NTM Lecture Series for Providers

September 19-20, 2019
NATIONAL JEWISH HEALTH

Executive Summary: Activity Details

This program is an annual, innovative two-day conference for providers featuring key opinion leaders from across the U.S. leading lectures and panel discussions. Topics for the provider session include the epidemiology of NTM, environmental sources of NTM, host susceptibility, radiologic evaluation of NTM, treatment of slow and rapidly growing mycobacteria, NTM in immunocompromised patients and drug side effects, bronchiectasis, cystic fibrosis related NTM infections, extrapulmonary NTM, and the patient's perspective.

Features included:

✓Panel discussion
✓Challenging cases
✓Laboratory Tour
✓Audience Response System

Learning Objectives

- ❑ Recognize the incidence and distribution of NTM disease.

- ❑ Identify the clinical manifestations of NTM disease.

- ❑ Identify and differentiate the various types of NTM infections.

- ❑ Describe the guidelines for the diagnosis and treatment of NTM infections.

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Faculty Presenters

Charles Daley, MD (Program Co-Director)
Chief, Division of Mycobacterial and Respiratory Infections
Professor of Medicine
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Shannon H. Kasperbauer, MD (Program Co-Director)
Associate Professor of Medicine
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Edward D. Chan, MD
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Pulmonary Section
Denver Veterans Affairs Medical Center
Professor of Medicine
Division of Pulmonary Sciences and Critical Care Medicine
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Jennifer R. Honda, PhD
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Faculty Presenters

Amy Leitman, JD
Director of Policy & Advocacy
NTM Info & Research (NTMir)

Ted Marras, MD, FRCPC, MSc
Associate Professor of Medicine
University of Toronto

Stacey Martiniano, MD
Associate Professor of Pediatrics
University of Colorado School of Medicine

PJ McShane, MD
Associate Professor of Medicine
University of Chicago

Michael Strong, PhD
Associate Professor of Academic Affairs
Center for Genes, Environment and Health
National Jewish Health

Kevin Winthrop, MD
Professor of Public Health, Infectious Diseases, and Ophthalmology
Oregon Health and Science University

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Educational Impact Summary

Participants

60
Total Participants

Who see
508
NTM Patients Weekly

Which translates to
6096
Patient Visits Annually

Educational Impact

61.13% increase in confidence from baseline related to recognizing the incidence and distribution of NTM.

39.16% increase in confidence from baseline related to identifying the clinical manifestations of NTM.

58.51% increase in confidence from baseline related to identifying and differentiating the various types of NTM.

49.73% increase in confidence from baseline related to describing the guidelines for the diagnosis and treatment of NTM.

21% overall relative gain in competence from pre to post test.

Practice Change

94%
Reported changing their practice or intending to change their practice

477 per week
NTM patients will benefit from improved practice
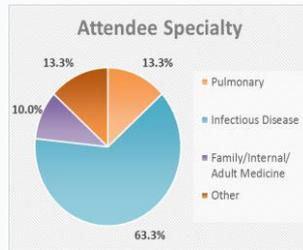
Which translates to
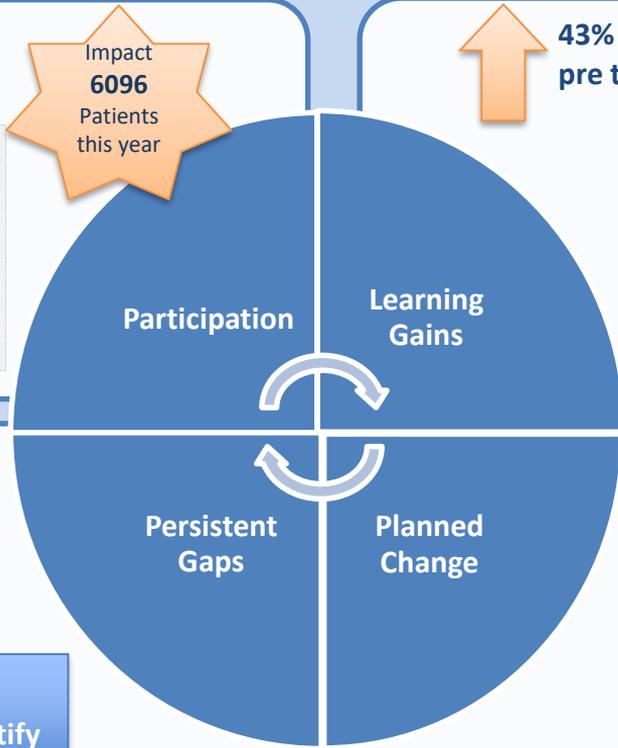**5730**
Patients Impacted Annually

National Jewish Health®

Total Live Learners: 60

80% of learners are prescribers

➤ **68%** MD/DO
➤ **12%** NP/PA

Attendee Specialty

- Pulmonary
- Infectious Disease
- Family/Internal/Adult Medicine
- Other

13.3% 13.3% 10.0% 63.3%

Impact **6096** Patients this year

Participation

Learning Gains

Persistent Gaps

Planned Change

43% overall relative knowledge gain from pre to post activity.

Learning Gains By Objective

Objective	Post	Pre
Diagnose and Treat	84.7	61.8
Differentiate Types	79.15	77.4
Clinical Manifestations	90.7	65.6
Recognize Incidence	87.5	27.45

■ Post ■ Pre
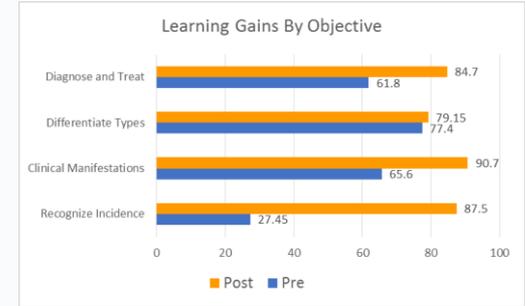
A gap persists related to identifying and differentiating the different types of NTM

Question 7

41.7
58.3
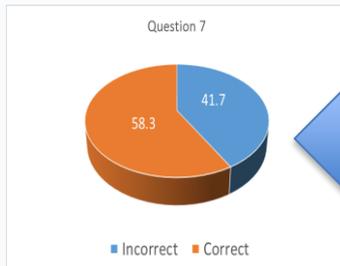
41.7% were unable to identify the subspecies

■ Incorrect ■ Correct

97% or participants reported that they planned to make changes to their practice (immediately after activity)

47% of participants indicated that they had already made changes to their practice at follow-up (6 weeks after activity)

Level 1 Outcomes: Participation

Attendee Designation

- MD/DO — 68.3%
- RN/LPN — 6.7%
- NP — 5.0%
- PA — 6.7%
- PharmD — 6.7%
- Other — 6.7%

Attendee Specialty

- Pulmonary — 13.3%
- Infectious Disease — 63.3%
- Family/Internal/Adult Medicine — 10.0%
- Other — 13.3%
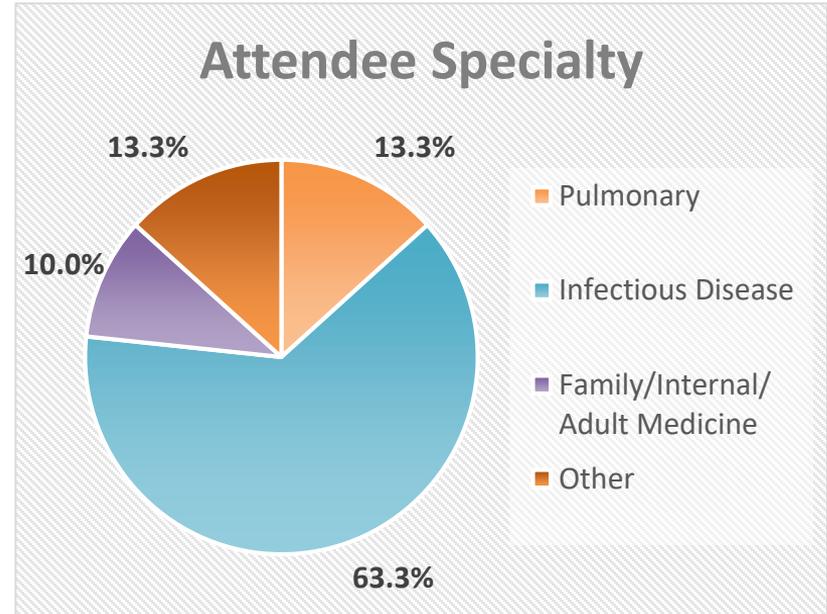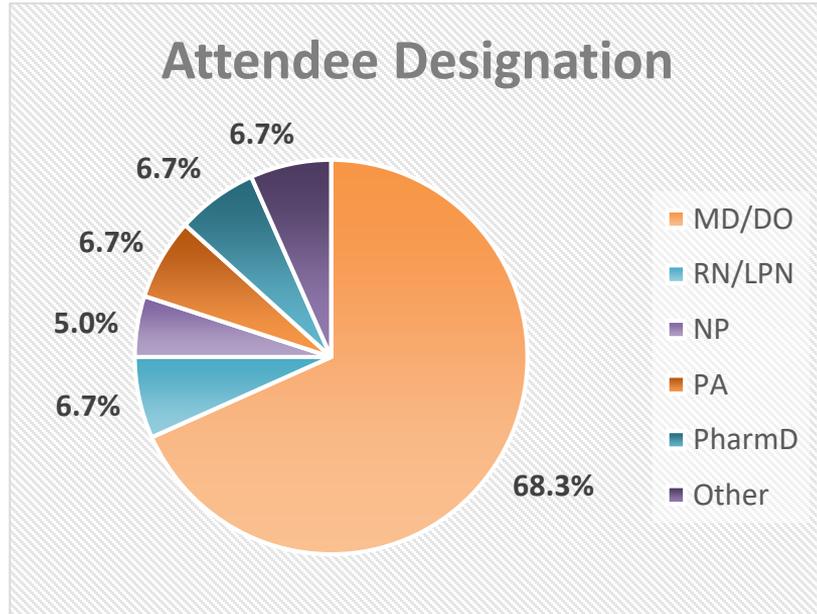
N = 60

Level 2&3 Outcomes: Learning & Satisfaction

Participants reported their confidence regarding each learning objective (confident – very confident)

	After course (N=36)	Before course (N=31)
Describe the guidelines for the diagnosis and treatment of NTM	91.7%	41.9%
Identify and differentiate the various types of NTM	97.2%	38.7%
Identify the clinical manifestations of NTM	97.2%	58.1%
Recognize the incidence and distribution of NTM	94.4%	32.3%

■ After course (N=36) ■ Before course (N=31)
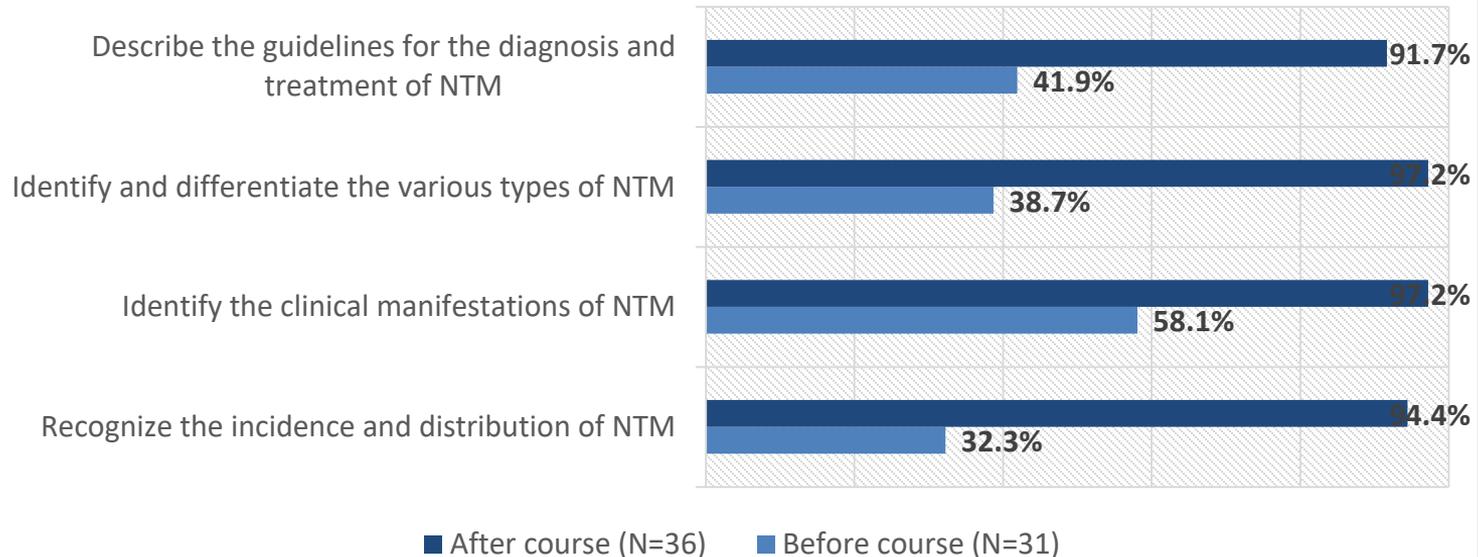
Level 2&3 Outcomes: Learning & Satisfaction

Analysis of participants responses related to educational needs

Participants reported the activity was "Excellent" to "Good" at:

Improving your ability to treat or manage your patients	100.0%
Enhancing your ability to apply the learning objectives to practice	100.0%
Reinforcing and/or improving your current skills	100.0%
Meeting your educational needs	100.0%

N = 36

■ Excellent to Good
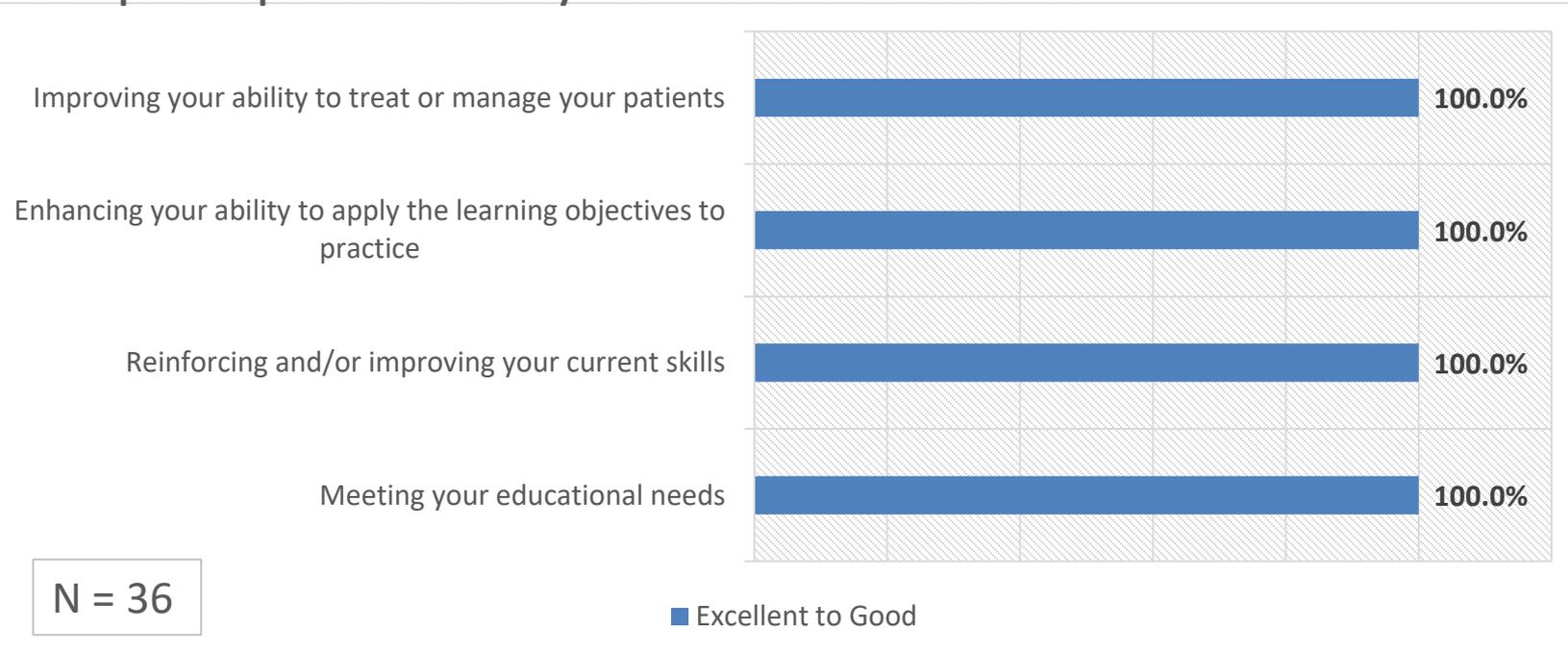
Level 3&4 Outcomes: Overall Learning (Knowledge/Competence)

Pre-test (N=31) Post-test (N=36)

60% 86%

Overall relative knowledge gain from pre- to post-activity

43%

Level 3 and 4 outcomes were measured by comparing participants' pre- and post-test answers. The attendees' responses to these questions demonstrated that **participants gained knowledge as a result of the activity.**
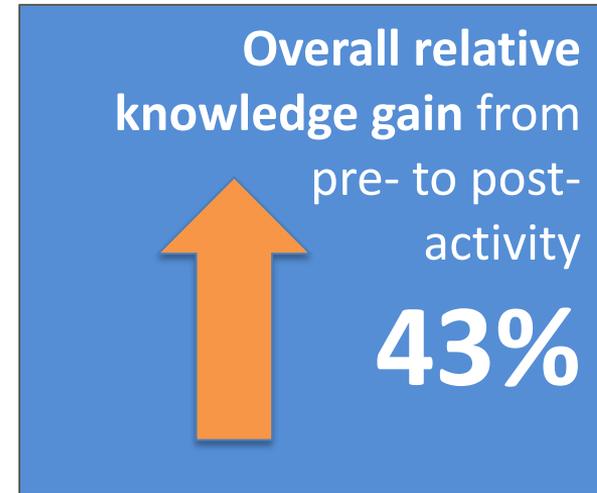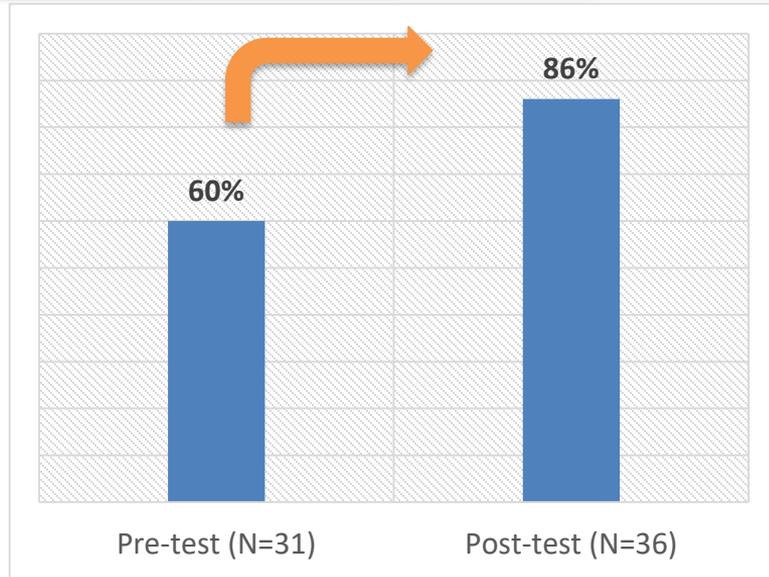
Standard Deviation	
Pre-test	Post-test
.14	.11

Level 3&4 Outcomes: Learning by Objective (Knowledge/Competence)

Learning Objective Knowledge Gain

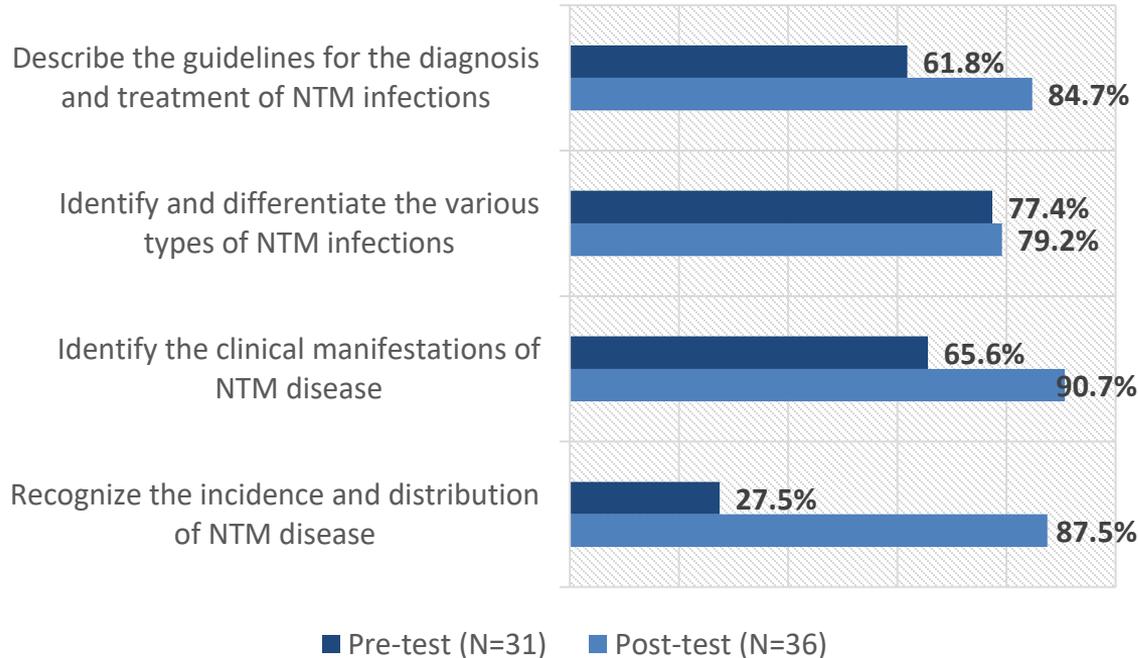Describe the guidelines for the diagnosis and treatment of NTM infections
- Pre-test: 61.8%
- Post-test: 84.7%

Identify and differentiate the various types of NTM infections
- Pre-test: 77.4%
- Post-test: 79.2%

Identify the clinical manifestations of NTM disease
- Pre-test: 65.6%
- Post-test: 90.7%

Recognize the incidence and distribution of NTM disease
- Pre-test: 27.5%
- Post-test: 87.5%

■ Pre-test (N=31)   ■ Post-test (N=36)

Standard Deviation by Learning Objective		
Objective	Pre-test	Post-test
Describe the guidelines for the diagnosis and treatment of NTM infections	.45	.30
Identify and differentiate the various types of NTM infections	.41	.20
Identify the clinical manifestations of NTM disease	.26	.25
Recognize the incidence and distribution of NTM disease	.43	.31

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 1 (Pre/Post-Test)

Learning Objective: *Recognize the incidence and distribution of NTM disease.*

Q1: Which state in the US has the highest rate of NTM infection?

Question 1

P<.0001
d=2.49
Very Large Effect Size

402% relative gain
78% absolute gain

97.2%

67.7%

19.4%

3.2%   0.0%   9.7%   0.0%   2.8%

New York   California   Hawaii   Florida

Pre-test (N=31)   Post-test (N=36)
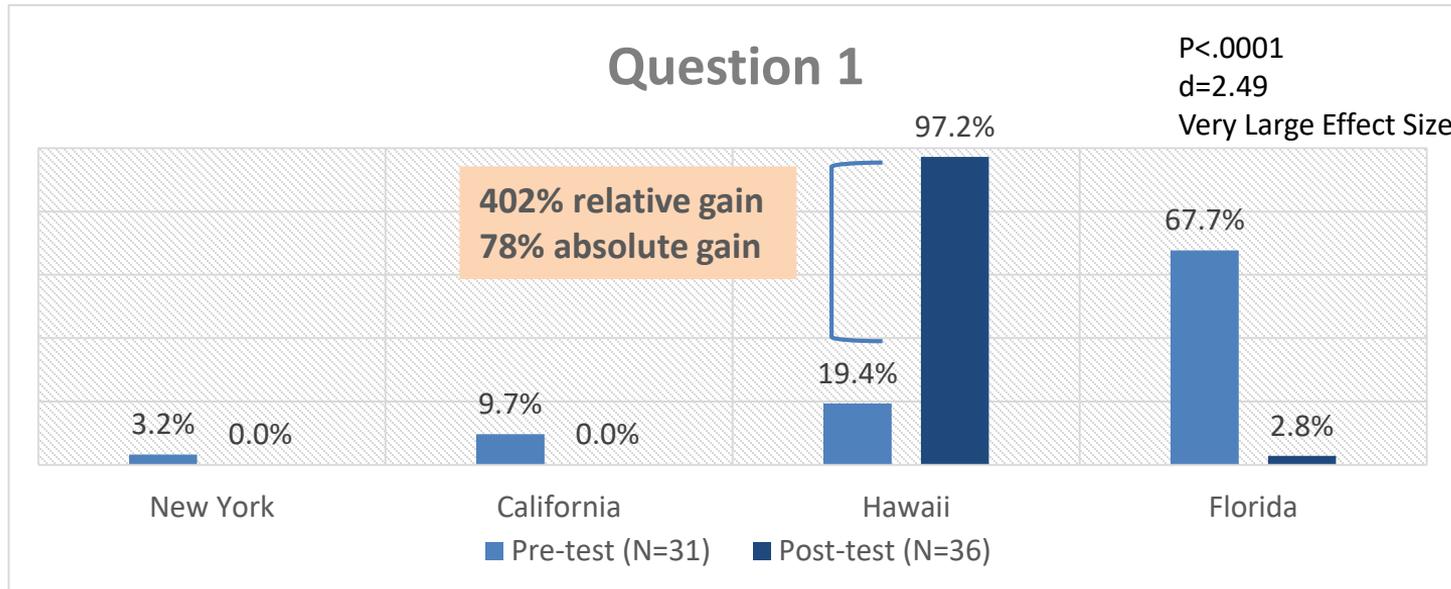
Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 2 (Pre/Post-Test)

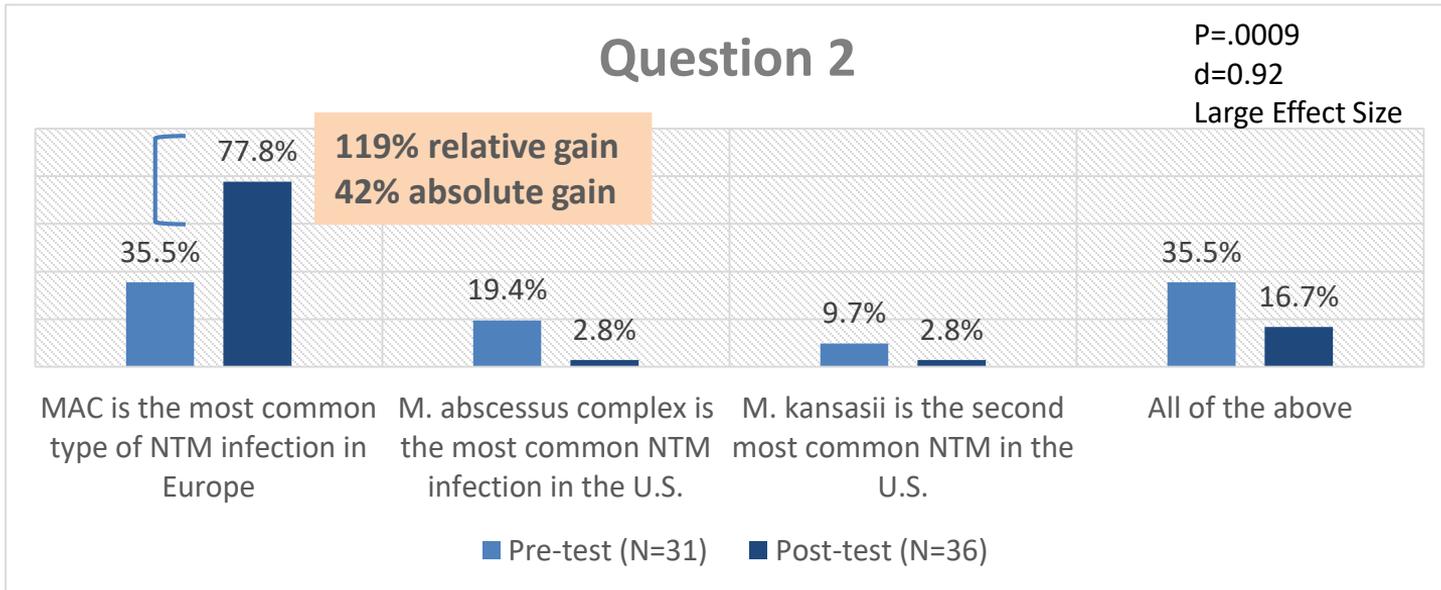**Learning Objective:** *Recognize the incidence and distribution of NTM disease*

Q2: Within the CF population, which of the following is true:

Question 2

P=.0009
d=0.92
Large Effect Size

119% relative gain
42% absolute gain

77.8%

35.5%

19.4%

9.7%

35.5%

2.8%

2.8%

16.7%

MAC is the most common type of NTM infection in Europe

M. abscessus complex is the most common NTM infection in the U.S.

M. kansasii is the second most common NTM in the U.S.

All of the above

■ Pre-test (N=31)　■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 3 (Pre/Post-Test)

Learning Objective: *Identify the clinical manifestations of NTM disease.*

Q3: All of the following are risk factors for disseminated NTM infections EXCEPT:

Question 3

P=.0009
d=0.92
Large Effect Size

132% relative gain
43% absolute gain

75.0%

32.3%

29.0%

19.4%

12.9%   5.6%

0.0%   5.6%   13.9%

6.5%

Systemic prednisone use | INF-gamma autoantibodies | Anti-IL-17 therapy | Hairy cell leukemia | Organ transplantation

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 4 (Pre/Post-Test)

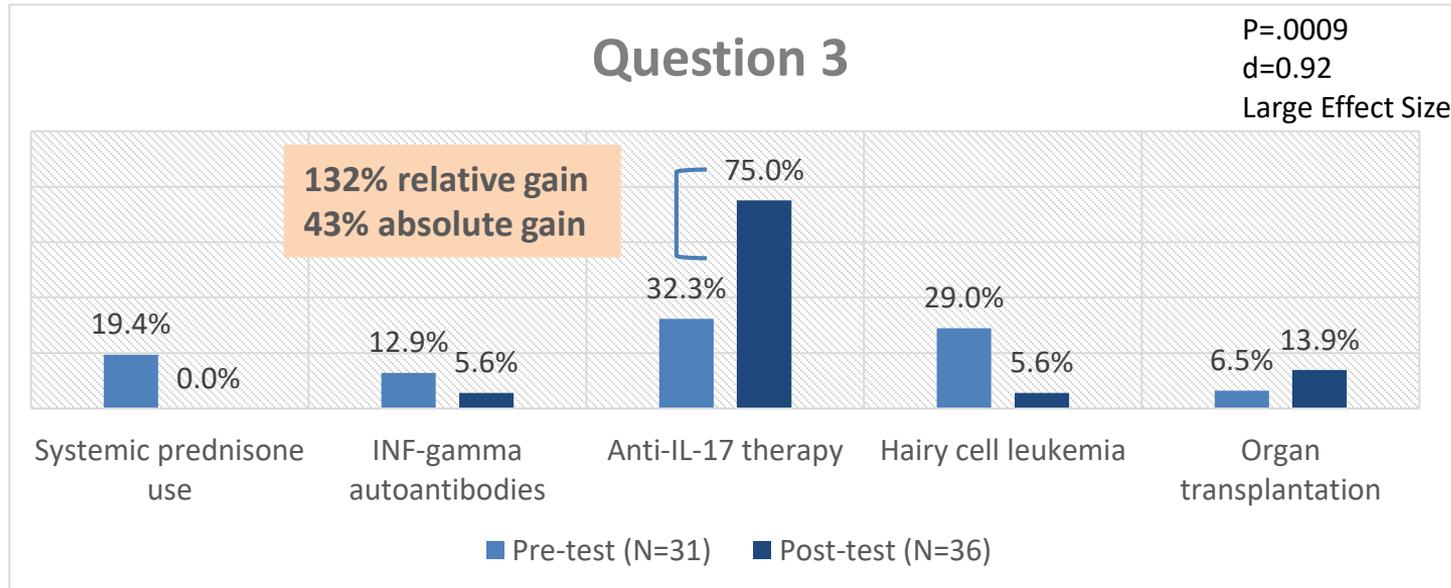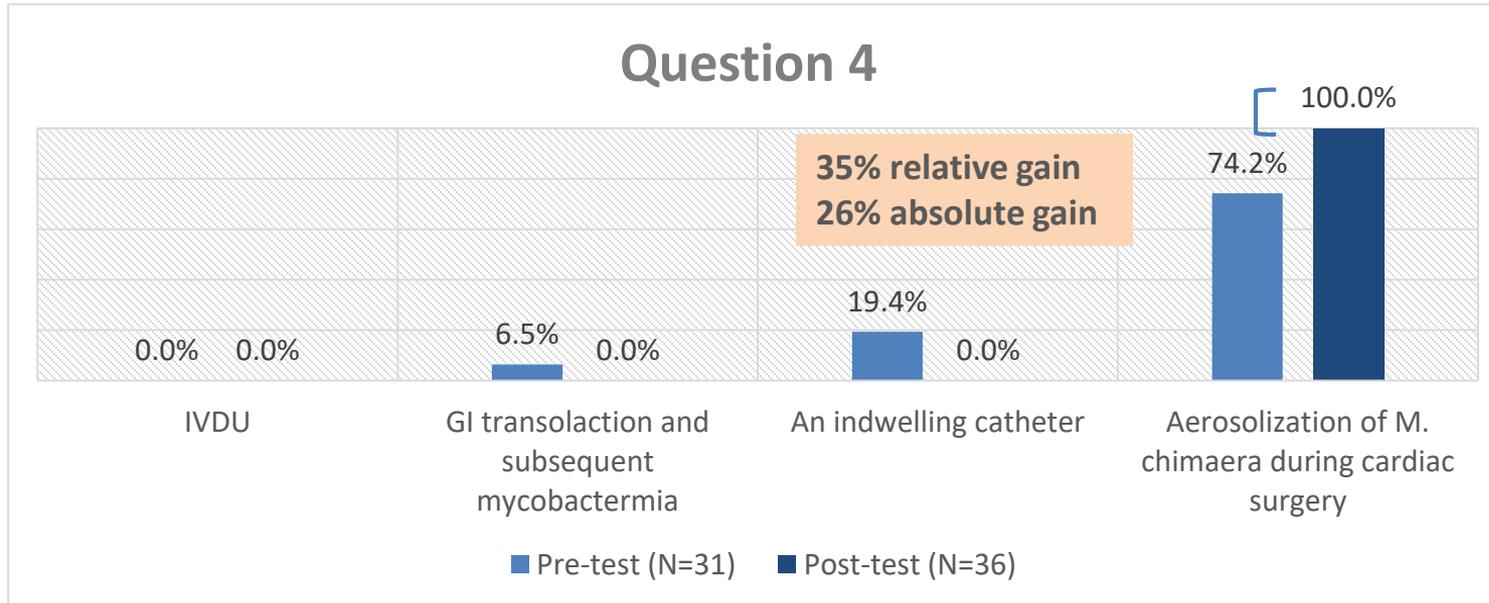**Learning Objective:** *Identify the clinical manifestations of NTM disease*

Q4: A patient with M. chiamera endocarditis most likely acquired infection from:

Question 4

- 35% relative gain
- 26% absolute gain

IVDU: Pre-test 0.0%, Post-test 0.0%
GI transolaction and subsequent mycobactermia: 6.5%, 0.0%
An indwelling catheter: 19.4%, 0.0%
Aerosolization of M. chimaera during cardiac surgery: 74.2%, 100.0%

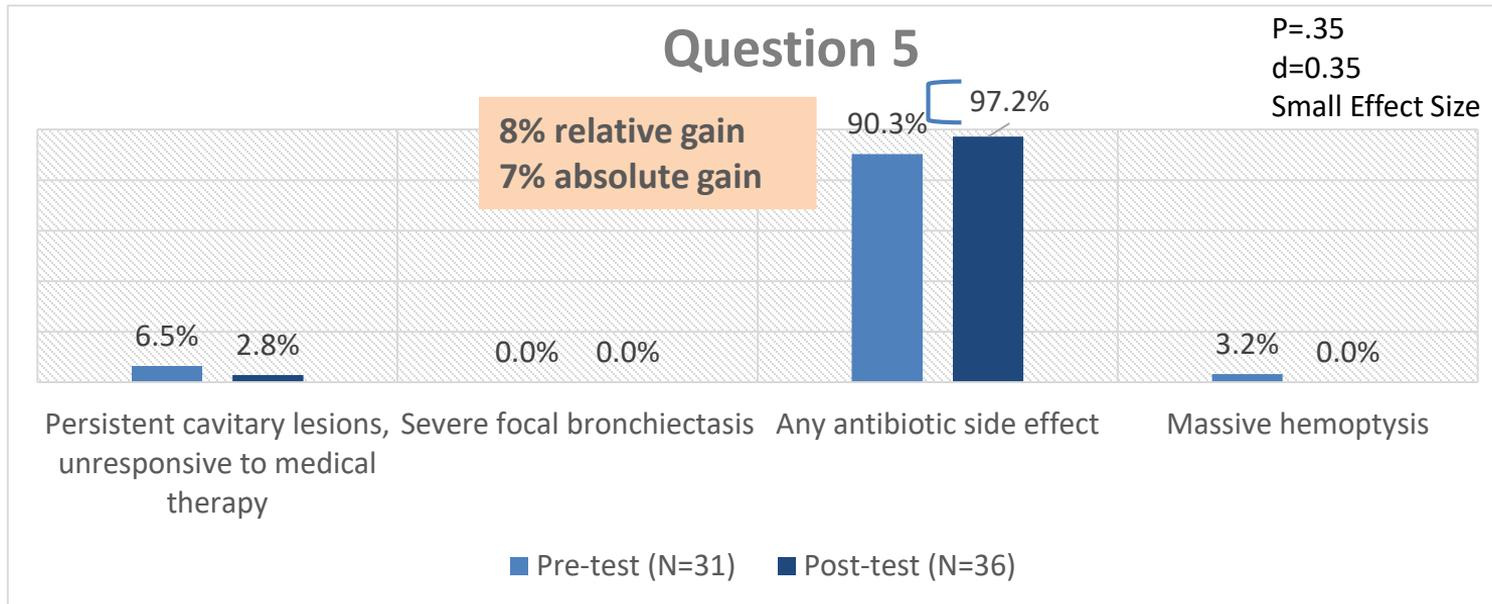■ Pre-test (N=31) ■ Post-test (N=36)

P=.0044
d=0.82
Large Effect Size

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 5 (Pre/Post-Test)

Learning Objective: *Identify the clinical manifestations of NTM disease.*

Q5: All of the following are indications for pulmonary resection in a patient with pulmonary NTM infection EXCEPT:

Question 5

P=.35
d=0.35
Small Effect Size

8% relative gain
7% absolute gain

97.2%
90.3%

6.5%   2.8%   0.0%   0.0%   3.2%   0.0%

Persistent cavitary lesions, unresponsive to medical therapy | Severe focal bronchiectasis | Any antibiotic side effect | Massive hemoptysis

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 6 (Pre/Post-Test)

Learning Objective: *Identify and differentiate the various types of NTM infections*
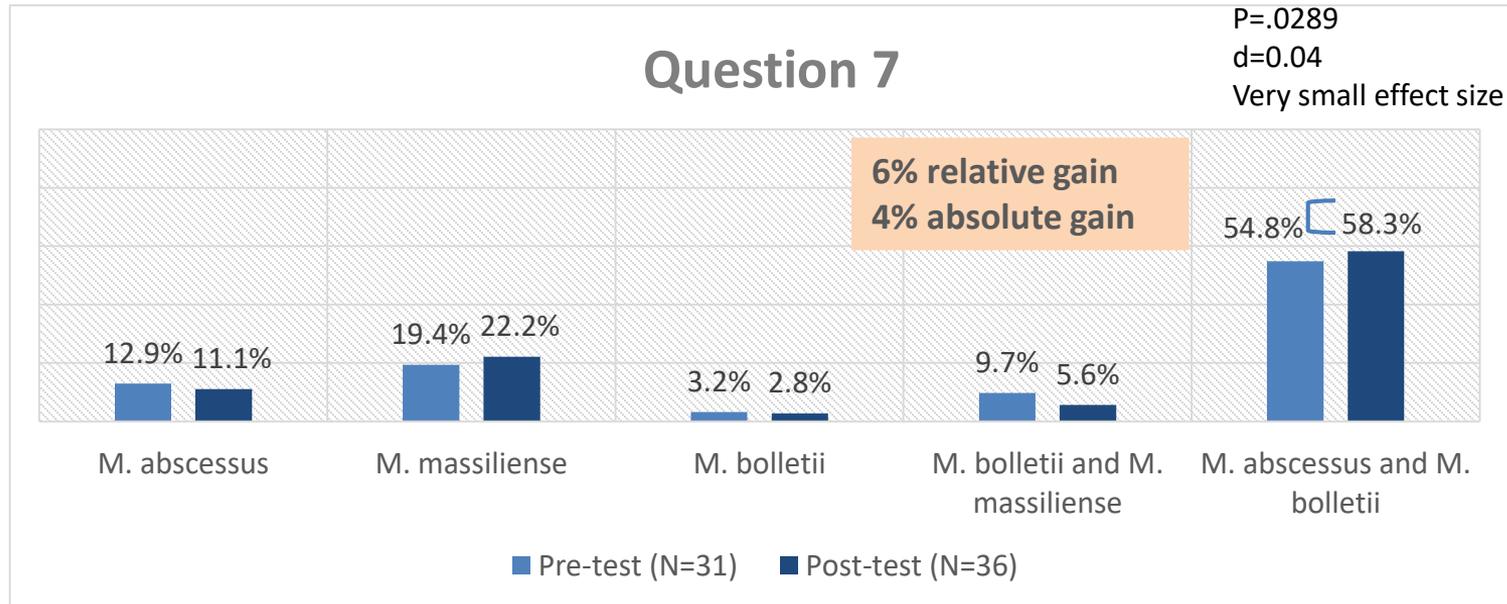
Q6: A 35-year old patient presents for the evaluation of a chronic productive cough and frequent sinopulmonary infections. She has been prescribed various antibiotics for her infections but as soon as she finishes the antibiotics, her symptoms return. High-resolution CT reveals upper-lobe predominant bronchiectasis. Which of the following tests should be performed to determine the etiology of her bronchiectasis?

Question 6

100.0% 100.0%

0.0%   0.0%   0.0%   0.0%   0.0%   0.0%

No testing is indicated as the majority of bronchiectasis cases are idiopathic.

CBC with differential, testing for ABPA, alpha-1 antitrypsin, and rheumatoid factor

CBC with differential, immunoglobulin levels, and bronchoprovocation testing

CBC with differential, immunoglobulin levels, testing for ABPA, sweat chloride, and sputum culture for bacteria and AFB.

■ Pre-test (N=31) ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 7 (Pre/Post-Test)

Learning Objective: *Identify and differentiate the various types of NTM infections.*
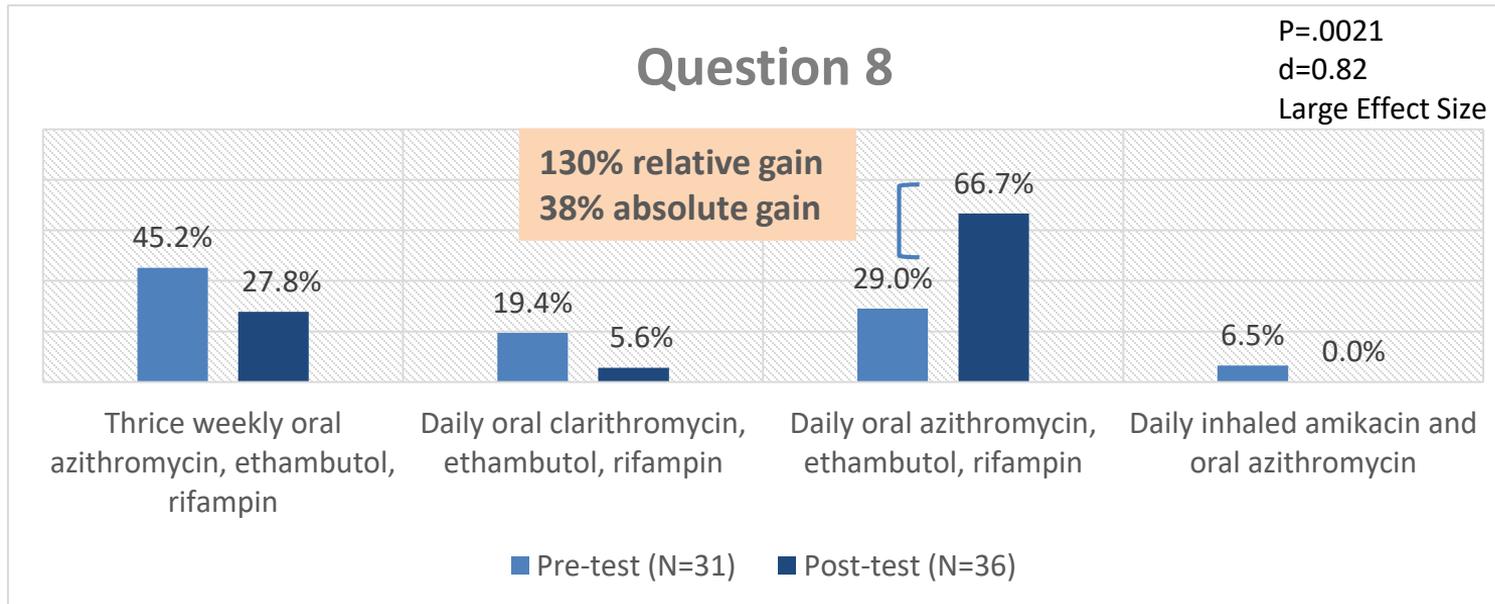
Q7: In which subspecies of the M. abscessus complex is the erm41 gene usually functional?

Question 7

P=.0289
d=0.04
Very small effect size

6% relative gain
4% absolute gain

	M. abscessus	M. massiliense	M. bolletii	M. bolletii and M. massiliense	M. abscessus and M. bolletii
Pre-test (N=31)	12.9%	19.4%	3.2%	9.7%	54.8%
Post-test (N=36)	11.1%	22.2%	2.8%	5.6%	58.3%

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 8 (Pre/Post-Test)

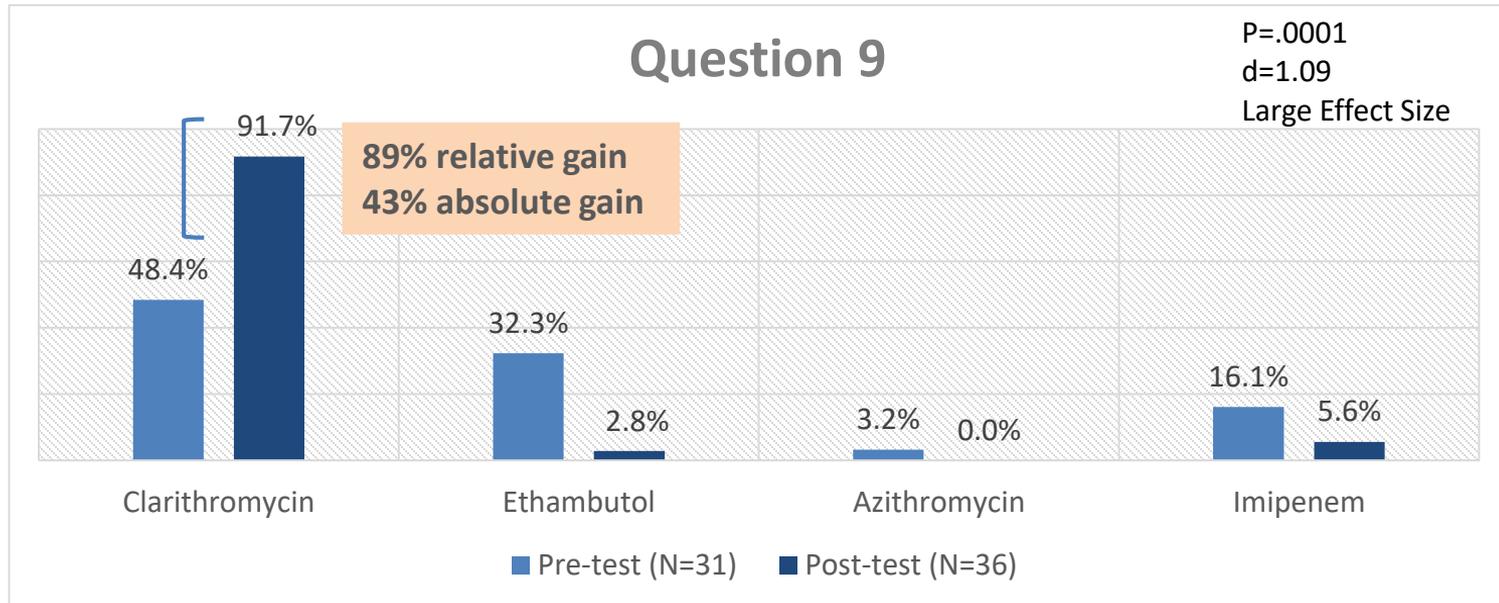**Learning Objective:** *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q8: What do the CFF/ECFS consensus guidelines recommend for first-line treatment for macrolide-susceptible, non-cavitary MAC in patients with cystic fibrosis?

Question 8

P=.0021
d=0.82
Large Effect Size

130% relative gain
38% absolute gain

- Thrice weekly oral azithromycin, ethambutol, rifampin: 45.2% / 27.8%
- Daily oral clarithromycin, ethambutol, rifampin: 19.4% / 5.6%
- Daily oral azithromycin, ethambutol, rifampin: 29.0% / 66.7%
- Daily inhaled amikacin and oral azithromycin: 6.5% / 0.0%

■ Pre-test (N=31) ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 9 (Pre/Post-Test)

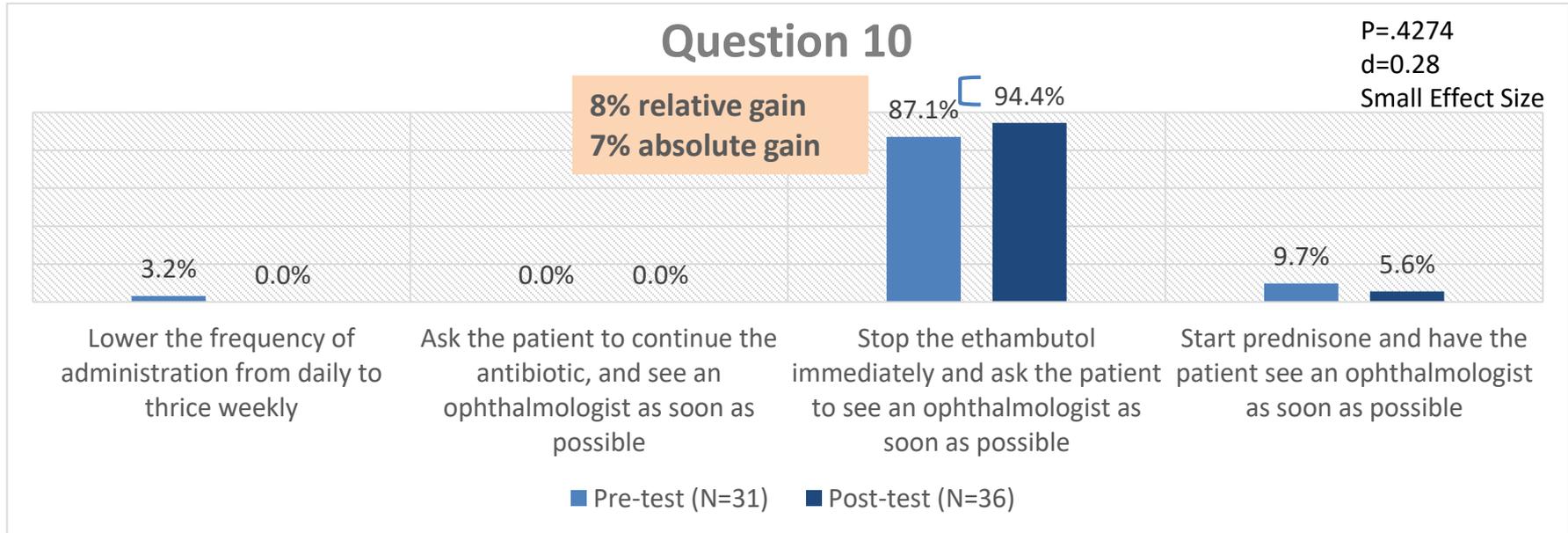**Learning Objective:** *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q9: Which medication can cause significant accumulation of rifabutin if given as part of a multidrug regimen for M. avium infection?

Question 9

P=.0001
d=1.09
Large Effect Size

91.7%

89% relative gain
43% absolute gain

48.4%

32.3%

2.8%

3.2%   0.0%

16.1%

5.6%

Clarithromycin   Ethambutol   Azithromycin   Imipenem

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 10 (Pre/Post-Test)

Learning Objective: *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q10: If you suspect ethambutol induced optic neuritis, what is your first recommendation to the patient?
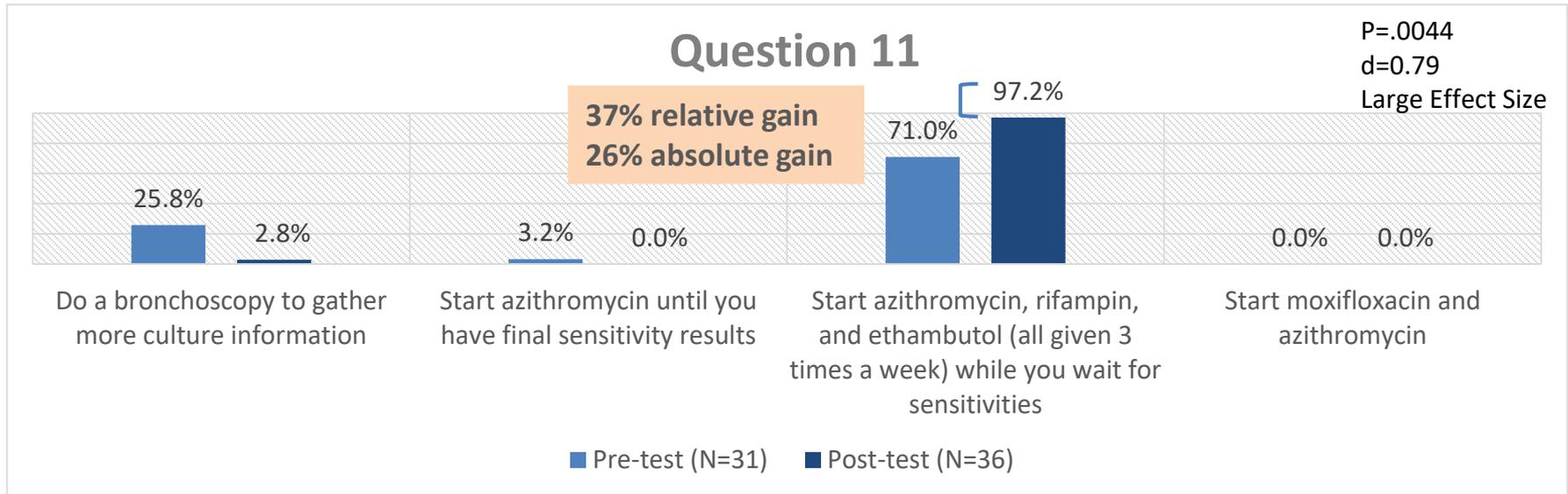

Question 10

P=.4274
d=0.28
Small Effect Size

8% relative gain
7% absolute gain

87.1% 94.4%

3.2%   0.0%   0.0%   0.0%   9.7%   5.6%

Lower the frequency of administration from daily to thrice weekly

Ask the patient to continue the antibiotic, and see an ophthalmologist as soon as possible

Stop the ethambutol immediately and ask the patient to see an ophthalmologist as soon as possible

Start prednisone and have the patient see an ophthalmologist as soon as possible

■ Pre-test (N=31) ■ Post-test (N=36)

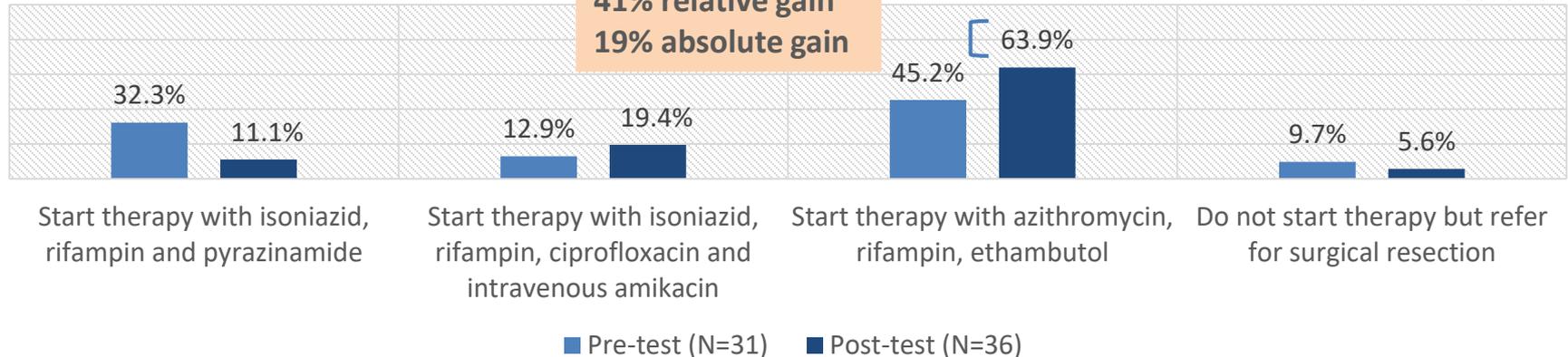# Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 11 (Pre/Post-Test)

Learning Objective: *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q11: You have an 80-year-old patient on diltiazem, insulin, and pantoprozole with newly diagnosed pulmonary non-cavitary M. avium infection based on 2 smear negative/ culture positive sputums with moderate cough and fatigue. The CT scan shows only tree-in-bud changes. What diagnosis/treatment is most appropriate at this time?

Question 11

P=.0044
d=0.79
Large Effect Size

37% relative gain
26% absolute gain

97.2%

71.0%

25.8%

2.8%

3.2%

0.0%

0.0%

0.0%

Do a bronchoscopy to gather more culture information

Start azithromycin until you have final sensitivity results

Start azithromycin, rifampin, and ethambutol (all given 3 times a week) while you wait for sensitivities
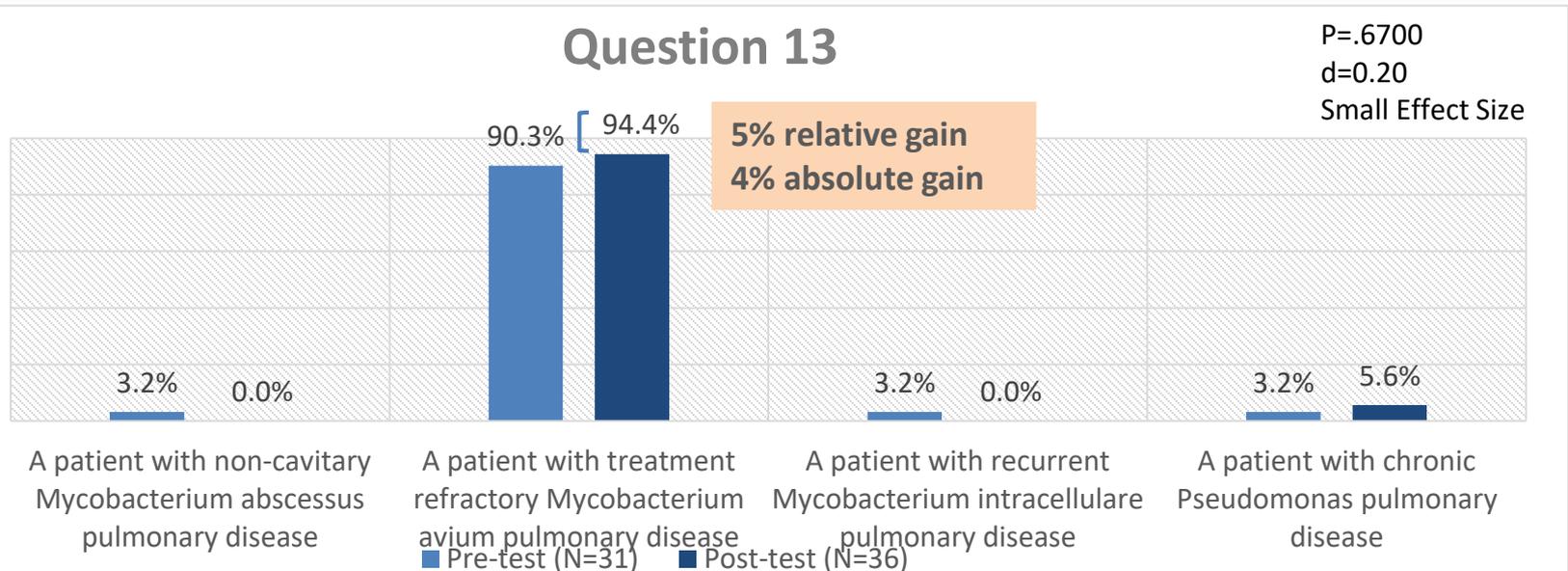
Start moxifloxacin and azithromycin

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 12 (Pre/Post-Test)

Learning Objective: *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q12: A 70 year old man grows Mycobacterium kansasii from three out of three sputum specimens. Chest CT scan shows evidence of fibrocavitary changes in the left upper lobe and areas of emphysema. The patient complains of shortness of breath and some weight loss but minimal cough. Which of the following is the most appropriate next step?

Question 12

P=.1563
d=0.38
Small Effect Size

41% relative gain
19% absolute gain

	Pre-test (N=31)	Post-test (N=36)
Start therapy with isoniazid, rifampin and pyrazinamide	32.3%	11.1%
Start therapy with isoniazid, rifampin, ciprofloxacin and intravenous amikacin	12.9%	19.4%
Start therapy with azithromycin, rifampin, ethambutol	45.2%	63.9%
Do not start therapy but refer for surgical resection	9.7%	5.6%

Level 3&4 Outcomes: Learning (Knowledge/Competence) Assessment: Question 13 (Pre/Post-Test)

Learning Objective: *Describe the guidelines for the diagnosis and treatment of NTM infections.*

Q13: Amikacin liposome inhaled suspension is approved by the Federal Drug Administration (FDA) for treatment of which of the following patients?

Question 13

P=.6700
d=0.20
Small Effect Size

90.3%   94.4%

5% relative gain
4% absolute gain

3.2%   0.0%   3.2%   0.0%   3.2%   5.6%

A patient with non-cavitary Mycobacterium abscessus pulmonary disease

A patient with treatment refractory Mycobacterium avium pulmonary disease

A patient with recurrent Mycobacterium intracellulare pulmonary disease

A patient with chronic Pseudomonas pulmonary disease

■ Pre-test (N=31)   ■ Post-test (N=36)

Level 4 Outcomes: Competence and Learner Feedback

97%

Learners intend to make changes to practice as a result of the activity

- Screen immune compromised patients more for NTM infections
- More emphasis on airway clearance
- More use of inhaled amikacin
- Establishing better sputum induction in clinic
- Check drug interactions thoroughly
- Monitor patients for longer duration
- Increase sputum induction rather than going to bronchoscopy
- Ask for changes to identification at subspecies level of MAC in micro lab
- Teaching patients airway clearance and medication use
- Use of proper diagnostics
- Use colony count from AFB culture as one of the data to treat or not to treat
- Sub-typing if possible of MAC on sputum inductions
- Post treatment sputum surveillance

100% Learners indicated content presented was evidence-based and clinically relevant

97% Learners indicated material was presented in an objective manner & free of commercial bias

Level 5 Outcomes: Performance (Follow-up Survey)

46%

Learners reported that they had made changes to their practice

Changes made to practice:

- Post treatment sputum AFB follow-up, more aggressive treatment with Imipenem, Amikacin
- Requesting sputum cultures rather than brunch cultures. Asking lab to further ID MAC. More discussion about potential source of MAC
- Discuss with my patients now the importance of airway clearance techniques
- Management of side effects of medications; approach to multi drug resistant NTM's

47%

Learners reported that they planned to make changes to their practice

Learner Feedback

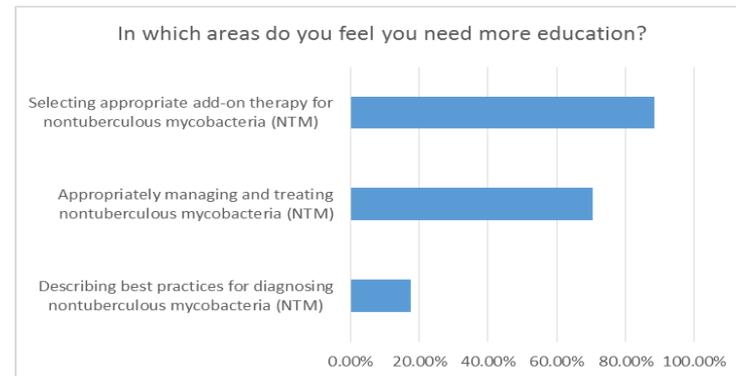| Most important thing providers think patients diagnosed with NTM should know	Biggest challenge for patients with NTM as it relates to coping with their illness
• It is manageable and they will improve with treatment • Treatment will be prolonged but good chance of being cured • Address expectations of treatment and drug side effects • Multiple options for treatment so be open-minded • Prognosis and integrated care • Resources for patients • Chronicity and recurrence of disease • Airway clearance • Knowledge of the nature of the disease	• Long time to treat • Few providers comfortable with care • Cough and feeling bad despite appearance • Chronicity of symptoms and burden of treatment • Understanding the "why me" question • Lack of understanding of prognosis • Fatigue • Long-term antibiotic use and side effects • Social stigma • Recurrence/relapse • Maintaining good airway clearance • Anxiety • Social isolation • Weight loss • Effects on quality of life

Learner Feedback

Course Strengths

- It was an excellent course and provided information on approach to diagnostics and treatment
- Fantastic wealth of knowledge and experience of speakers
- Presenters specified evidence-based & expert opinion on treatment strategies when relevant
- Expert clinicians as lecturers, liked the smaller group of attendees and length of course
- Course is well designed which included interactive session and case discussions
- The ability to have case-based discussions and hear practice patterns from experts in the field
- Very comprehensive overview of key aspects of NTM infections
- Excellent educators with years of experience
- Strong faculty and quality time to ask questions

Recommendations for Future Education

- Extra pulmonary NTM (e.g. orthopedic)
- More information about use of culture data, particularly interpretation of reported antimicrobial susceptibilities for specific NTM species
- More topics with high relevance to patient and management of challenging cases.

In which areas do you feel you need more education?

Selecting appropriate add-on therapy for nontuberculous mycobacteria (NTM)

Appropriately managing and treating nontuberculous mycobacteria (NTM)

Describing best practices for diagnosing nontuberculous mycobacteria (NTM)

0.00%   20.00%   40.00%   60.00%   80.00%   100.00%

Accreditation

NJH is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. The NJH Office of Professional Education produced and accredited this program and adhered to the updated ACCME guidelines.

NJH designates the live symposia for a maximum of 13.5 *AMA PRA Category 1 Credits*™ and 16.5 CBRN nursing contact hours.
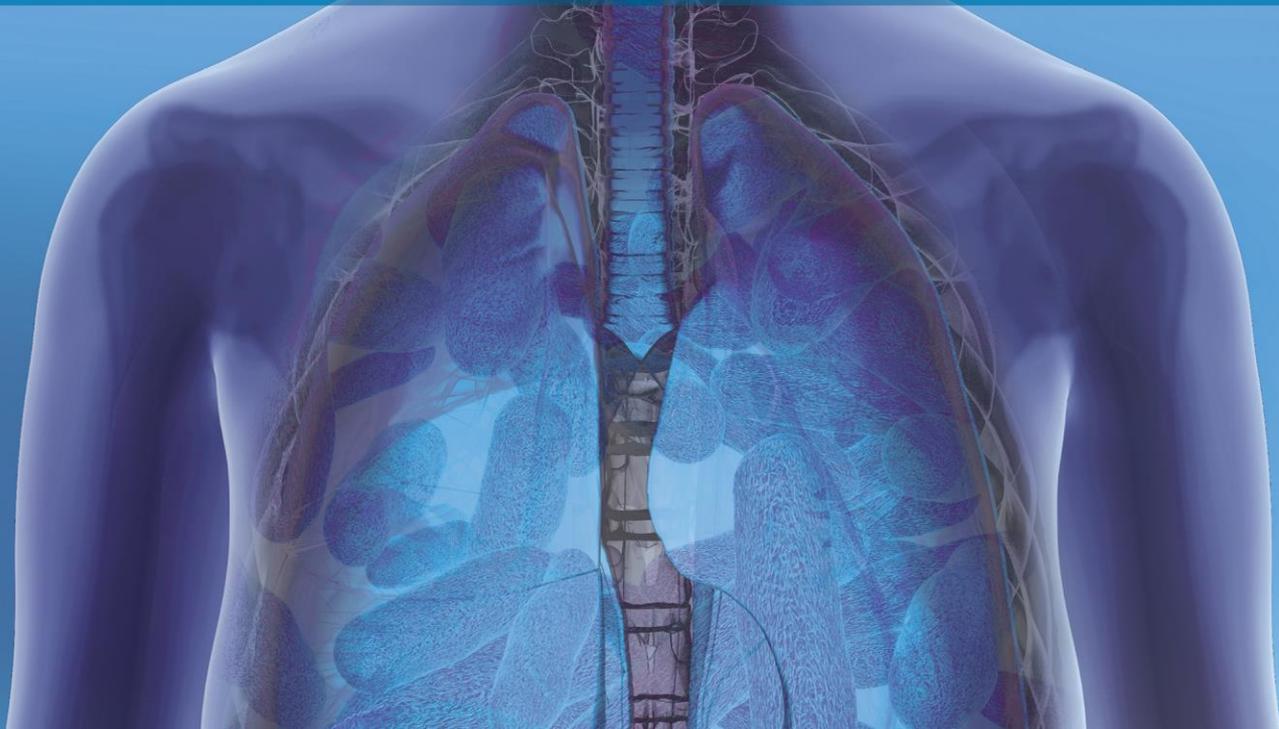
Executive Summary: Activity Details

This program is an annual, innovative one-day conference for patients and their families featuring key opinion leaders from across the U.S. leading lectures and panel discussions. Topics for the patient session include overview of NTM/bronchiectasis, update on patient resources, nutrition guidelines, treatment of NTM, mycobacteria, management of side effects, coping and caring, how to feel better, overview of GERD, and surgical approach.
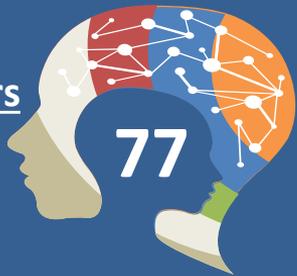
Features included:

✓Panel discussion
✓Handouts

NTM Lecture Series for Patients: Dashboard

Total Learners

77

94% indicated the conference addressed topics important to them

- "I found this informative and enjoyable"
- "Thank you for providing this opportunity to meet so many of the health care providers and the information provided"
- "Thank you for being a leader in this field. We need the support and broad base of knowledge"
- "Education reduces anxiety"
- "It was so well done"
- "It was a good conference with great and knowledgeable speakers"

97% indicated that they liked the conference format (lectures and panel)

85%

Indicated it was important to talk with other patients

94%

Indicated it was important to talk with HCPs

Most important take-away from this activity

- Better understanding of what my future outlook will be
- Others that are affected by NTM have the same concerns as me
- Studies and research in process
- Clear definitions and printed materials to review
- Better understanding of GERD and bronchiectasis
- Greater understanding of the disease as a whole (negative culture, recurrence)
- Treatment options
- Species of NTM and where they live
- Need to be more diligent with airway clearance
- Combat my illness with a positive attitude
- Continue good nutrition habits
- Education is power
- Different types of medications & side effects

Most significant challenges patients report facing related to their illness

- Fear of the future
- Airway clearance
- Damage from side effects
- Stamina, breathing, mucous
- Fatigue, sputum after eating
- Impact on lifestyle and wellness
- Time management of medications
- Chronic cough
- Limitations on exercising
- Intermittent aspiration at night
- Hearing loss
- Reinfection
- Loss of "spirit"

Education patients report wishing they received when first diagnosed

- Standards to begin antibiotic treatment
- Available resources for patients
- More detail about prognosis
- Explanation on why lifestyle needed to be changed
- Expectations for the duration of diagnose and determine treatment plan
- The need for cardio workouts and breathing treatments
- Discuss the bronchiectasis aspect

The NTM Lecture Series for Patients and Families was also recorded to reach a further audience of individuals who were unable to attend.

The webpage for the recordings launched on October 25, 2019

https://www.nationaljewish.org/ntmpatientvideos

Nontuberculous Mycobacteria (NTM) Lecture Series For Patients and Families

The NTM Lecture Series for Patients and Families was held in Denver on September 21, 2019. Please click on the image or title of each session that you would like to view.

Update on Patient Resources
Amy Leitman, JD

Overview of NTM and Bronchiectasis
Pamela J. McShane, MD

Overview of GERD
Jeffrey King, MD

Treatment of NTM
Charles Daley, MD

Management of Side Effects/Toxicity
Gwen Huitt, MD

Nutrition Guidelines
Michelle MacDonald, MS, RD, CNE

Surrounded by Mycobacteria
Jennifer Honda, PhD

When Antibiotics are not Enough: A Surgical Approach
Gwen Huitt, MD

Coping and Caring
Kristen Holm, PhD

What Can I Do to Feel Better?
Cheryl Torres, RRT

Thank you for your support of this educational program!