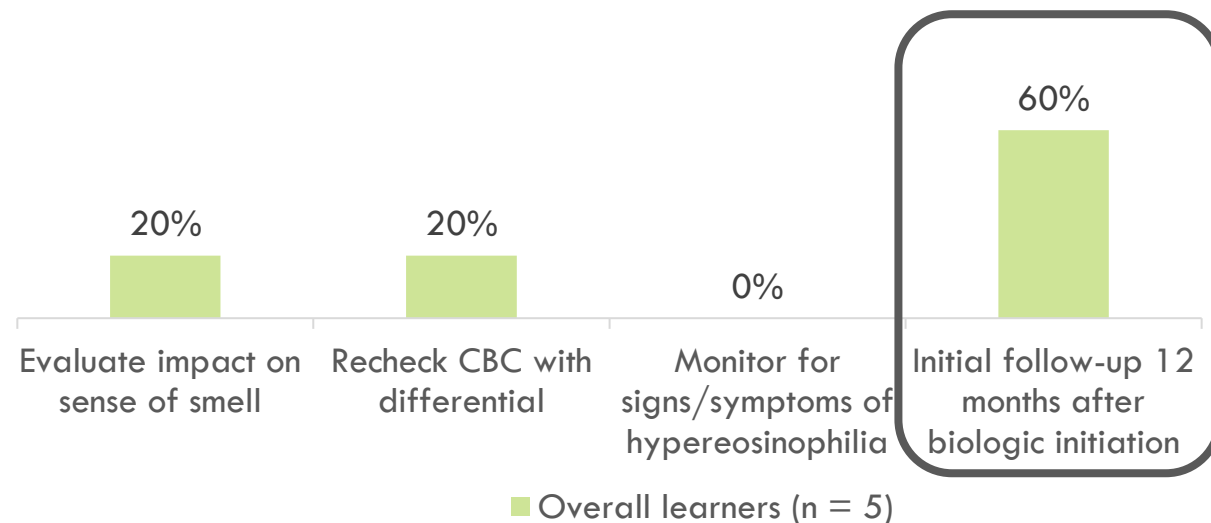
With shared decision making, TM opts to pursue dupilumab.

Audience poll 3: Which option would you pursue for TM?



Note: There is no single correct answer for this question.

Audience poll 4: Which of these should not be considered in follow-up?



Activity 3: ROUNDTABLE DISCUSSIONS

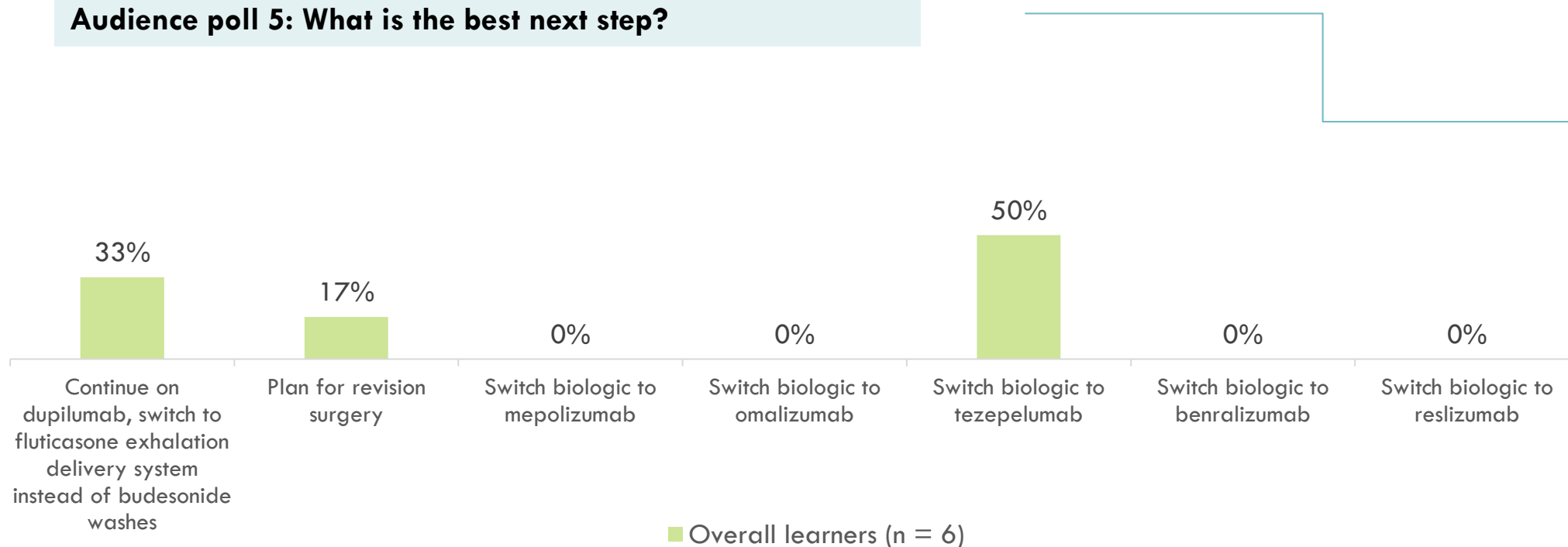
OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #1: Difficult Cases and Unmet Needs in CRSwNP

Case presentation 2 continued: TM does great with improved smell and taste and without respiratory exacerbations for 3 years on dupilumab. However, over the last 2 years, feels response waning and has had 2 CRSwNP exacerbations/year with milder asthma involvement. Evaluation with recurrence of nasal polyps, anosmia, no new comorbidities, no NSAID sensitivity. Restarted budesonide added to nasal washes bid.

- Blood eosinophil count (BEC) 300 cells/ μ L
- FeNO 22 ppb
- Total serum IgE 450
- NP score 2 on left, 2 on right.
- Previous aeroallergen skin prick testing: + trees, grasses, weeds
- Spirometry without airflow obstruction and significantly improved

Audience poll 5: What is the best next step?



With shared decision making, TM opts to pursue a switch to tezepelumab. At 4-month follow-up, he feels much improved in sense of smell. No interim exacerbations.

Note: There is no single correct answer for this question.

Activity 3: ROUNDTABLE DISCUSSIONS

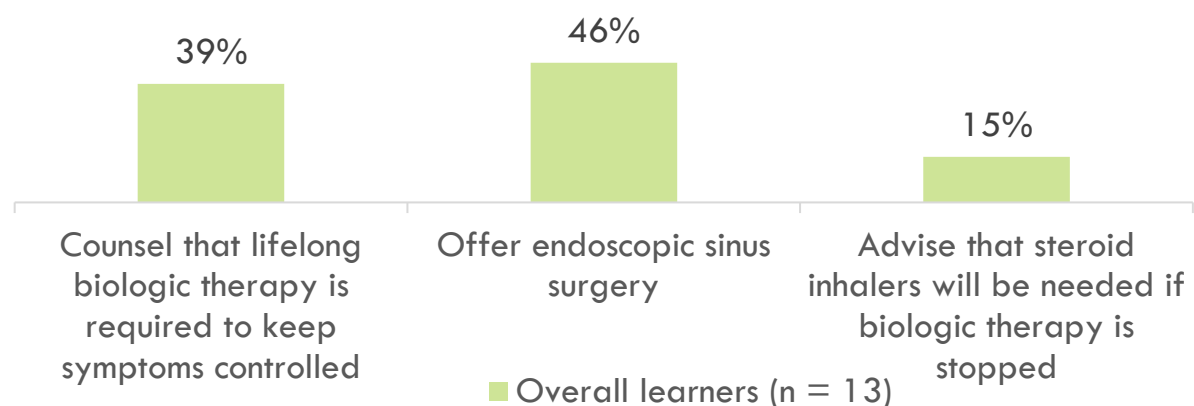
OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #2: Surgery, Biologics, or Both?

Case Presentation 1: AH is a 41-year-old female with history of childhood asthma, developed worsening asthma 2.5 years prior. Difficulty using inhaled steroids → hyposmia. Benralizumab – no benefit. Eval by ENT in NJH – diagnosed with CRSwNP. Started dupilumab 2 months prior to presentation – complete resolution of symptoms.

- Eos off therapy: 600
- IgE: 201
- History of positive methacholine challenge on PFTs
- Nasal endo: bilateral grade 1 polyps (on dupilumab)

Audience poll 1: The patient is interested in options to avoid a lifetime biologic. What do you recommend?



Note: There is no single correct answer for this question.

AH Underwent full ESS with postoperative mometasone NSI.

- Continued periop dupilumab through 6 weeks postop.
- 3 mos postop off dupilumab, doing very well from upper/lower airway standpoint.
- Tolerating inhalers without problematic hyposmia.
- Eos off biologic: 260
- Continued excellent control 18 mos postop.

Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #2: Surgery, Biologics, or Both?

Case Presentation 2: Beverly is a 48-year-old woman with adult-onset asthma. Multiple asthma exacerbations over last 5 years, 1 requiring hospitalization last year. She reports > 3 OCS-requiring exacerbations/year, each one requiring long tapers. Also reports uncontrolled upper respiratory symptoms of persistent nasal congestion, hyposmia, pressure, ear plugging, needing to sleep in chair recently. Has had 2 sinus surgeries in past, last one 3 years ago. Noted worsening symptoms starting ~ 6-12 months after each surgery despite topical regimen. Triggers: URLs, cats, random, smoke.

- **PMH:** asthma, presumed chronic sinusitis, HTN
- **PSH:** C-section x 2
- **FH:** father with CAD, HTN; mother with gout, HTN
- **SH:** never smoker, 2 dogs in home, engineer
- **Medications:** High dose ICS/LABA, SABA prn, budesonide added to nasal sinus rinses twice
- SNOT-22 score of 84
- NPS right 3, left 3
- Lund MacKay 12
- + NSAID sensitivity (respiratory exacerbations triggered by ibuprofen and naproxen)
- **VITAL SIGNS:** T 36.6, HR 85, RR 18, BP 111/64, O2 96%, BMI 24
- **GENERAL:** well-developed, well-nourished, well-groomed
- **SKIN:** no eczema, rashes, or urticaria
- **LYMPH:** no cervical, supraclavicular or submandibular LAD
- **HEAD/EYES:** normal conjunctivae, and lids; PERRL, EOMI
- **ENT:** nl EACs and TMs; **severely edematous inferior turbinates bilaterally with white discharge, polyps visualized anteriorly on both sides to level of inferior turbinate**, septum midline, oropharynx clear
- **RESPIRATORY:** **wheezing diffusely throughout, prolonged expiratory phase, no crackles or rhonchi**
- **CARDIOVASCULAR:** RRR, normal S1-S2, no M/R/G; 2+ pulses
- **ABDOMEN:** soft, nontender, nondistended, active bowel sounds

Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #2: Surgery, Biologics, or Both?

Case presentation 2 continued: You opt to phenotype and better characterize her asthma and CRSwNP. She has been off systemic corticosteroids for > 2 weeks. Beverly's results:

Blood eosinophil count (BEC) 550 cells/ μ L

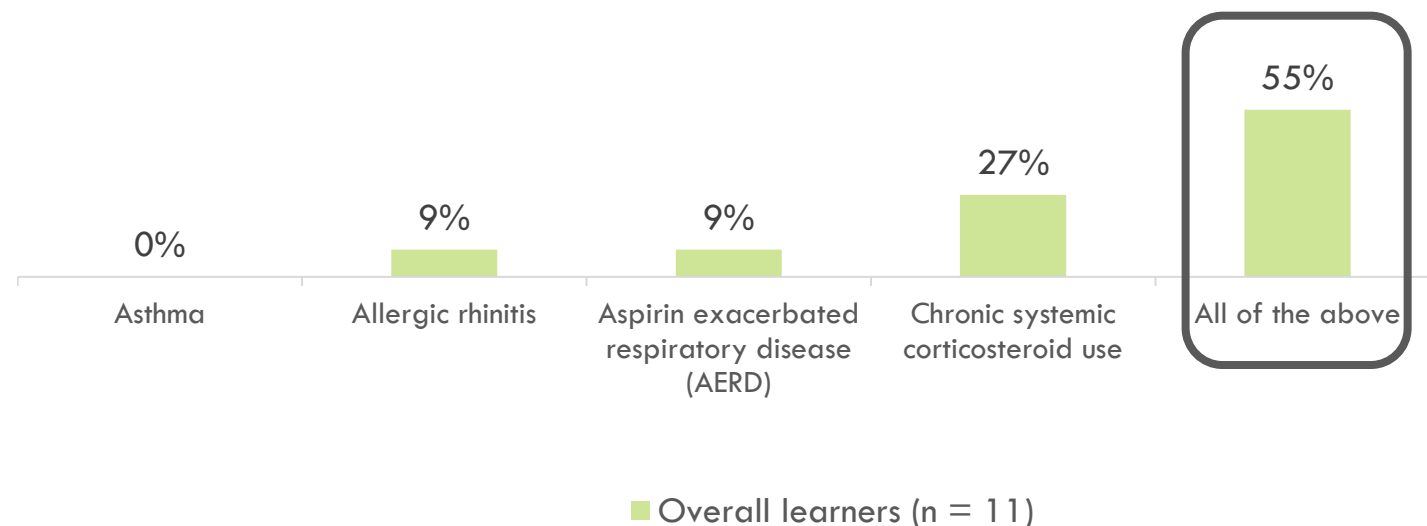
FeNO 55 ppb

Aeroallergen skin prick testing: + dog, cat, tree and grass pollen

Spirometry with airflow obstruction: Pre-bronchodilator FEV₁ is 70% predicted with significant bronchodilator reversibility of 14%. Pre-bronchodilator FEV₁/FVC 65

You ask about NSAID sensitivity and find out she has had flaring of her respiratory symptoms with both naproxen and aspirin

Audience poll 1: In terms of Beverly's comorbidities, I am most concerned about her:



Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

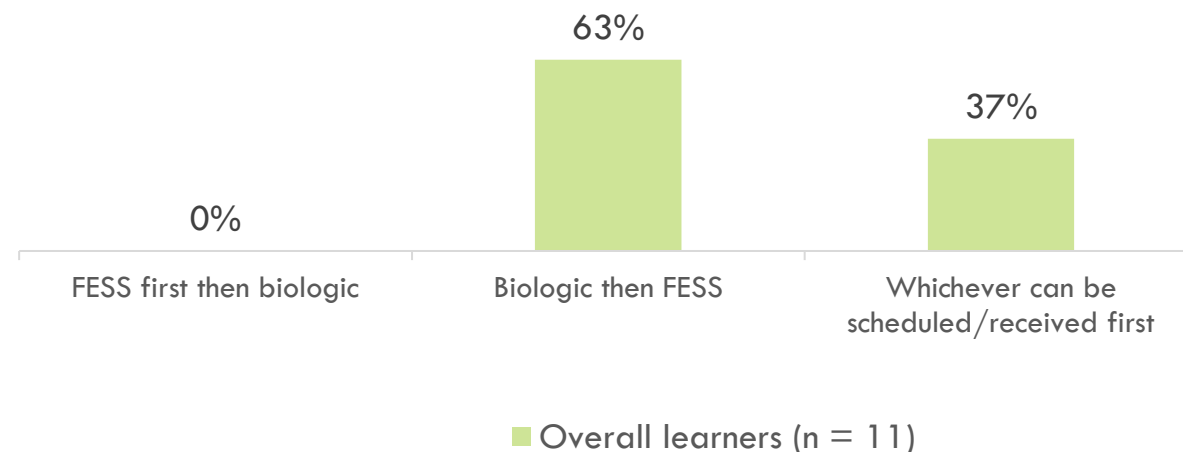
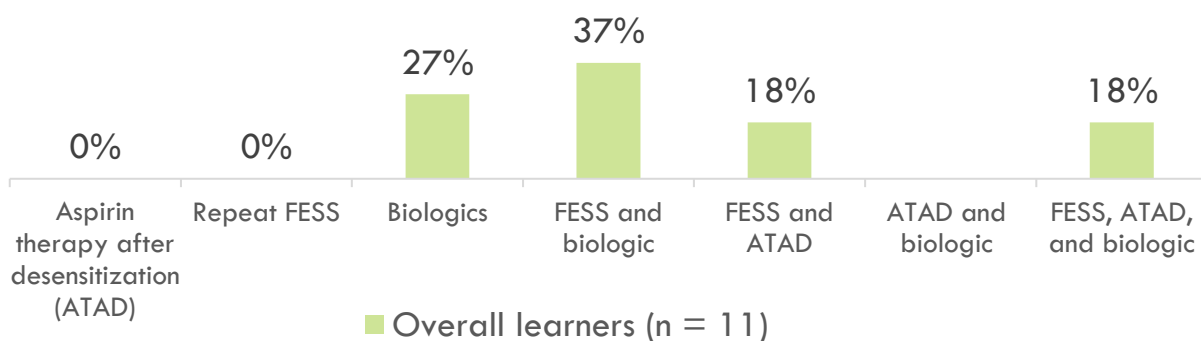
Roundtable Discussion #2: Surgery, Biologics, or Both?

Case presentation 2 continued: LAMA daily, ICS/SABA prn, and anti-leukotriene daily added. Beverly was told in the past she would likely need another surgery. She would like to discuss options.

Beverly would like to pursue repeat FESS, adding on a biologic, and consider ATAD in the future if evidence of rapid recurrence.

Audience poll 2: Which treatment options would you pursue?

Audience poll 3: What timing of FESS and biologic would you pursue?



Note: There is no single correct answer for these questions.

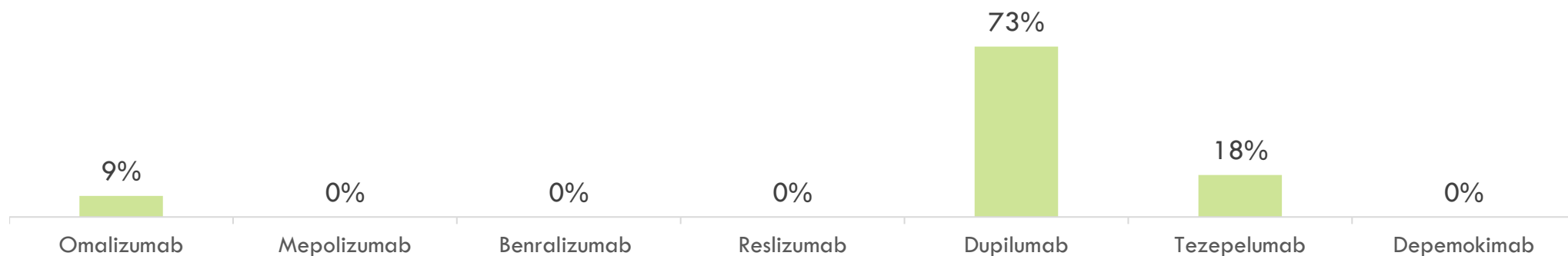
Activity 3: ROUNDTABLE DISCUSSIONS

OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #2: Surgery, Biologics, or Both?

Case presentation 2 continued:

Audience poll 4: Which biologic would you pursue for Beverly?



Overall learners (n =11)

Note: There is no single correct answer for this question.

Beverly started on tezepelumab and shortly after underwent repeat FESS. At her 3 and 6-month follow-up, she reports great improvement and continued improvement each month.

At 6-month follow-up:

SNOT-22 improved from 84 → 45

NPS improved from 6 → 0

Given her history of AERD and rapid recurrence, plan for close monitoring of CRSwNP and asthma with consideration of ATAD if needed.

Activity 3: ROUNDTABLE DISCUSSIONS

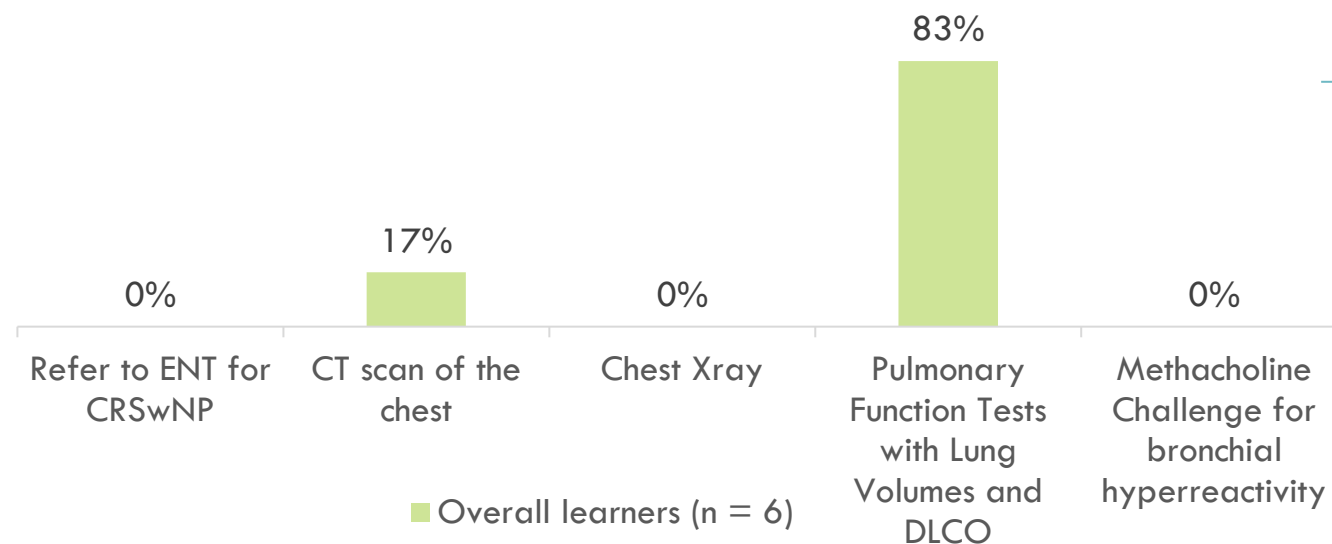
OUTCOMES ASSESSMENT – AUDIENCE POLLING

Roundtable Discussion #3: Multidisciplinary Approach to CRSwNP?

Case Presentation 1: CC is a 41-year-old female with weekly episodes of shortness of breath with incline but also post-prandial Dry cough not always associated DOE → No childhood respiratory issues but recurrent bronchitis as adult.

- Obstructive sleep apnea (BMI 34)
- GERD
- Hx CRwNP
 - status post ESS 2020
 - No topical therapies
 - Morning frontal headaches
- Hx Atopic Derm, mild

Audience poll 1: What would you do next?



Faculty Consensus:

- Chest X-Ray
- Pulmonary Function Testing
- Methacholine Challenge

Note: There is no single correct answer for this question.