Idiopathic Pulmonary Fibrosis:
Making Sense of Diagnostic and Therapeutic Options in Primary Care

A NACE Program
Final Live Outcomes Report
Grant ID: ME201621437

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Executive Summary

Outcomes at Moore's Level 1-5

Clinical Updates for Nurse Practitioners and Physician Assistants

6th Annual Live Symposia Series - 2016

93% of Attendees are Engaged in Direct Patient Care

708
Total Attendees

4 Cities

409
On Site

299
Remote Simulcast

City	Date
Charlotte NC	Oct 29, 2016
Columbia SC*	Nov, 11, 2016
White Plains NY	Nov 12, 2016
Seattle WA	Nov 19, 2016

*Simulcast and Live Conference

Outcome Indicator (matched learners only)	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change
Knowledge	23.44% (38.82)	92.50% (23.92)	**295.00%***
Competence	86.11% (34.74)	94.44% (23.01)	**9.67%***
Confidence	1.51 (0.70)	3.14 (1.05)	**41.72%***
Practice Strategy**	3.11 (1.30)	4.45 (0.81)	**43.09%***
RealIndex**	63.15% (31.84)	87.81% (21.60)	**39.05%***

Learning Objective	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
1. Implement an appropriate strategy for diagnosing a patient with idiopathic pulmonary fibrosis.	33.73% (47.57)	95.18% (21.55)	**182.18%**	< .0005
2. Discuss and contrast the available pharmacotherapeutic options for patients with IPF.	14.93% (35.90)	89.55% (30.81)	**500.00%**	< .0005
3. Describe the non-pharmacotherapeutic options for IPF patients.	14.93% (35.90)	89.55% (30.81)	**500.00%**	< .0005
4. Establish the clear role for the primary care clinician in diagnosing and managing disease in IPF patients	86.11% (34.74)	94.44% (23.01)	**9.67%**	< .05

Data Interpretation

Significant improvement occurred in the following areas:

- Recognizing the appropriate diagnostic strategy for a patient with idiopathic pulmonary fibrosis
- The role of High-resolution CT
- Understanding of available pharmacologic and non-pharmacotherapeutic treatment options
- The role of primary care in managing patients with IPF

Significant gaps remain concerning the selection of appropriate pharmacotherapeutic treatments.

Implications for Future Education

Closing the identified gaps can be accomplished by:

- Focusing content on improving knowledge and competency around pharmacological and non-pharmacologic therapy selection.
- Education that improves practice behaviors related to the use of appropriate diagnostic tools.

Future Education Design

- Program design to close gaps might incorporate case-based activities emphasizing diagnostic protocol and imaging for patients with IPF.
- Education focused on appropriate therapy(ies) for treating IPF.
- Engaging learners in serial reinforcement will address low confidence concerning diagnosis and treatment of IPF and lack of retention at follow-up.

Curriculum Overview

- Accredited Live Regional Symposia, Launch Date: October 29, 2016 through November 29, 2016
  - The live symposia was held in 4 cities.
- Non-Accredited "Clinical Highlights" - The program content was reinforced to participants with a document containing key teaching points from the program and is distributed 1 week after each meeting.
- Enduring Symposium Monograph, Launch Date: January 23, 2017 End Date: January 22, 2018
  - http://naceonline.com/CME-Courses/course_info.php?course_id=804

Faculty

Fernando Martinez, MD, MS
Executive Vice Chair of Medicine
Weill Cornell Medical Center
New York, NY

Franck Rahaghi, MD, MHS, FCCP
Director, Pulmonary Hypertension Clinic
Director, Pulmonary Education and Rehabilitation
Cleveland Clinic Florida
Weston, FL

Ganesh Raghu, MD
Professor of Medicine and Laboratory Medicine
Director, Center for Interstitial Lung Diseases
Co-Director, Scleroderma Lung Clinic
University of Washington School of Medicine
Seattle, WA

Course Accreditation

National Association for Continuing Education is approved as a provider of nurse practitioner continuing education by the American Association of Nurse Practitioners. AANP Provider Number 121222. This program has been approved for 7 contact hours of continuing education (which includes 3.25 pharmacology hours).

Commercial Support

The Clinical Updates for Nurse Practitioners and Physician Assistants 2016 series of CME activities were supported through educational grants or donations from the following companies: Allergan, Boehringer Ingelheim Pharmaceuticals, Inc., BioReference, An OPKO Company, Gilead, Grifols, Novartis Pharmaceuticals, Prometheus, and Sanofi US

Cities and Dates

Clinical Updates for Nurse Practitioners and Physician Assistants: 2016

Charlotte, North Carolina
Oct 29, 2016

Columbia, SC*
Nov, 11, 2016

White Plains, New York
Nov 12, 2016

Seattle, Washington
Nov 19, 2016

*Simulcast and Live Location

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Learning Objectives:

1. Implement an appropriate strategy for diagnosing a patient with idiopathic pulmonary fibrosis
2. Discuss and contrast the available pharmacotherapeutic options for patients with IPF
3. Describe the non-pharmacotherapeutic options for IPF patients
4. Establish the clear role for the primary care clinician in diagnosing and managing disease in IPF patients

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10	**Curriculum Summary of Results**	• Summary of Curriculum Findings

Outcomes Assessment Methodology

ACTIVITY OUTCOMES PROTOCOL

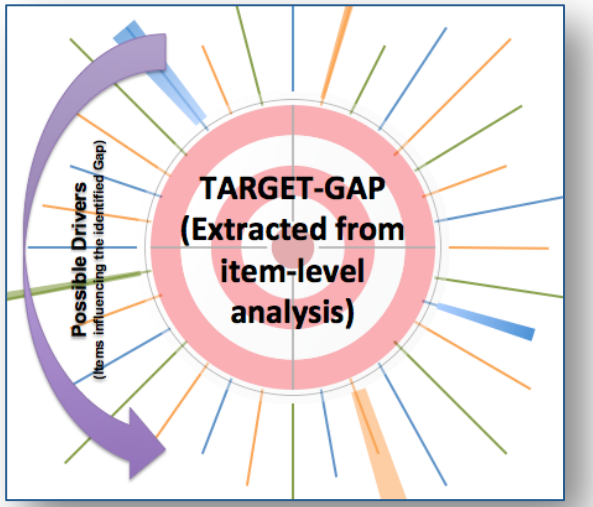
- Data collection:
  - Paired **Pre- and Post-Test** questions
  - **Demographic** questions
  - Learner **Challenge** questions
- Employs **Knowledge, Competence, Confidence**, and **practice strategy** question types
- Appropriate statistics applied to assess change across learning domains

PREDICTIVE MODELING PROTOCOL

- Establish a **Target-Gap composite score**
- ALL Post-Test items and demographic variables make-up possible **drivers**
- Algorithms narrow down most important drivers influencing the Target-Gap to be addressed in future content

CURRICULUM OUTCOMES PROTOCOL

- Assess Moore's Levels 1–5
- **Learning objective** analysis
- **Longitudinal** analysis following learner scores over monthly intervals (e.g., learning objectives, domains, repeated measure)
- Multi-dimensional **repeated-measure** (Level 5):
  - Prior to activity/after completion of each activity
  - Post-curriculum assessment survey



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RealMeasure® Outcomes Assessment Methodology

The methodology utilized by RealCME, known as RealMeasure ®, utilizes a sophisticated approach to measuring impact on the intended learner cohorts, analyzing pre/post and 4-week follow-up learner data in concert with a curriculum-based, multidimensional, index-based metric that serves as a surrogate marker for performance (the RealIndex). These analyses include paired-samples t-tests, correlations, non-parametric testing, as well as opportunities for advanced analytics.

RealIndex

An **objective** metric (scored from 0% - 100%) that serves as a surrogate measure of performance.

The RealIndex has been validated against EHR data over the past 7 years, producing consistently high alphas of (0.8-0.9) having been assessed on over 200 curricula thus confirming it as a valid and reliable surrogate performance metric.

Knowledge & Competence

Objective assessments that are scored on a scale of 0%-100%.

These metrics measure evidenced-based knowledge, application of best clinical practice (s); as well as interpretation and application of clinical trial data to current practice.

Confidence & Practice Strategy

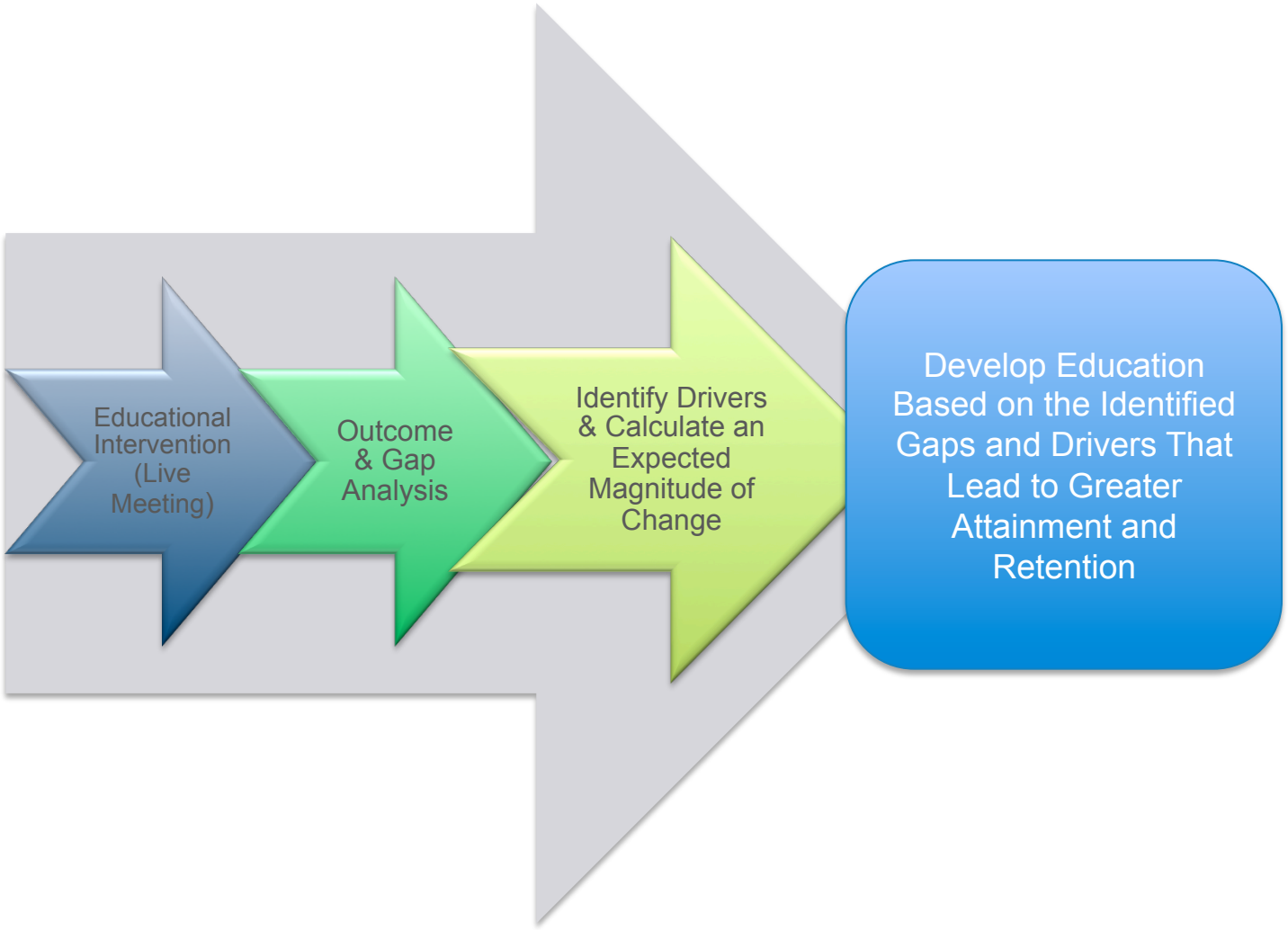
Subjective assessments measured on a 5-point Likert scale. The learner provides ratings for their confidence and current practice strategy.

These assessments are correlated with the scored (objective) metrics to provide additional statistical support to any identified gaps or areas of mastery.

PredictiveModeling

Predictive modeling was employed following the live meetings to identify the significant drivers that can be used to address additional educational needs of learners, Post-Test.

This approach enables educators to develop interventions that are more robust; leading to greater attainment and better retention.



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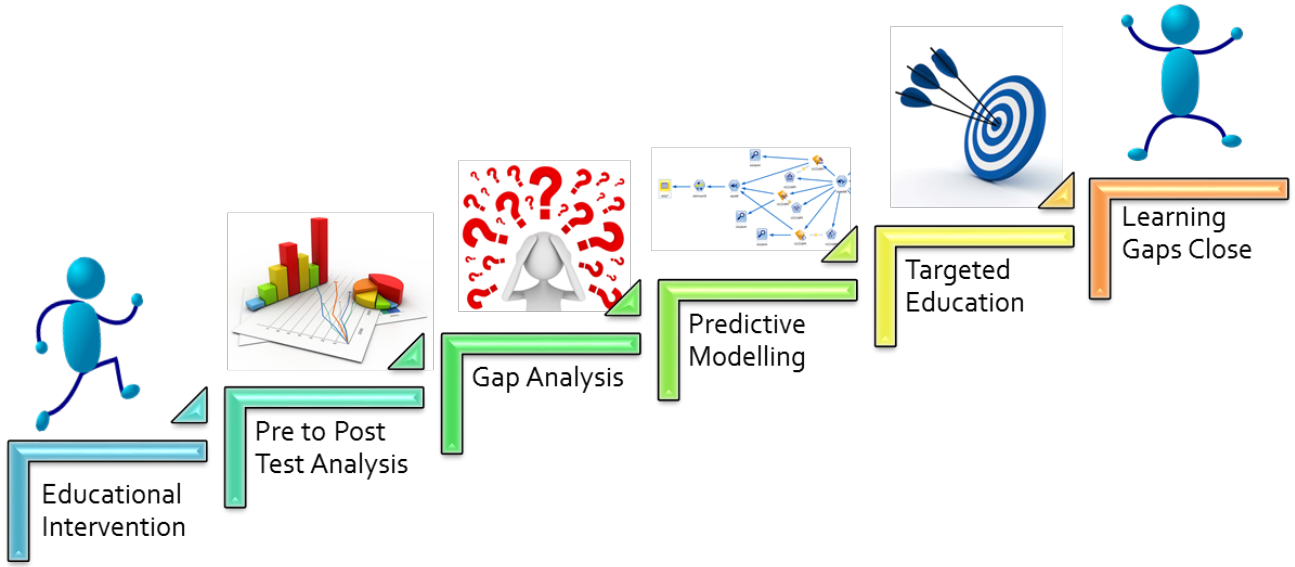
What benefits does predictive modeling offer?

Gap analysis COMBINED with predictive modeling *enables* educators to go beyond identifying areas of additional educational need. Predictive modeling precisely guides educators in developing more robust educational programs that are targeted to learners' deficits based upon learners' prior performance rather than educated guesswork.

By examining learner strengths and weaknesses statistically, a profile of what contributes to high educational attainment, as well as areas where key deficits remain, can be derived. This profile will provide key indicators for what subject matter should be emphasized, as well as who might benefit most from these educational initiatives.

Not only that, the predictive model can be used to determine how effective future education will be; enabling educators to put their resources to best use.



Executive Summary
Outcomes at Moore's Levels 1-5

Level 1 (Participation):

Live Meeting Location (Date)	Attendees	Started Pre-Test	Started Post-Test	% Completed	Simulcast
Charlotte, NC (Oct 29, 2016)	101	82	86	**95.34%**	-
Columbia, SC (Nov, 11, 2016)	65	54	57	**94.73%**	299
White Plains, NY (Nov 12, 2016)	146	103	131	**78.63%**	-
Seattle, WA (Nov 19, 2016)	97	71	79	**89.87%**	-
Total Learners to Date:	**409**	**310**	**353**	**87.81%**	**708**

Level 2 (Satisfaction): Participants' comments and self-reports reflect a high level of satisfaction with the curriculum and indicate that the content was relevant to their practice.

Levels 3-5 (Knowledge, Competence, Confidence, and Performance): Statistically significant gains were measured from Pre-Test across the program, in all learning domains.

Outcome Indicator (matched learners only)	**Pre-Test Avg. Score (SDS)**	**Post-Test Avg. Score (SDS)**	**% Change**
Knowledge	23.44% (38.82)	92.50% (23.92)	**295.00%***
Competence	86.11% (34.74)	94.44% (23.01)	**9.67%***
Confidence	1.51 (0.70)	3.14 (1.05)	**41.72%***
Practice Strategy**	3.11 (1.30)	4.45 (0.81)	**43.09%***
RealIndex**	63.15% (31.84)	87.81% (21.60)	**39.05%***

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* Results are statistically significant $p < .05$;**Performance metric

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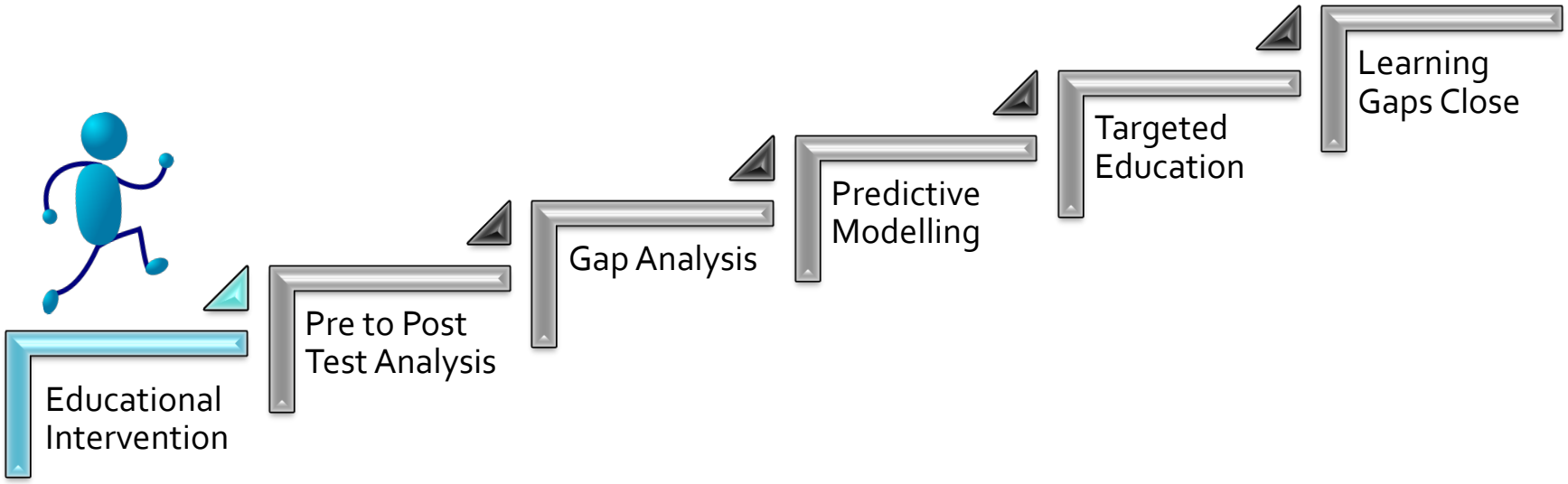
Level 2: Satisfaction

- 99% rated the activity as excellent
- 100% indicated the activity improved their knowledge
- 99% stated that they learned new and useful strategies for patient care
- 99% said they would implement new strategies that they learned in their practice
- 100% said the program was fair-balanced and unbiased

Level 1: Demographics



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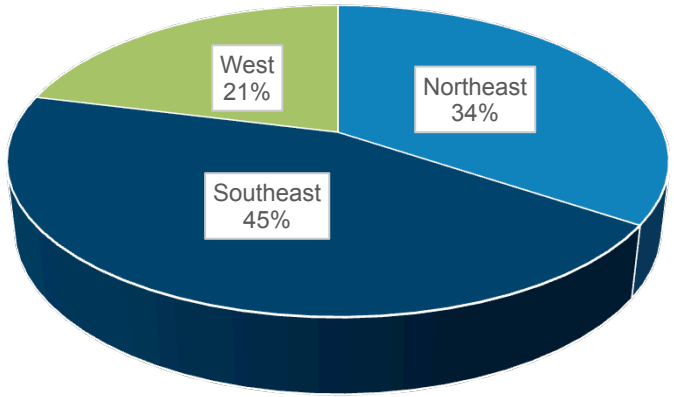
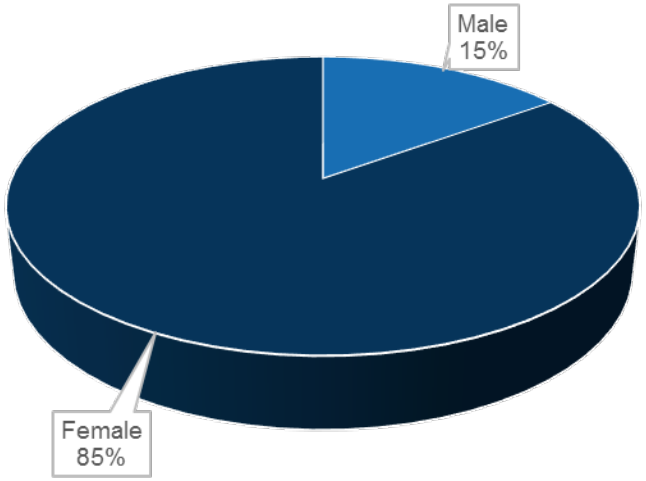
Level 1: Participation – Demographics

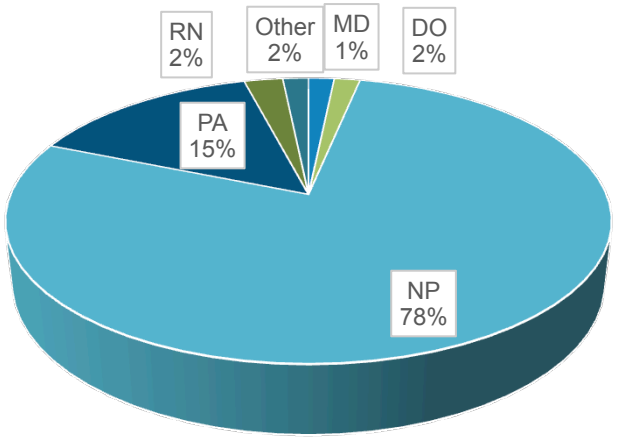
Region



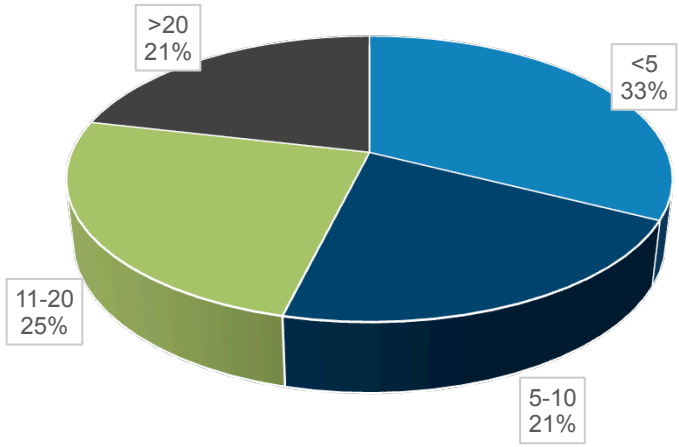
Gender



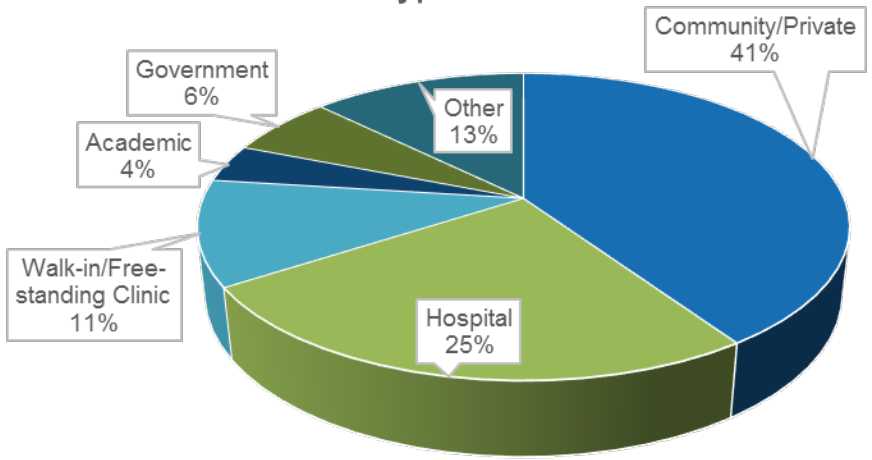
Profession



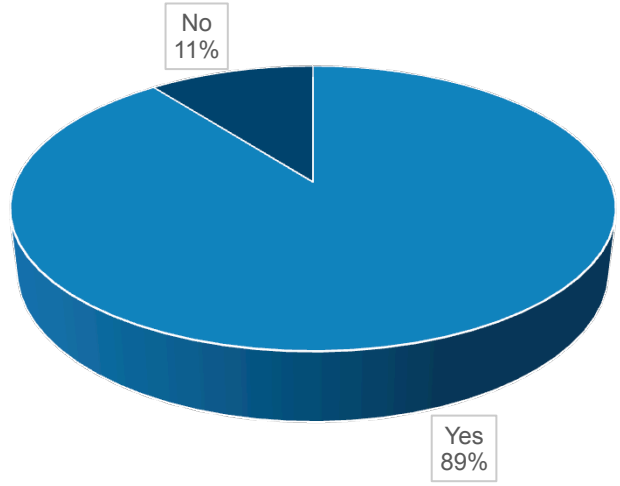
Yrs in Practice



Type of Practice



Practice Devoted to Patient Care



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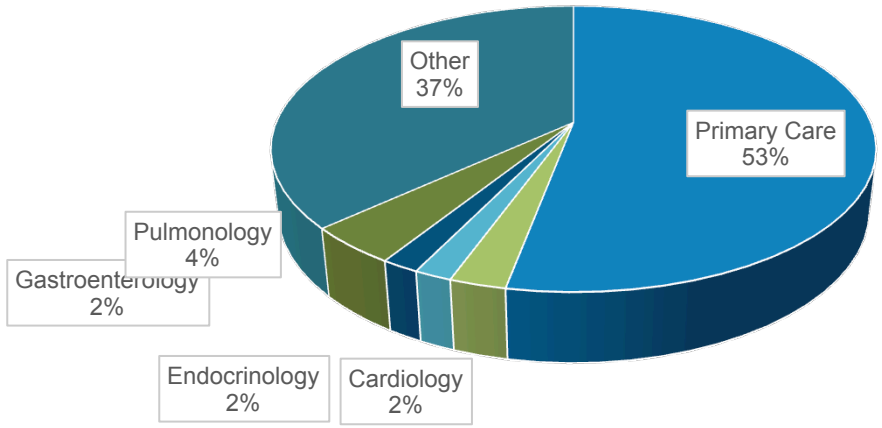
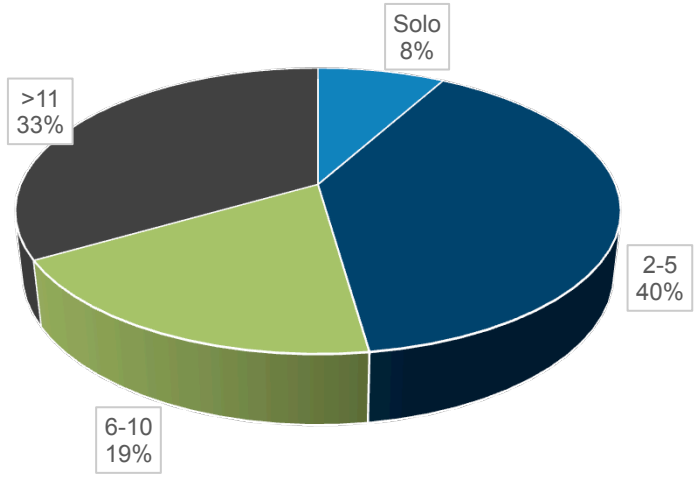
Level 1: Participation – Demographics

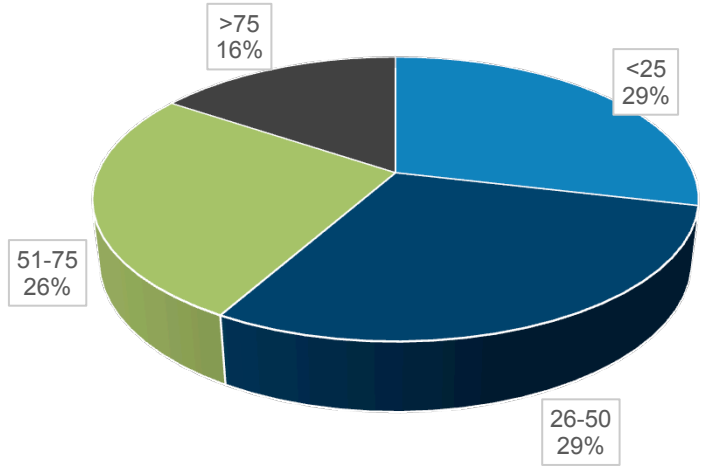
Specialty



Number of Providers



Number of Pts Seen Per Wk



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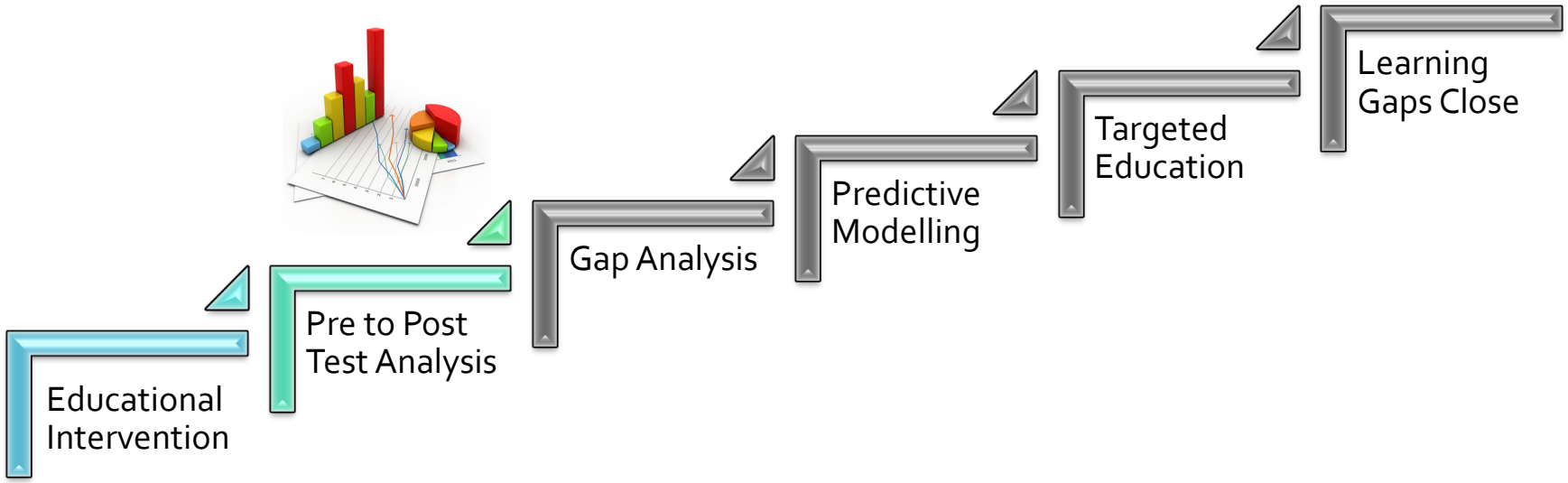
Levels 3-5: Outcomes Metrics



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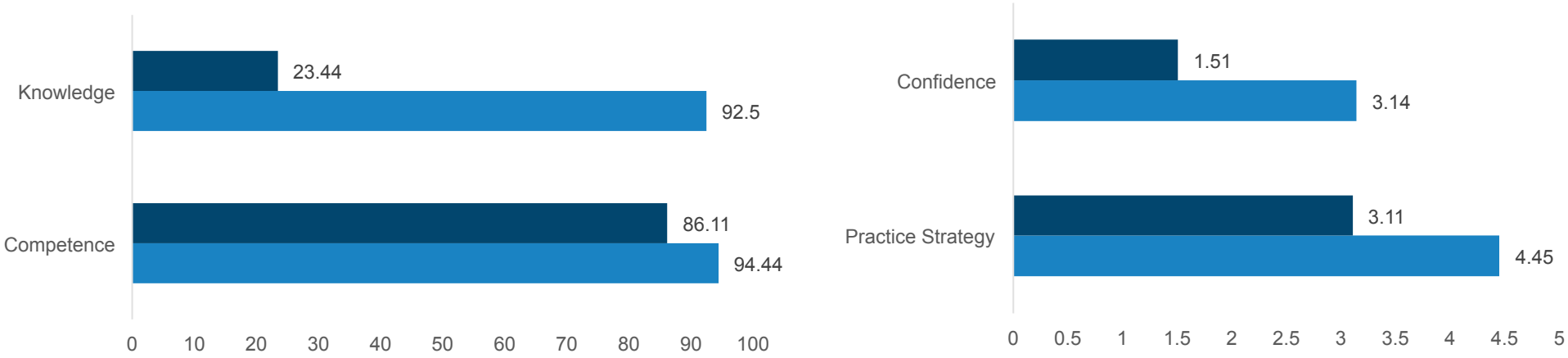
Levels 3-4 - Learning Domain Summary

SDS = Standard Deviation Score

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	23.44% (38.82)	92.50% (23.92)	**295.00%**	< .0005
Competence	86.11% (34.74)	94.44% (23.01)	**9.67%**	< .05
Confidence	1.51 (0.70)	3.14 (1.05)	**41.72%**	< .0005
Practice strategy	3.11 (1.30)	4.45 (0.81)	**43.09%**	< .0005
Additional Questions	64.78% (28.98)	-	**-**	-



- Statistically significant and substantial gains (p < .05 -.0005) were achieved across the curriculum in all domains from relatively low Pre-Test averages with the exception of Competence. Learners showed greater proficiency with Competence at Pre-Test, and achieved statistically significant gains at Post-Test resulting in very high averages exceeding 90%.
- Learner score scatter (SDS) improved to more moderate levels by Post-Test with the exception of Confidence, where the SDS increased.
- These Pre- to Post-Test percentage changes were primarily above established benchmarks, which estimate gains ranging from 15% to 20% by Post-Test.

Level 3 - Learning Objectives

Learning Objective	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
1. Implement an appropriate strategy for diagnosing a patient with idiopathic pulmonary fibrosis.	33.73% (47.57)	95.18% (21.55)	**182.18%**	< .0005
2. Discuss and contrast the available pharmacotherapeutic options for patients with IPF.	14.93% (35.90)	89.55% (30.81)	**500.00%**	< .0005
3. Describe the non-pharmacotherapeutic options for IPF patients.	14.93% (35.90)	89.55% (30.81)	**500.00%**	< .0005
4. Establish the clear role for the primary care clinician in diagnosing and managing disease in IPF patients	86.11% (34.74)	94.44% (23.01)	**9.67%**	< .05

- Significant (p <.05 - .0005) and substantial gains were measured for all items mapped to the curriculum Learning Objectives. Observed gains by Post-Test ranged from 182% to 500%, from relatively low-to-moderate Pre-Test averages with the exception of LO4 where learners demonstrated proficiency at baseline.
- LO 2, and 3 demonstrated the greatest gain by Post-Test (500%) from the lowest Pre-Test average (approximately 15%).
  - LO4 showed a modest gain (9.67%), however averages at Pre- and Post-Test averages were the highest measured across the analysis.
- The Pre- to Post-Test percentage changes observed were primarily above historical benchmarks, which show average estimates of 20% by Post-Test.

Level 5 Performance Metric: The RealIndex

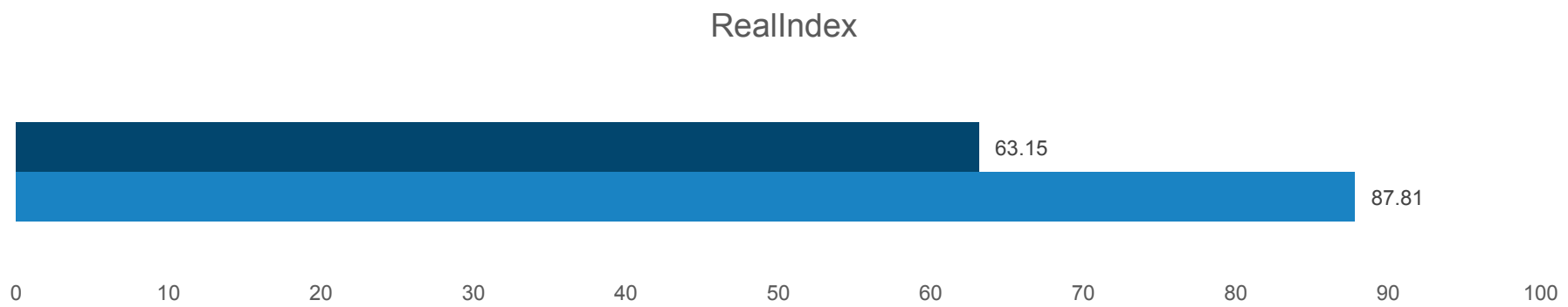
A 63-year-old man presents with a 6-month history of progressive dry cough and dyspnea on exertion. He is a former smoker (30 pack-years, quit 12 years ago) and has a history of chronic low back pain (10 years) and GERD (7 years). Examination identifies bibasilar crackles, but no other findings. Current medications include naproxen prn and omeprazole 20 mg qd.

After reviewing the brief scenario above, please rate each of the statements as consistent with or not consistent with best clinical practice:

Consistent	**Not Consistent**
Order PFTs and plain chest radiography	Prescribe empiric bronchodilator therapy
If initial workup does not identify likely etiology, consider high-resolution CT	If workup is consistent with IPF, prescribe N-acetylcysteine
If patient has oxygen saturation <88% on activity, recommend supplemental oxygen	

Level 5 - Performance Change: RealIndex

Curriculum Intervention				Intervention Effect			
N	Baseline Avg. Score (SDS)	Final Avg. Score (SDS)	% Change	P - Value	Average Effect Size	% Non-Overlap Baseline - Final	Power
305	63.15% (31.83) →	87.81% (21.60)	**39.05%**	< .0005	0.880	50.54%	0.824



A substantial and significant gain (39.05%, p < .0005) was measured from baseline to the final RealIndex which resulted in a large effect size (d= 0.90) with a non-overlap of 51%. This result demonstrated a high degree of statistical power (0.824)

- This improvement is above historical benchmarks that show Performance gains ranging from 5%-10% from baseline.
- Standard deviation scores (SDSs) also improved, indicating that the majority of learners demonstrated greater performance consistency as well as overall improvement.

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Levels 3-5 - Learning Domain Summary: By Location

Columbia (N = 54)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	15.15% (31.83)	90.91% (26.38)	**500.00%**	< .0005
Competence	88.89% (32.02)	96.30% (19.26)	**8.33%**	-
Confidence	1.71 (0.72)	2.39 (0.91)	**39.77%**	< .0005
Practice	2.65 (1.41)	4.71 (0.59)	**77.74%**	< .0005
ReallIndex	66.02% (30.00)	92.53% (16.36)	**40.14%**	< .0005

Charlotte (N =78)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	25.58% (41.36)	87.21% (29.06)	**240.93%**	< .0005
Competence	89.47% (31.53)	100.00% (-)	**11.77%**	-
Confidence	1.40 (0.82)	2.60 (0.82)	**85.71%**	< .0005
Practice	3.25 (1.24)	4.38 (0.96)	**34.77%**	< .0005
ReallIndex	66.47% (34.99)	80.92% (24.20)	**21.74%**	< .0005

Seattle (N = 77)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	32.50% (41.68)	91.25% (27.47)	**180.77%**	< .0005
Competence	87.10% (34.01)	87.10% (34.01)	**-**	-
Confidence	1.58 (0.65)	3.13 (1.30)	**98.11%**	< .0005
Practice	3.25 (1.39)	4.67 (0.70)	**43.70%**	< .0005
ReallIndex	67.47% (25.35)	85.82% (25.21)	**27.20%**	< .0005

White Plains (N = 96)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	19.32% (37.70)	100% (-)	**417.60%**	< .0005
Competence	80.65% (40.16)	96.77% (17.96)	**20.00%**	<.05
Confidence	1.37 (0.60)	3.63 (0.76)	**165.00%**	< .0005
Practice	3.22 (1.11)	4.00 (0.84)	**24.22%**	< .0005
ReallIndex	55.38% (33.83)	92.36% (16.87)	**66.78%**	< .0005

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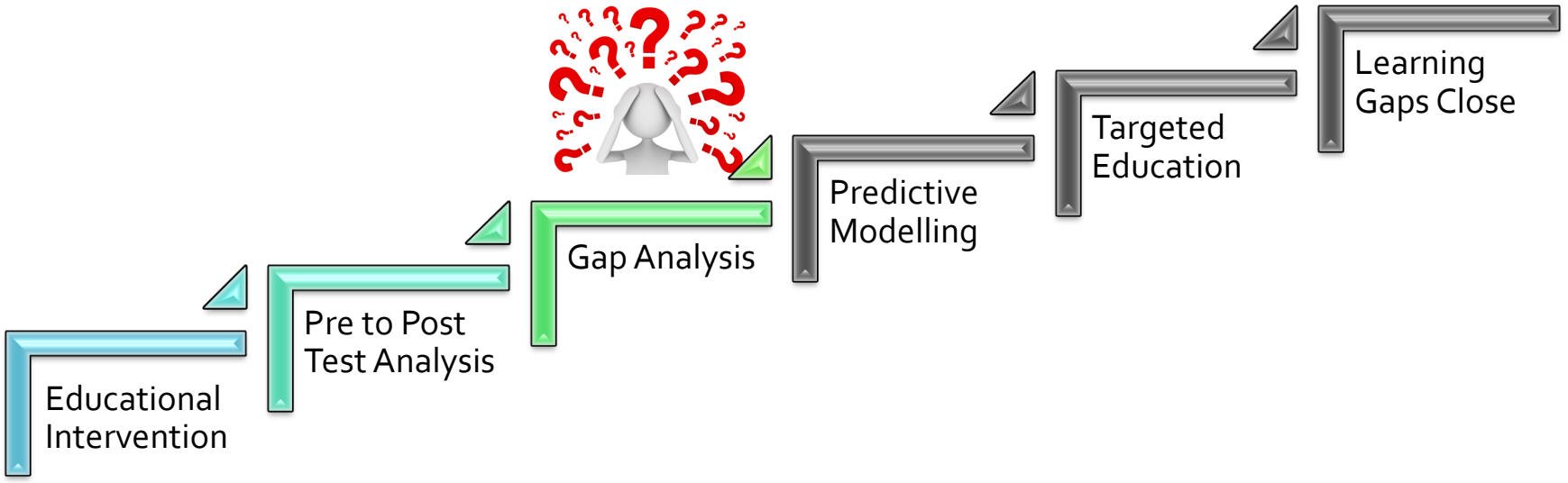
Item-Level/Gap Analysis
(Including Analysis of Demographic Correlations)



Knowledge

Question Diagnostic Imaging (LO 1)

Which of the following tests is considered the gold standard imaging study for the diagnosis of idiopathic pulmonary fibrosis?

Correct Answer		Choice	Pre-Test (N = 165)	Post-Test (N =176)
	1.	Low-dose CT	13.9%	0.00%
	2.	Inspiratory MRI	6.7%	0.00%
X	3.	**High-resolution CT**	29.7%	94.0%
	4.	Combination of PFTs and plain radiography	49.7%	5.1%

Question Therapy (LO 2, 3)

Any of the following may be an appropriate therapy for a patient with idiopathic pulmonary fibrosis, **EXCEPT**:

Correct Answer		Choice	Pre-Test (N = 161)	Post-Test (N = 166)
	1.	Nintedanib	23.6%	1.8%
X	2.	**N-acetylcysteine, azathioprine, prednisone**	13.7%	90.4%
	3.	Supplemental oxygen	20.5%	3.0%
	4.	Pirfenidone	42.2%	4.8%

Competence

Question Diagnostic work-up(LO 4)

A 68-year-old man with a 12-month history of progressive dyspnea on exertion and dry cough presents for evaluation. He is a former smoker (25 pack-years, quit 10 years ago) and has a history of hypertension and GERD. Workup identifies bibasilar crackles, BP 118/78 mmHg, normal sinus rhythm, and no fever. Spirometry identifies a restrictive pattern with no reversibility. Current medications include hydrochlorothiazide 25 mg qd and omeprazole 20 mg as needed.

What should his primary care provider do at this time?

Correct Answer		Choice	Pre-Test (N = 172)	Post-Test (N = 212)
X	1.	**Refer to pulmonologist**	12.8%	34.0%
	2.	Increase omeprazole to every day dosing	2.9%	3.3%
	3.	Initiate empiric therapy with bronchodilator	12.8%	2.8%
X	4.	**Continue workup with chest radiography and pulse oximetry**	71.5%	59.9%

- Learners' Pre-Test results demonstrate high degree of proficiency regarding next steps in a diagnostic work up. While the majority of learners who endorsed "continue workup" at Pre-Test continued to do so at Post-Test, a significant proportion of learners changed their response to "refer to pulmonologist", which would also be an appropriate next step.

Confidence

Question Clinical Features

Please rate your confidence in your ability to recognize features consistent with idiopathic pulmonary fibrosis (based on a scale of 1 to 5, with 1= “Not at all confident” and 5= “Very confident”).

Choice	Pre-Test (N = 168)	Post-Test (N = 165)
Not at all confident	57.1%	1.2%
Slightly confident	33.3%	25.5%
Moderately confident	7.1%	40.0%
Pretty much confident	1.8%	23.0%
Very confident	0.6%	10.3%

Learners’ self-reported Confidence at Pre-Test was extremely low. Post-Test Confidence improved by 42%, providing evidence that the curriculum not only met an area of educational need, but also provided an opportunity for learners to gain confidence in their abilities to effectively recognize features of IPF; however, learners’ Confidence remained an issue suggesting an ongoing need for education and support.

Practice Strategy

Question Supplemental Therapy

How often do/will you consider supplemental oxygen therapy for patients with idiopathic pulmonary fibrosis (based on a scale of 1 to 5, with 1= “Never” and 5= “Always”)?

Choice	Pre-Test (N = 152)	Post-Test (N = 158)
Never	11.2%	0.6%
Rarely	7.9%	3.2%
Sometimes	43.4%	14.6%
Often	20.4%	18.4%
Always	17.1%	63.3%

At Pre-Test, learners’ self-reported practice strategy was quite varied. The majority reported they were not likely to consider the usage of supplemental oxygen therapy for their patients with IPF; however, at Post-Test the majority of learners reported that they were very likely or always going to engage in this performance behavior; representing a 43% change in practice strategy.

Additional Questions (non-matched ARS items presented during meeting):

A 75-year-old man presents with a 3-year history of progressive dyspnea and cough

Question 1 Clinical Features

Which of the following features of this presentation are consistent with IPF?

Correct Answer		Choice	Internal Item (N = 120)
	1.	Patient age	1.7%
	2.	Bibasilar crackles	3.3%
	3.	Progressive dyspnea and dry cough	3.3%
X	4.	**All of the above**	91.7%

Question 2 Diagnostic Imaging

In this 75-y/o man with 3-year history of progressive dyspnea and cough, which imaging study is most likely to be diagnostic?

Correct Answer		Choice	Internal Item (N = 137)
	1.	Plain chest radiograph	17.5%
	2.	Inspiratory MRI of chest	5.1%
X	3.	**High-resolution CT of chest**	66.4%
	4.	Spiral, contrast enhanced, pulmonary embolism CT of chest	10.9%

Additional Questions (non-matched ARS items presented during meeting)

Question 3 Differential Diagnosis

In this 75-year-old man with 3-year history of progressive dyspnea and cough, the differential diagnosis includes:

Correct Answer		Choice	Internal Item (N = 122)
	1.	COPD	1.6%
	2.	Congestive heart failure	1.6%
	3.	Idiopathic pulmonary fibrosis	8.2%
X	4.	**All of the above**	88.5%

Question 4 Initial Workup

In this 75-year-old man with 3-year history of progressive dyspnea and cough, all of the following contribute to the initial workup in primary care, EXCEPT:

Correct Answer		Choice	Internal Item (N = 123)
	1.	PFTs	3.3%
	2.	Pulse oximetry	2.4%
	3.	Chest radiography	6.5%
X	4.	**Surgical lung biopsy**	87.8%

Additional Questions (non-matched ARS items presented during meeting)

Question 5 Diagnostic Imaging

In this 75-year-old man with progressive dyspnea and cough, which imaging features on his HRCT will ensure a diagnosis of usual interstitial pneumonia (UIP)?

Correct Answer		Choice	Internal Item (N = 121)
	1.	Honeycomb changes	3.3%
	2.	Basilar predominance of abnormality	16.5%
	3.	Extensive ground glass abnormalities	14.0%
X	4.	**Both 1 and 2**	66.1%

Question 6 Therapy Options

For this 75-year-old man with a confirmed diagnosis of IPF, which of the following therapies should be considered?

Correct Answer		Choice	Internal Item (N = 126)
	1.	Ambrisentan	2.4%
X	2.	**Pirfenidone or nintedanib**	6.3%
	3.	N-acetylcysteine monotherapy	20.6%
	4.	N-acetylcysteine, azathioprine, and prednisone	70.6%

Additional Questions (non-matched ARS items presented during meeting)

Question 7 Therapy Options

The 75-year-old man with IPF develops gradually progressive breathlessness and resting hypoxemia. Which of the following therapies should be considered?

Correct Answer		Choice	Internal Item (N = 134)
	1.	Lung transplantation	4.5%
	2.	Oxygen supplementation	20.1%
	3.	Long-acting bronchodilator	15.7%
X	**4.**	**1 and 2**	59.7%

- Engagement questions presented during the live meeting provide additional support with regards to areas of mastery and/or challenge to learners. Comparison of response sets for each question indicated that learners showed a firm understanding of the clinical features of IPF, as well as some capability with differential diagnosis, and initial workup; however, they also showed a lack of proficiency with the selection/interpretation of diagnostic imaging and choice of therapy.

The RealIndex

A 63-year-old man presents with a 6-month history of progressive dry cough and dyspnea on exertion. He is a former smoker (30 pack-years, quit 12 years ago) and has a history of chronic low back pain (10 years) and GERD (7 years). Examination identifies bibasilar crackles, but no other findings. Current medications include naproxen prn and omeprazole 20 mg qd.

After reviewing the brief scenario above, please rate each of the statements as consistent with or not consistent with best clinical practice:

Consistent	Not Consistent
Order PFTs and plain chest radiography **(93.20% BL → 86.41% FINAL)**	Prescribe empiric bronchodilator therapy **(30.38% BL → 67.09% FINAL)**
If initial workup does not identify likely etiology, consider high-resolution CT **(81.11% BL → 96.67% FINAL)**	If workup is consistent with IPF, prescribe N-acetylcysteine **(33.33% BL → 85.71% FINAL)**
If patient has oxygen saturation <88% on activity, recommend supplemental oxygen **(84.52% BL → 96.43% FINAL)**	

Summary of Outcomes Analyses (Levels 1-5)

Statistically significant gains were measured across the curriculum from Pre-Test (and baseline) to Post-Test (and final) in all learning domains across the intervention.

- Learners demonstrated a substantial increase in proficiency from Pre- to Post-Test for Knowledge, and a statistically significant improvement to Competence.
  - Gains in Knowledge demonstrated a nearly 300% improvement by Post-Test.
  - Competence proved to be an area of mastery at Pre-Test; though further gains were observed at Post-Test demonstrating the effectiveness of this curriculum.
- While Confidence ratings were very low at Pre-Test, at Post-Test learners achieved a robust improvement in Confidence regarding their ability to identify features of IPF.

Correlation Analysis

- A moderate, negative relationship was identified between performance on Knowledge (diagnostic imaging) and Confidence, indicating some inconsistency between learners' clinical knowledge and their perception of their abilities.
- A positive relationship was identified between practice strategy and the number of providers in a learners' practice, which could be indicative of larger practices offering more support to staff.
- A positive relationship between performance on Competence and specialty was identified with PCPs achieving very high average scores (84%) compared to other specialties.
- A negative relationship was identified between performance on Knowledge (therapy selection) and gender, with females achieving much lower average scores at Pre- and Post-Test.

Summary of Gap Analysis

RealIndex: A 63-year-old man presents with a 6-month history of progressive dry cough and dyspnea on exertion. He is a former smoker (30 pack-years, quit 12 years ago) and has a history of chronic low back pain (10 years) and GERD (7 years). Examination identifies bibasilar crackles, but no other findings. Current medications include naproxen prn and omeprazole 20 mg qd.

While learners achieved statistically significant and substantial gains across all domains of the curriculum, there were areas where learners lacked proficiency at Post-Test:

1. **Performance behavior** related to pharmacotherapeutic selection presented in the patient vignette (**the RealIndex****) in which learners were asked to select clinical decisions that were either consistent or not consistent with their current practice approach. Over 32% of learners incorrectly indicated that they would “Prescribe empiric bronchodilator therapy”, at Post-Test.
2. **Knowledge** related to diagnostic imaging; both selection of appropriate radiographic imaging and imaging features specific to the diagnosis of IPF.
3. Very low average **Confidence**, related to the clinical features of IPF were observed at Pre-Test, and remained moderate at Post-Test. This persistent lack of Confidence correlates with these identified gaps and suggest that these learners are aware of deficits regarding IPF.

Retention: 4 Weeks Post-Curriculum (*N* = 66)

Knowledge & Competence

- Learners demonstrated high levels of retention for Knowledge relating to the use of high-resolution CT scan.
    - Slippage was observed for items related to the appropriate pharmacotherapeutic selection.
- Learners demonstrated high levels of retention on Competence indicating they would “refer to pulmonologist” and “continue workup with chest radiography and pulse oximetry”

RealIndex

- Learners demonstrated high levels of retention for items related to “ordering PFT and plain chest radiography”, as well as “consider high-resolution CT” and the use of supplemental oxygen.
    - Slippage was evident for non-consistent items related to pharmacotherapeutic selection.

Persistent Learning Gap

- Learners achieved dramatic improvements in Knowledge, Competence, Confidence, practice strategy and performance behavior (RealIndex), by Post-Test with regards to the identification of IPF.
- While learners demonstrated excellent retention at the 4 week follow-up, the challenges identified at Post-Test, persisted with learners continuing to struggle with selecting appropriate therapy(ies) for treating IPF as well as some difficulties with diagnostic imaging.
- The predictive model that follows will identify drivers that can help close the learning gaps, reduce slippage, facilitate attainment and may lead to higher Confidence. This includes the predicted magnitude of change expected if the learning gaps are successfully addressed.

Idiopathic Pulmonary Fibrosis:
Making Sense of Diagnostic and Therapeutic Options in Primary Care

What specific ***skills*** or ***practice behaviors*** have you implemented for patients with idiopathic pulmonary fibrosis since this CME activity?
(Comments received from attendees at 4 week follow up) (*N* = 66)

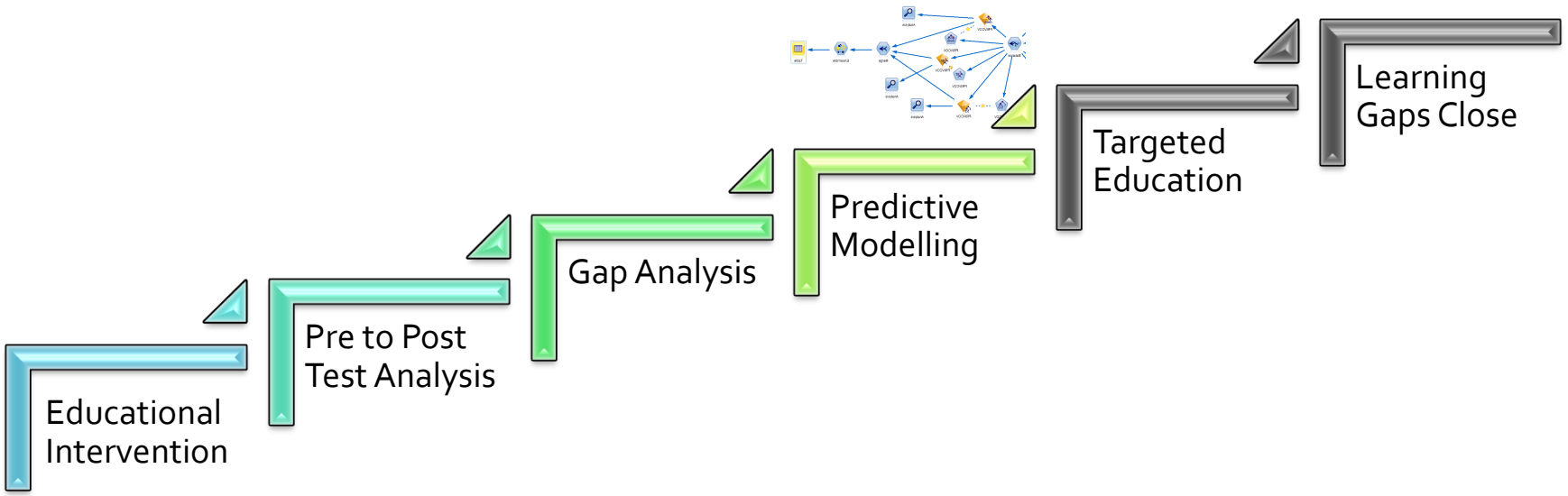
- "I am more aware that honeycomb patters on CT scan along with patient age and smoking history make me think about IPF"
- " I am aware of the need to order High-resolution CT to diagnose IPF" (*N*=3)
- "I am more aware of IPF" (*N*=3)
- "I am more aware of the pharmacotherapeutic options and management of IPF" (*N*= 5)
- "I am more aware of how to properly diagnose IPF" (*N*=5)
- "I understand when to refer to a specialist"
- "I am more comfortable teaching my patients about IPF"
- "I monitor all patients with lung diseases for signs and symptoms of IPF"
- "I am more aware of the importance of early detection of IPF"
- "I have a higher index of suspicion for IPF" (*N*=3)
- "I know to look for other autoimmune diseases that may be linked to ILD"

Idiopathic Pulmonary Fibrosis:
Making Sense of Diagnostic and Therapeutic Options in Primary Care

What specific ***barriers*** have you encountered that may have prevented you from successfully implementing strategies for patients with idiopathic pulmonary fibrosis since this CME activity?
(Comments received from attendees at 4 week follow up) (*N* = 66)

- My lack of education and knowledge in the recognition of risk factors, disease patterns, and appropriate diagnostic evaluation
- Patient population limited (*N*=2)
- Lack of knowledge
- High incidence of COPD and asthma can make diagnosing IPF more obscure
- Patient compliance
- Insurance formulary (*N*=2)
- Difficult to refer uninsured to specialists
- Practice area with limited specialists
- Getting authorizations for testing
- Medication coverage

Predictive Modeling



RealCME

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PredictiveModeling

After an educational intervention takes place, a gap analysis is completed. The gap analysis identifies areas where learners continued to struggle, Post-Test.

The identified gaps are then compiled into a ‘target gap score’. This score enables us to target gaps in knowledge, competence, practice strategy, and/or clinical performance, statistically.

Learner demographics, as well as the remaining knowledge, competence, confidence, practice strategy and clinical performance items are modeled against the target gap score (Post-Test) to identify areas that can not only reduce these gaps, but provide guidance on how to develop education proactively. These areas of are identified as drivers.

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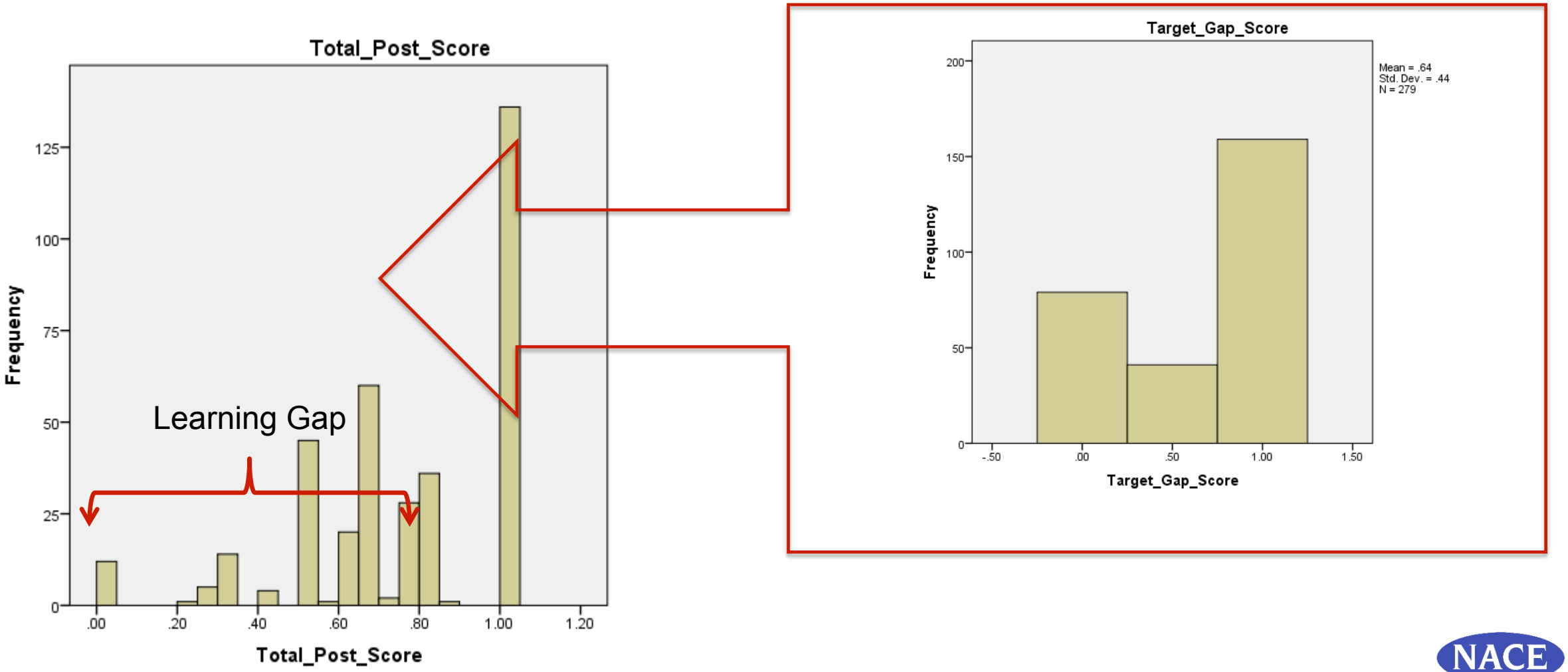
Target Gap Score:

By identifying the lowest scoring items in the curriculum and averaging the overall score, we obtain the target gap score. This score is used as the target in the predictive model to determine what is driving the gap.

The Composite Gap Score serves as the **Target Gap Score (TGS):** therapy(ies) for IPF; specifically **appropriate selection of pharmacotherapeutic treatment(s)**.

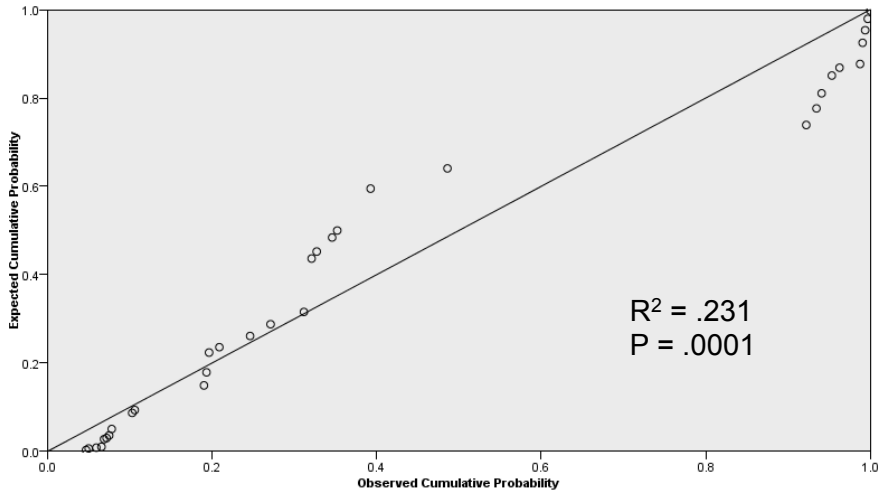


The IPF Model: Identifying Significant Drivers

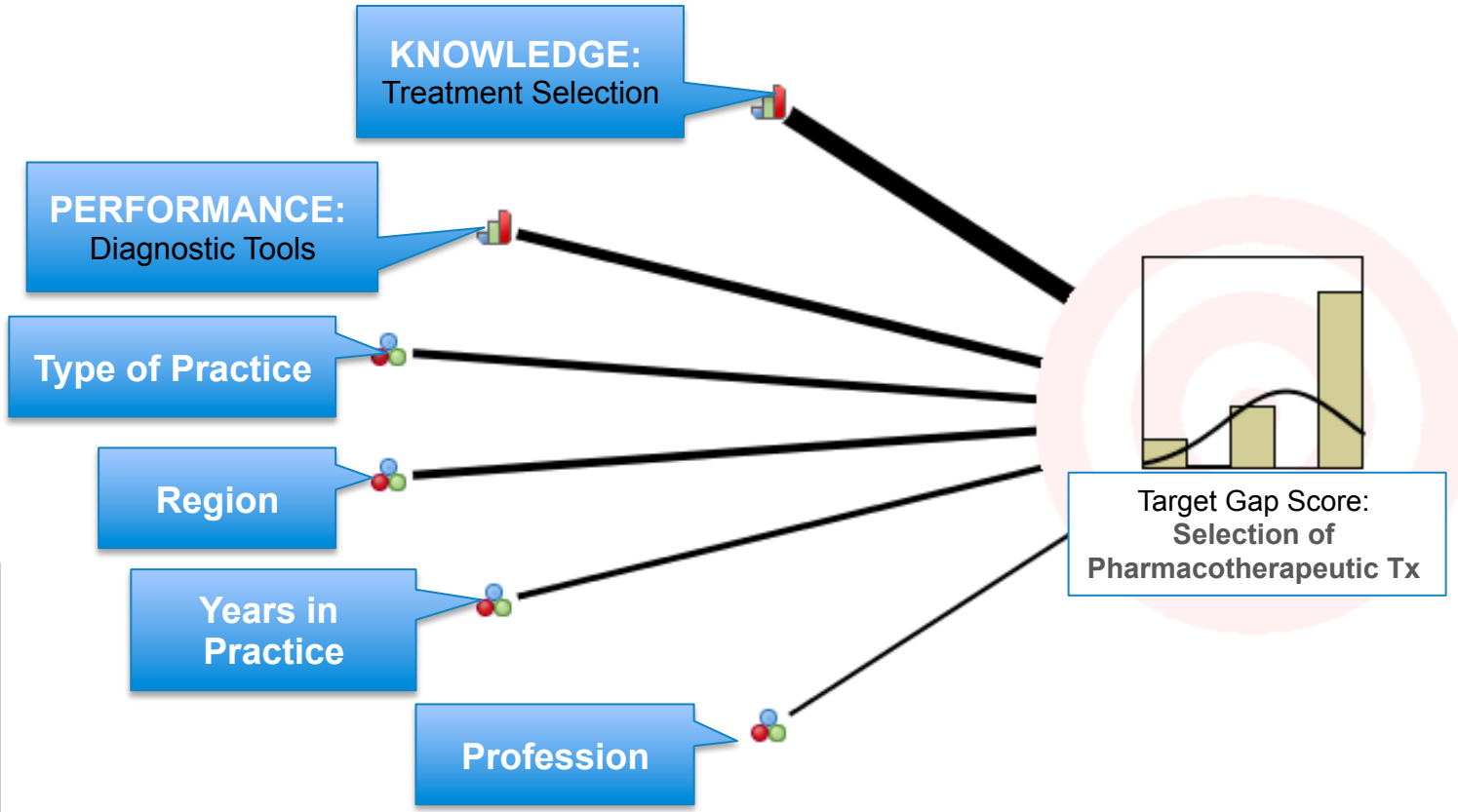
All questions across the learning domains (including knowledge, competence, confidence, and practice strategy), as well as learner demographics were analyzed to identify positive and/or negative predictors of learners' Target Gap Score.

6 statistically significant drivers were identified that include Knowledge, Performance, and demographics.

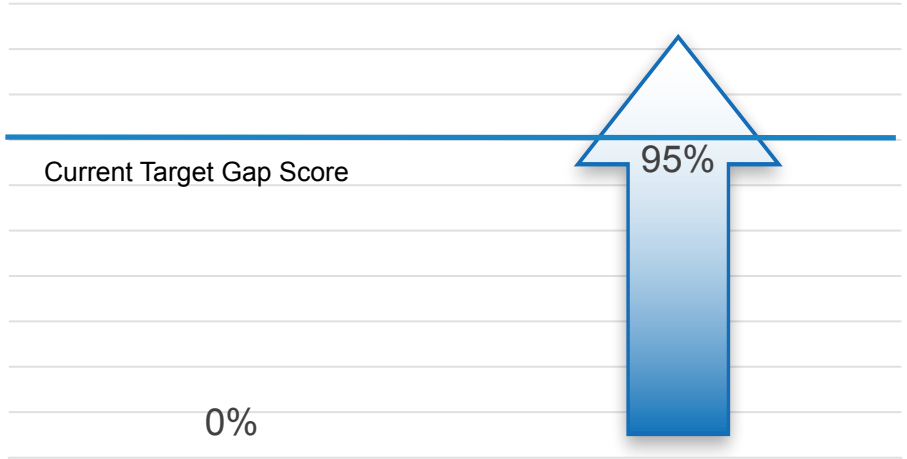
It is important to note that drivers can facilitate or hinder learners' performance. This means they can have either a positive or a negative influence on the Target Gap Score.



The P-P plot of Studentized residuals compares the distribution of the residuals to a normal distribution. The diagonal line represents the normal distribution. The closer the observed cumulative probabilities of the residuals are to this line, the closer the distribution of the residuals is to the normal distribution.



Educational Drivers (2): The IPF Model (64% Current Gap Score)



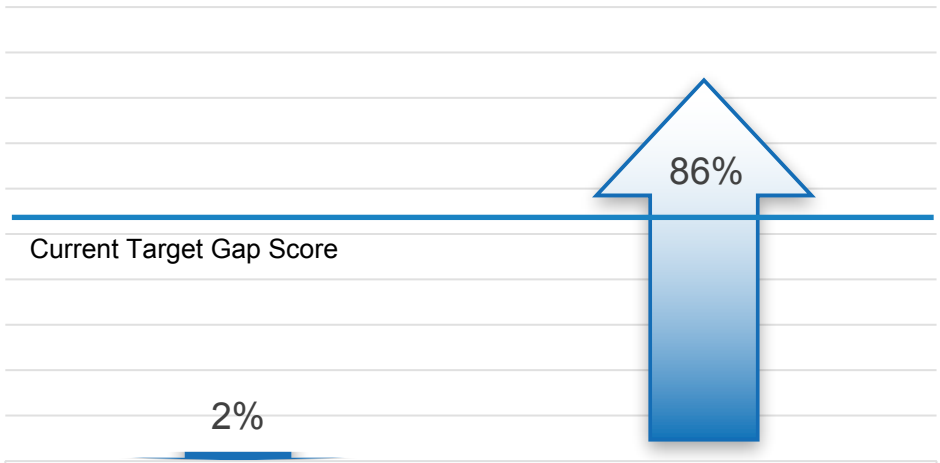
KNOWLEDGE of specific pharmacologic and non-pharmacologic therapies

Driver Influence

= % predicted **improvement** in Target Gap Score (TGS), if driver is addressed

= % predicted **decrease** of TGS, if driver is **not** addressed

= No effect



PERFORMANCE BEHAVIOR: Use of appropriate diagnostic tools

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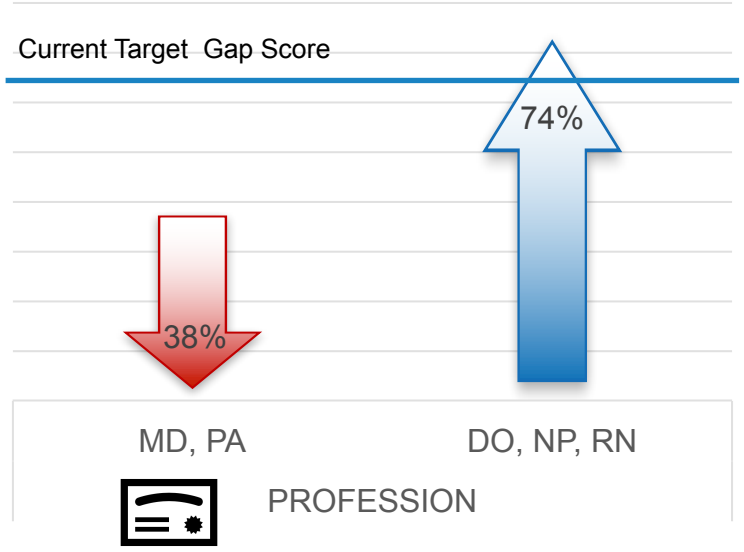
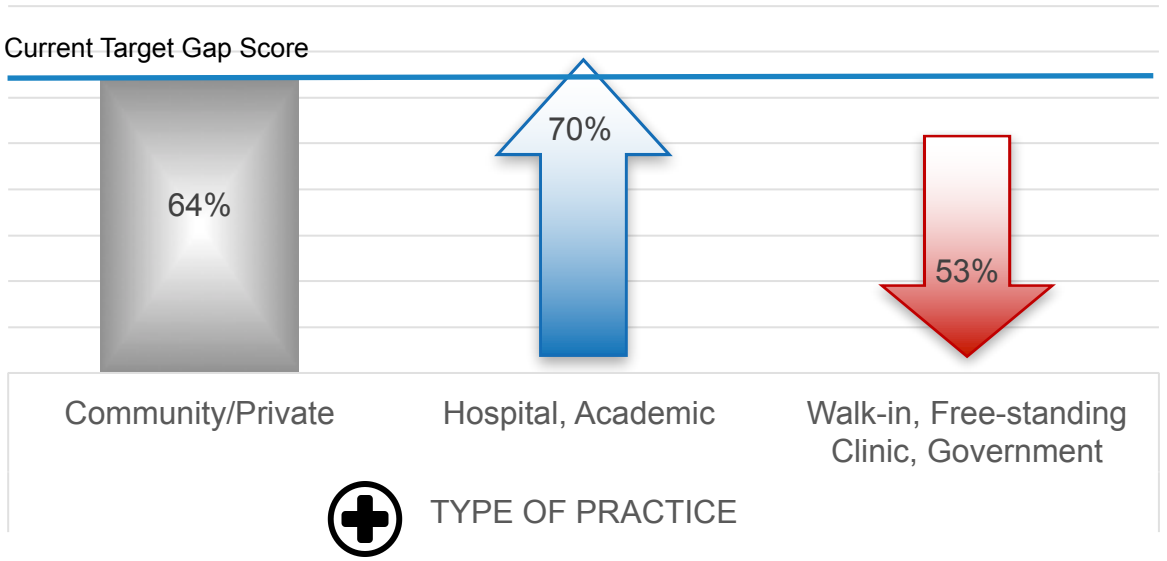
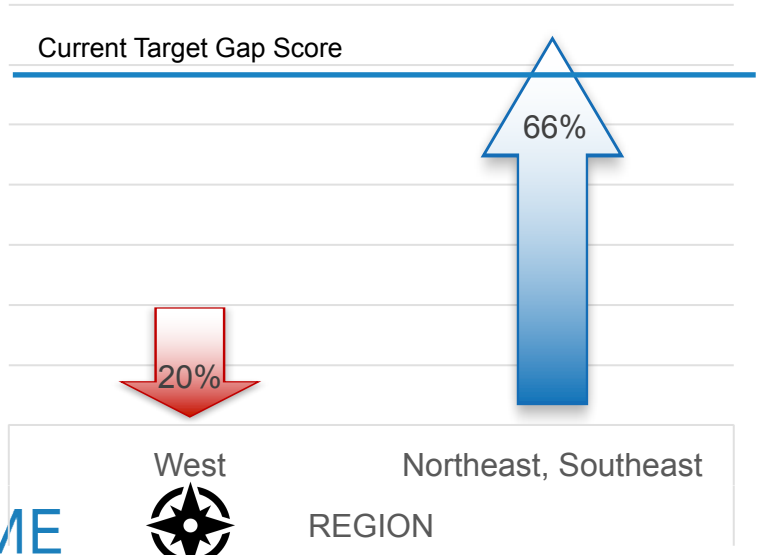
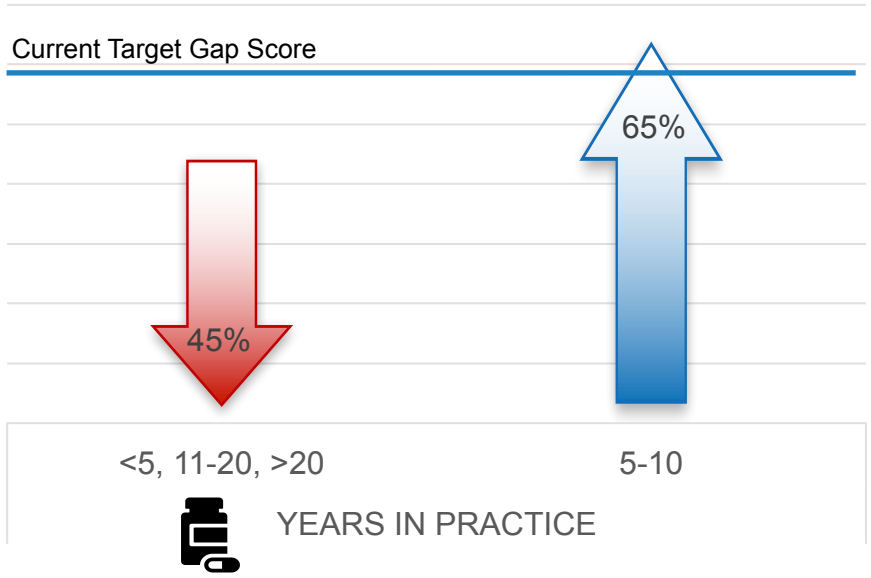
Demographic Drivers (4): The IPF Model (64% Current Gap Score)









Driver Influence

= % predicted **improvement** in Target Gap Score (TGS), if driver is addressed

= % predicted **decrease** of TGS, if driver is **not** addressed

= No effect

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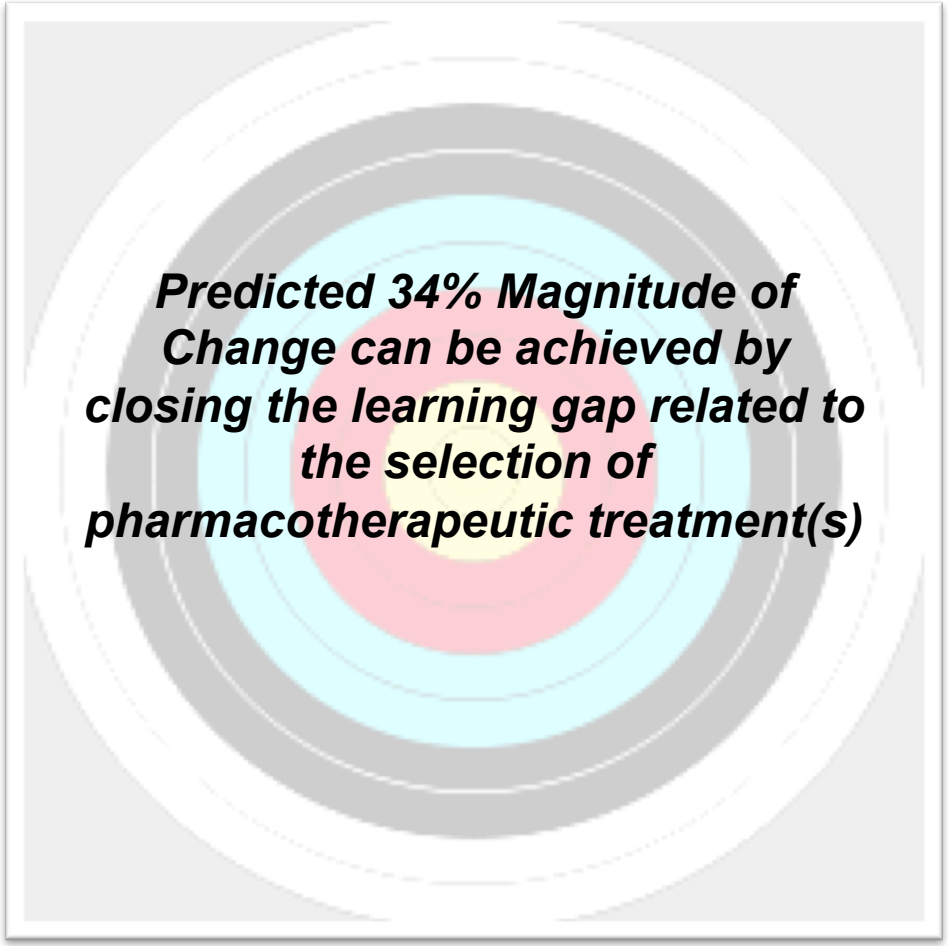
Predicted Magnitude of Change

By addressing these drivers a **34% magnitude of change** can be achieved.

Targeted learning that focuses not only on the identified learning gap, but also incorporates the drivers, will facilitate higher educational attainment, retention and increased Confidence.



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IPF Predictive Model: Summary of Findings

- Results from the final advanced analysis revealed an educational **gap concerning the selection of appropriate pharmacotherapeutic treatment(s)**.
- The final predictive modeling procedure identified 6 drivers that, if addressed in future education, will lead to an estimated **34% (magnitude of change) improvement in learners' overall proficiency in this area**.
  - Drivers (areas of focus to improve identified gap):
    1. **Knowledge** – Pharmacologic and non-pharmacologic therapies
    2. **Performance Behavior** – Use of appropriate diagnostic tools
    3. **Profession** – MD & PA
       - Representing 16% of the total sample
    4. **Practice Type** – Walk-in/Free-standing Clinic, Government

       - Representing 17% of the total sample
    1. **Region** – West
       - Representing 21% of the total sample
    2. **Years in Practice** – <5, >11
       - Representing 75% of the total sample

IPF Application of Findings – Applying the Outcomes

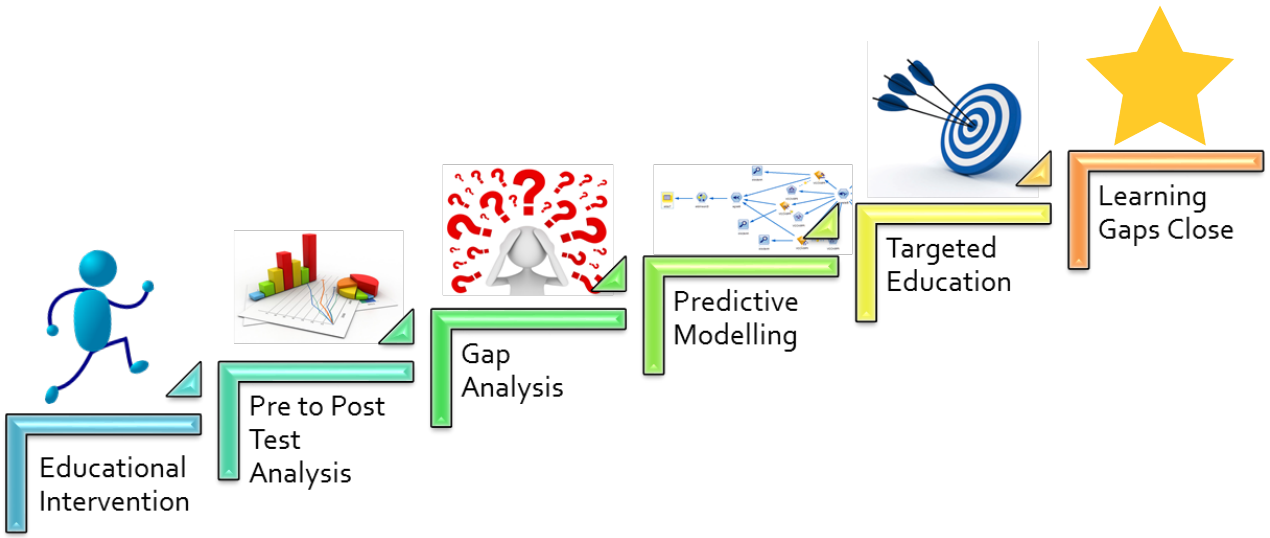
Addressing the identified learning gap & drivers

Demographic Targeting

- **Geographic** – Western part of U.S.
- **Years in practice** - <5, >11 years
- **Profession** – MDs and PAs
- **Practice Type** – Walk-in/Free-standing Clinic, Government

Content Focus

- Knowledge and competency around **pharmacological and non-pharmacologic therapy selection**
- **Practice behavior** related to the use of appropriate diagnostic tools



Instructional Design

- Incorporate case-based activities that emphasize diagnostic protocol for patients with IPF with an emphasis on diagnostic imaging; as well as education that focuses on appropriate therapy(ies) for treating IPF.
- Serial reinforcement to address low Confidence concerning diagnosis and treatment of IPF as well as lack of retention at follow-up.
- Target specific demographic-based deficiencies through presenting case-based scenarios that reflect these sub-populations (e.g., level of experience, profession, practice-type)
- Include a team-based approach to management through presenting a case-based challenge including the entire care team (specialist/ professional)