Clinical Challenges In Individualized Heart Failure Treatment

Association of Black Cardiologists, Inc. (ABC)

A NACE Program

Final Live Outcomes Report

April 17, 2017

Novartis Pharmaceuticals Grant: 27536

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Cities and Dates

Clinical Updates for Nurse Practitioners and Physician Assistants: 2016

Orlando, Florida
September 17, 2016

Cincinnati, OH
September 24, 2016

Pittsburg, Pennsylvania
October 1, 2016

Fairfax, West Virginia
October 8, 2016

Dallas, Texas
October 15, 2016

Phoenix, Arizona
October 22, 2016

Charlotte, North Carolina
October 29, 2016

Columbia, South Carolina
November 11, 2016

White Plains, New York
Nov 12, 2016

Seattle, Washington
Nov 19, 2016

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Learning Objectives

1. Recognize the use of biomarkers in the diagnosis, prognosis and risk stratification of heart failure
2. Understand the pathophysiologic and cultural differences between racial groups in determining management strategies for heart failure
3. Identify risk factors and recognize patients at risk for early heart failure based on physical exam and other clinical factors
4. Implement evidence based strategies to decrease symptoms and improve quality of life for patients with heart failure

Outcomes Assessment Methodology

ACTIVITY OUTCOME PROTOCOL

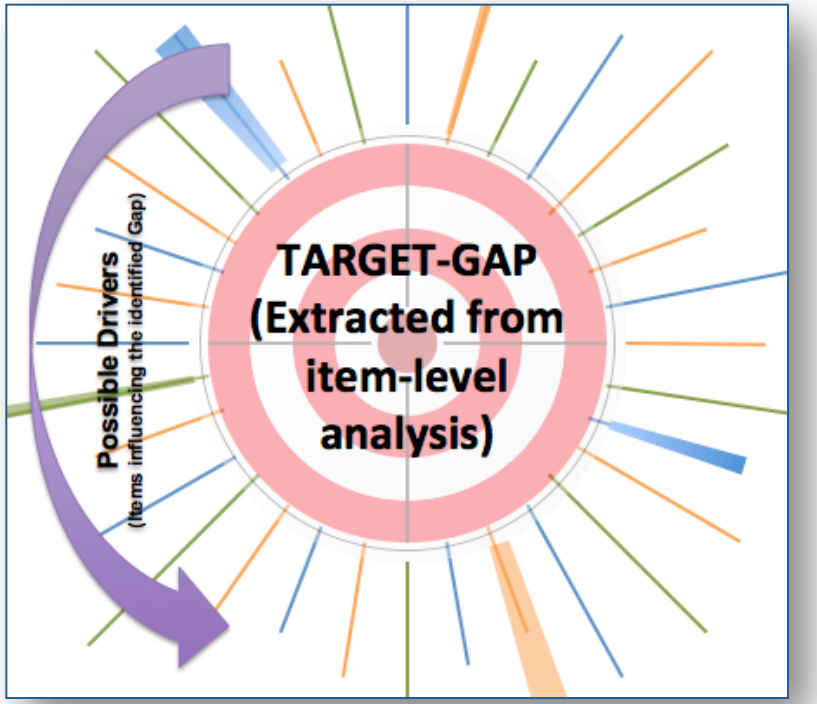
- Data collection:
  - Paired **Pre- and Post-Test** questions
  - **Demographic** questions
  - Learner **Challenge** questions
- Employs **Knowledge, Competence, Confidence**, and **practice strategy** question types
- Appropriate statistics applied to assess change across learning domains

CURRICULUM OUTCOMES PROTOCOL

- Assess Moore's Levels 1–5
- **Learning objective** analysis
- Multi-dimensional **repeated-measure** (Level 5):
  - Prior to activity/after completion of each activity
  - Post-curriculum assessment survey

PREDICTIVE MODEL 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



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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.

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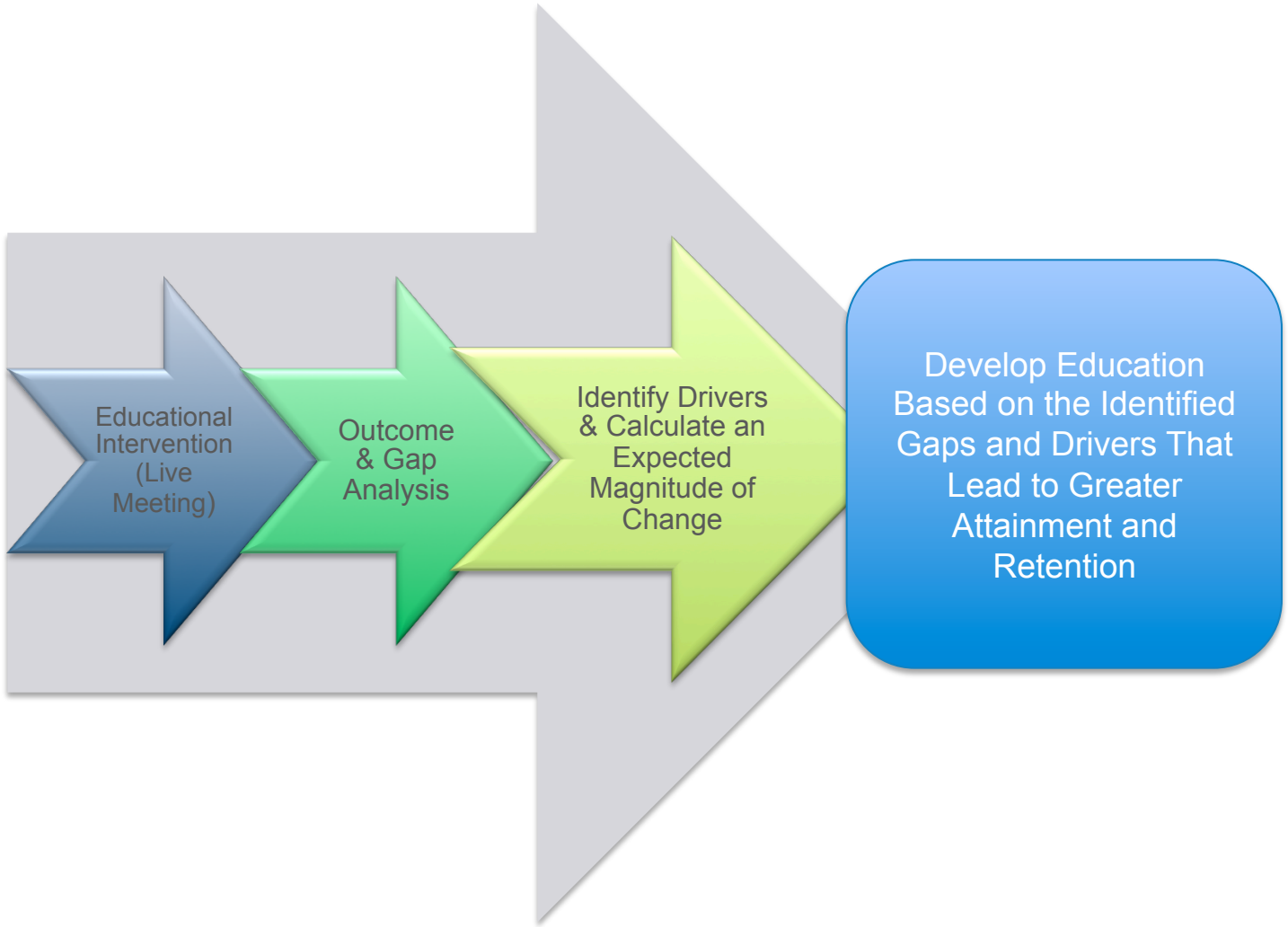
PredictiveModeling Methodology

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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Executive Summary
Outcomes at Moore's Levels 1-5

Level 1 (Participation):

Live Meeting Location (Date)	Attendees	Simulcast	Started Pre-Test	Started Post-Test	
Orlando, FL (Sept. 17, 2016)	185	-	91	85	**93%**
Cincinnati, OH (Sept. 24, 2016)	**73**	**-**	35	37	**95%**
Pittsburg, PA (Oct. 1, 2016)	82	-	43	37	**86%**
Fairfax, VA (Oct. 8, 2016)	**83**	**-**	39	37	**95%**
Dallas, TX (Oct. 15, 2016)	214	134	53	73	**73%**
Phoenix, AZ (Oct. 22, 2016)	142	-	61	62	**98%**
Charlotte, NC (Oct. 29, 2016)	101	-	44	42	**95%**
Columbia, SC (Nov. 11, 2016)	65	299	33	31	**93%**
White Plains, NY (Nov 12, 2016)	146	**-**	59	75	**79%**
Seattle, WA (Nov 19, 2016)	97	**-**	47	57	**82%**
Total Learners:	**1188**	**1621**	**505**	**536**	**94%**

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Executive Summary (cont'd)
Outcomes at Moore's Levels 1-5

- **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	46.46% (44.16)	83.63% (33.42)	**80.43%***
Competence	18.97% (39.28)	62.85% (48.42)	**231.31%***
Confidence	1.89 (0.96)	3.04 (0.95)	**108.46%***
Practice Strategy**	3.78 (1.20)	4.87 (0.38)	**28.83%***
RealIndex**	57.41% (36.27)	72.42% (33.25)	**26.15%***

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

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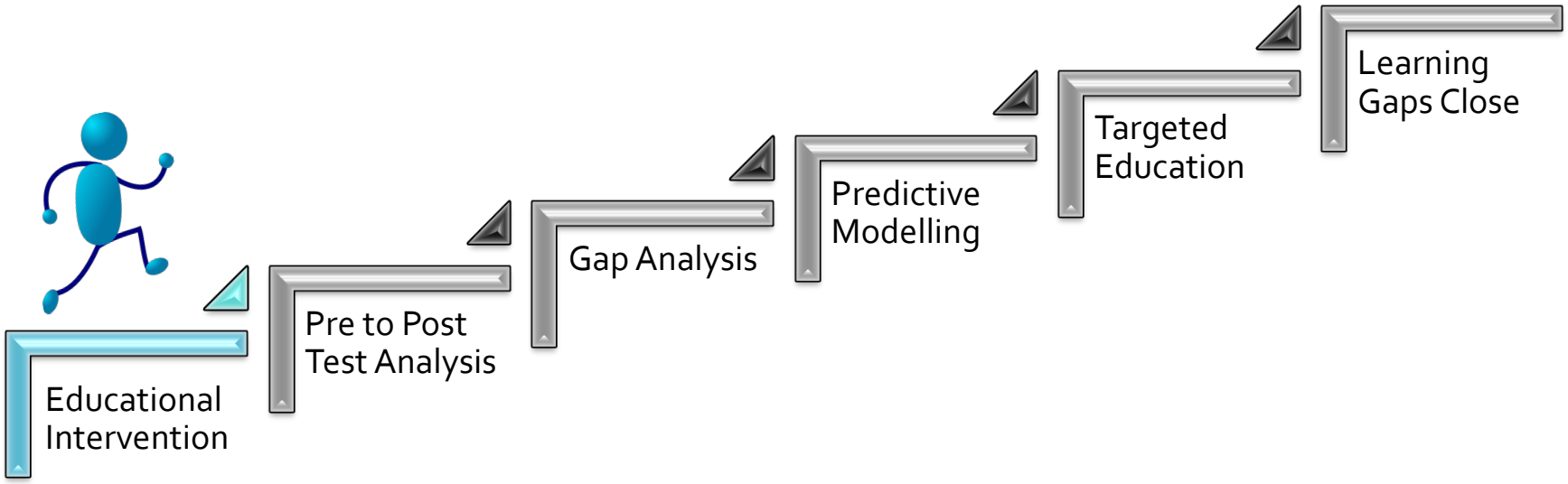
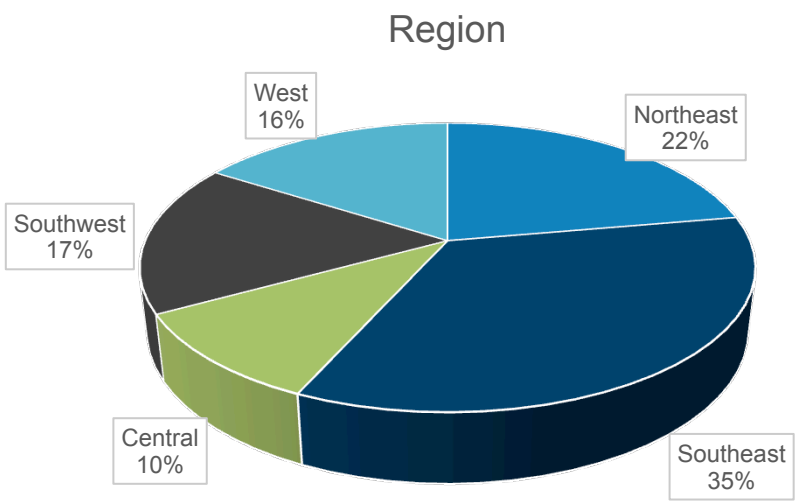
Level 2: Satisfaction

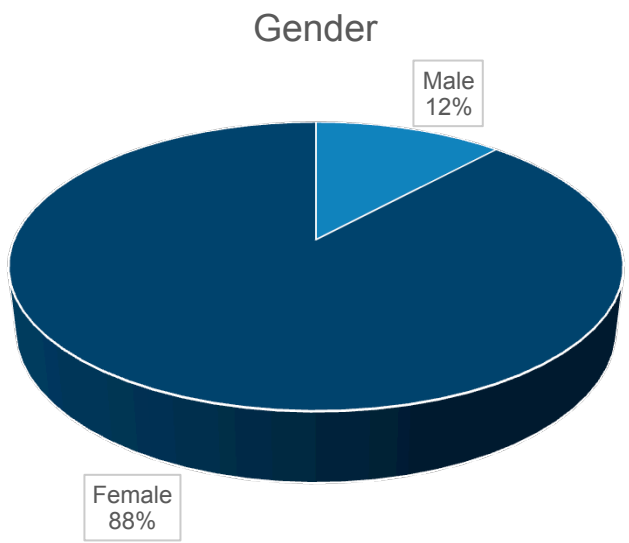
- 99% rated the activity as excellent
- 99% indicated the activity improved their knowledge
- 97% stated that they learned new and useful strategies for patient care
- 98% said they would implement new strategies that they learned in their practice
- 100% said the program was fair-balanced and unbiased

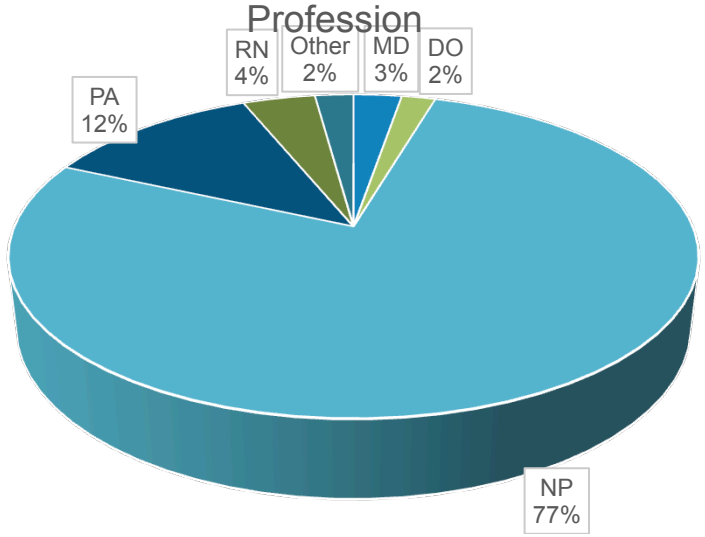
Level 1: Demographics

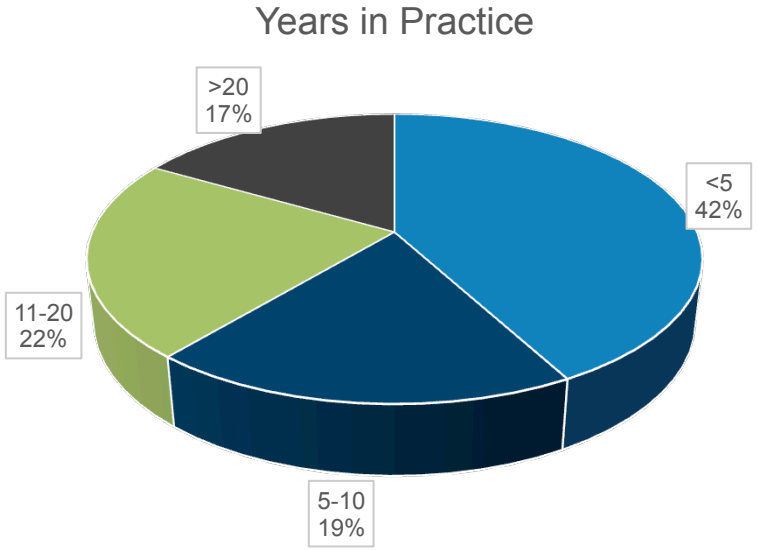


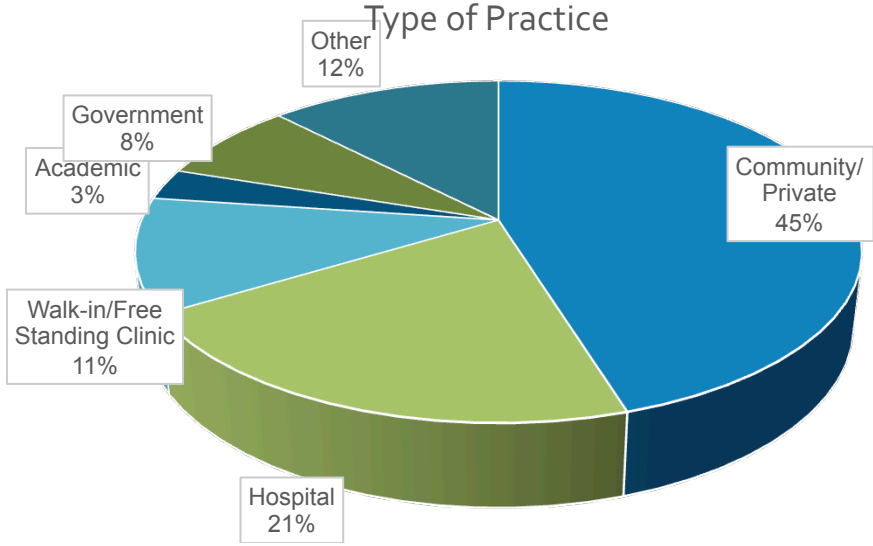
Level 1: Participation – Demographics

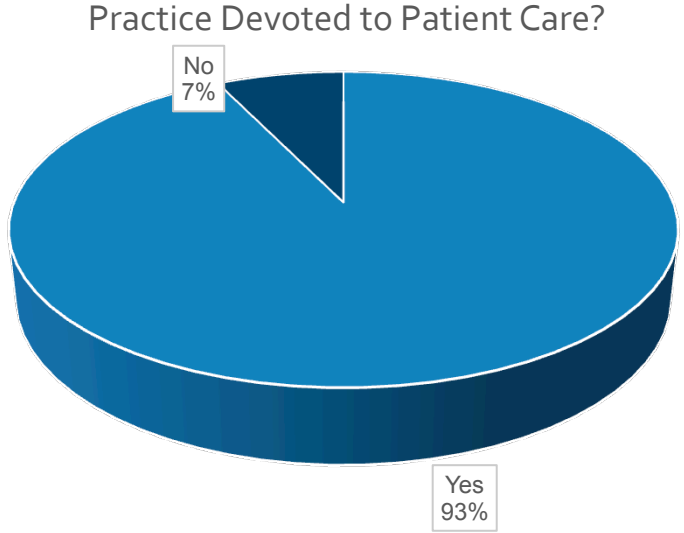












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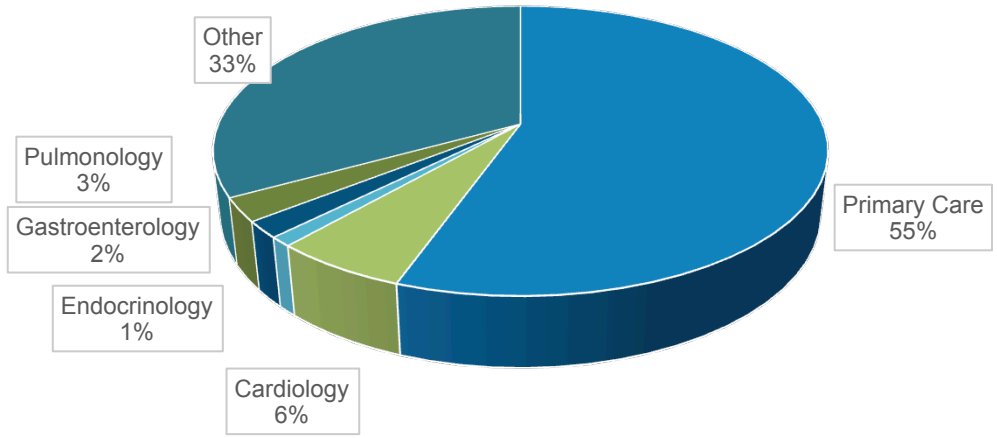
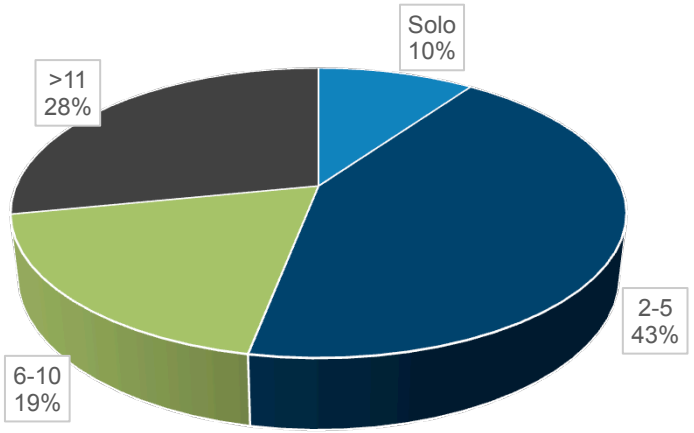
Level 1: Participation – Demographics

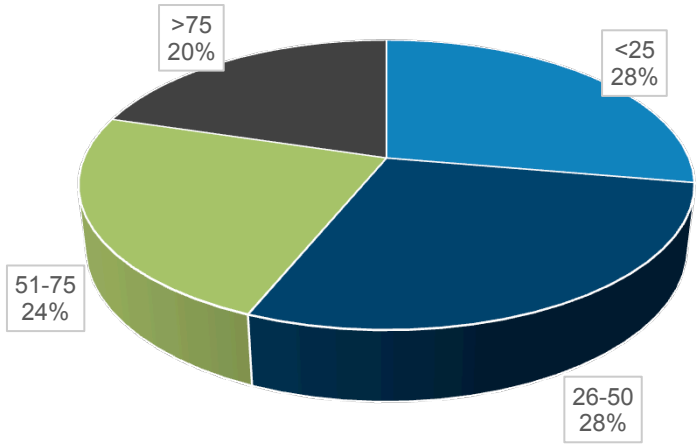
Specialty



Number of Practitioners



Number of Patients Seen Per Week



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Curriculum Patient Impact

Participants (*N*)	1,418
	Patient Reach Range
Weekly	2,992-18,363
Yearly	108,908-668,417

Learners (*N* = 1,418) were asked to complete an item approximating the number of patients that they personally see in their practice on a weekly basis that have CHF by selecting a range. The estimated ranges were calculated and the results indicate that this curriculum has the potential to impact the care of:

- 2,992-18,363 patients on a weekly basis (between 2 and 13 patients per/clinician), and
- 108,908-668,417 patients on an annual basis, based on the assumption that 30% of patients will be seen more than once per year by their clinician.
- Learners who are not actively seeing patients were accounted for in these calculations.

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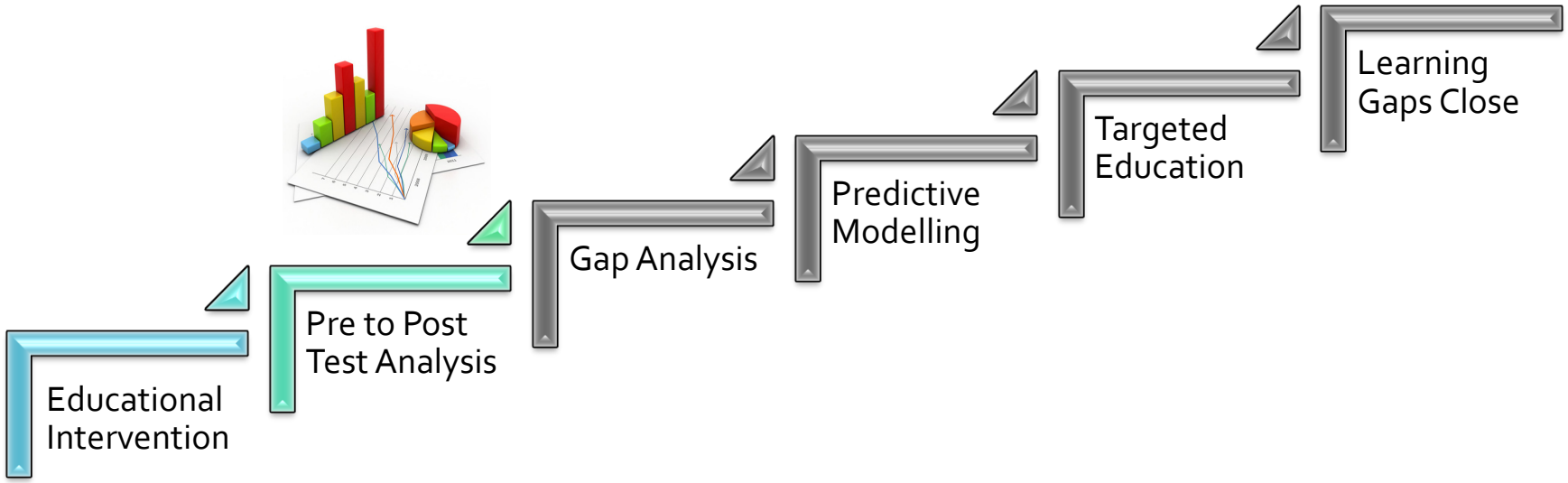
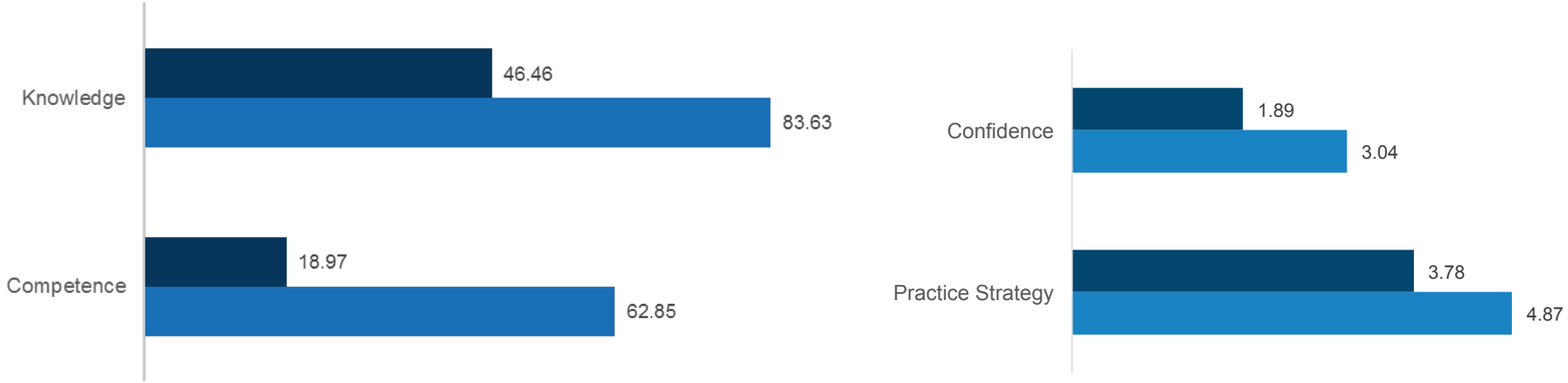
Levels 3-5: Outcomes Metrics



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	46.46% (44.16)	83.63% (33.42)	**80.43%**	< .0005
Competence	18.97% (39.28)	62.85% (48.42)	**231.31%**	< .0005
Confidence	1.89 (0.96)	3.04 (0.95)	**108.46%**	< .0005
Practice strategy	3.78 (1.20)	4.87 (0.38)	**28.83%**	< .0005
Additional questions	51.85% (38.72)	-	**-**	-



- Statistically significant and substantial gains (p < .0005) were achieved across the curriculum in all domains from relatively low Pre-Test averages.
- Learner score scatter (SDS) improved to more moderate levels by Post-Test suggesting that learners' responses were more consistent with the mean with the exception of Competence 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.

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Level 3 - Learning Objectives

Learning Objective	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P – Value
1. Recognize the use of biomarkers in the diagnosis, prognosis and risk stratification of heart failure	41.96% (49.46)	79.02% (40.80)	**88.32%**	< .0005
2. Understand the pathophysiologic and cultural differences between racial groups in determining management strategies for heart failure	18.97% (39.26)	62.85% (48.41)	**231.31%**	< .0005
3. Identify risk factors and recognize patients at risk for early heart failure based on physical exam and other clinical factors	50.63% (50.10)	88.19% (32.34)	**74.19%**	< .0005
4. Implement evidence based strategies to decrease symptoms and improve quality of life for patients with heart failure	18.97% (39.26)	62.85% (39.26)	**88.32%**	< .0005

- Statistically significant ($p < .0005$) and substantial gains were measured for all items mapped to the curriculum Learning Objectives. Observed gains by Post-Test ranged from 74% to 231%.
  - Standard deviation score (SDS) increased for LO2 at Post-Test, indicating that while learners improved considerably, they were not as consistent in their Post-Test responses, overall.
- The Pre- to Post-Test percentage changes observed were above historical benchmarks, which show average estimates of 20%, by Post-Test.

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Level 5 Performance Metric: The RealIndex

A 68-year-old white man, NYHA class II/stage C heart failure and left ventricular ejection fraction 30%, CAD, hypertension, and dyslipidemia presents for a checkup. He reports shortness of breath ONLY when he walks up stairs, but no other symptoms. BP today is 122/74 mmHg, HR 78 bpm, eGFR 38 mL/min/1.73m2, and potassium 4.5 mEq/L.

Meds: metoprolol SR 100 mg qd, furosemide 40 mg bid, enalapril 10 mg bid, rosuvastatin 40 mg qd, eplerenone 50 mg qd, aspirin 81 mg qd

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

Consistent	**Not Consistent**
Consider discontinuing enalapril and initiating sacubitril/valsartan after 36 hours.	Initiate fixed-dose isosorbide dinitrate/ hydralazine.
Consider adding ivabradine to current medications.	Add sacubitril/valsartan to current regimen

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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
643	57.41% (36.27)	72.42% (33.25)	**26.15%**	<.0005	.430	29.27%	1.00

A statistically significant gain (26%, $p < .0005$) was measured from baseline to the final RealIndex which resulted in a moderate effect size ($d = .430$) with a non-overlap of 29.27%. This result demonstrated a high degree of statistical power (1.00).

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

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Levels 3-5 - Learning Domain Summary: By Location

Charlotte (N =59)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	61.90% (41.04)	91.67% (24.50)	**48.10%**	< .0005
Competence	12.00% (33.17)	52.00% (51.00)	**333.0%**	< .005
Confidence	1.85 (0.81)	2.75 (0.77)	**48.65%**	< .0005
Practice**	3.81 (1.32)	5.00 (-)	**31.23%**	< .001
ReallIndex**	56.07% (35.52)	73.45% (36.10)	**31.00%**	< .007

Cincinnati (N = 48)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	36.11% (45.69)	88.90% (29.55)	**146.19%**	< .0005
Competence	14.29% (35.86)	85.71% (35.86)	**500.0%**	< .0005
Confidence	1.59 (0.94)	2.88 (0.99)	**81.13%**	< .0005
Practice**	3.28 (1.27)	4.83 (0.38)	**47.27%**	< .0005
ReallIndex**	63.89% (28.31)	61.81% (34.41)	**-3.13%**	= .0.748

Columbia (N = 45)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	52.78% (41.31)	97.22% (11.61)	**84.20%**	< .0005
Competence	31.58% (47.57)	57.89% (50.72)	**83.31%**	=.0 172
Confidence	2.05 (0.99)	2.82 (0.66)	**37.56%**	< .0005
Practice**	3.63 (1.36)	4.63 (0.62)	**27.27%**	< .0010
ReallIndex**	57.96% (36.32)	59.81% (32.97)	**3.19%**	= 0.792

Dallas (N = 103)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	43.33% (43.63)	72.50% (41.60)	**67.32%**	< .001
Competence	10.71% (31.50)	78.57% (41.77)	**633.61%**	< .0005
Confidence	1.88 (0.93)	3.53 (0.94)	**87.77%**	< .0005
Practice**	3.91 (1.34)	4.91 (0.29)	**25.58%**	< .003
ReallIndex**	52.43% (38.70)	83.25% (30.26)	**58.78%**	< .0005

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Levels 3-5 - Learning Domain Summary: By Location

** Performance metric

Fairfax (N = 51)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	38.24% (43.11)	83.33% (34.16)	**117.91%**	< .0005
Competence	28.57% (46.29)	42.86% (50.71)	**50.02%**	= 0.419
Confidence	1.80 (1.11)	3.05 (1.10)	**69.44%**	< .0005
Practice**	3.75 (1.12)	4.85 (0.50)	**29.33%**	< .0005
ReallIndex**	54.25% (37.62)	74.02% (31.61)	**36.44%**	< .008

Orlando (N = 116)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	46.21% (45.83)	76.52% (39.44)	**65.60%**	< .0005
Competence	19.57% (40.10)	60.87% (49.34)	**211.04%**	< .0005
Confidence	1.72 (0.85)	3.25 (0.92)	**88.95%**	< .0005
Practice**	3.93 (1.15)	4.96 (0.19)	**26.21%**	< .0005
ReallIndex**	62.43% (37.24)	74.21% (32.70)	**18.90%**	< .005

Phoenix (N = 94)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	44.44% (43.17)	83.33% (32.38)	**87.51%**	< .0005
Competence	20.00% (40.58)	48.57% (50.71)	**142.85%**	< .023
Confidence	1.90 (0.99)	2.83 (1.10)	**48.95%**	< .0005
Practice**	4.22 (0.89)	4.67 (0.55)	**10.66%**	< .008
ReallIndex**	59.04% (35.00)	62.41% (35.13)	**5.71%**	= 0.504

Pittsburg (N = 56)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	53.13% (45.44)	87.50% (26.29)	**64.70%**	< .0005
Competence	20.00% (40.68)	66.67% (47.94)	**233.35%**	< .0005
Confidence	2.14 (1.10)	3.14 (1.01)	**46.73%**	< .001
Practice**	3.25 (1.36)	5.00 (-)	**53.85%**	< .0005
ReallIndex**	56.85% (34.28)	78.13% (29.26)	**37.43%**	< .0005

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Levels 3-5 - Learning Domain Summary: By Location

Seattle (N = 71)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	45.00% (45.46)	83.00% (35.87)	**84.44%**	< .0005
Competence	17.86% (39.00)	75.00% (44.10)	**319.93%**	< .0005
Confidence	2.04 (0.96)	3.12 (0.91)	**52.94%**	< .0005
Practice**	3.73 (0.98)	5.00 (-)	**34.05%**	< .0005
ReallIndex**	53.40% (38.44)	75.70% (30.27)	**41.76%**	< .0005

White Plains (N =58)

Outcome Indicator	Pre-Test Avg. Score (SDS)	Post-Test Avg. Score (SDS)	% Change	P - Value
Knowledge	38.89% (45.00)	69.83% (42.86)	**79.55%**	< .0005
Competence	21.43% (41.77)	50.00% (50.92)	**133.32%**	= .02
Confidence	1.87 (0.87)	3.13 (1.22)	**67.38%**	< .0005
Practice**	4.20 (0.95)	5.00 (-)	**19.05%**	=. 001
ReallIndex**	54.77% (39.65)	62.13% (30.23)	**13.44%**	=.02

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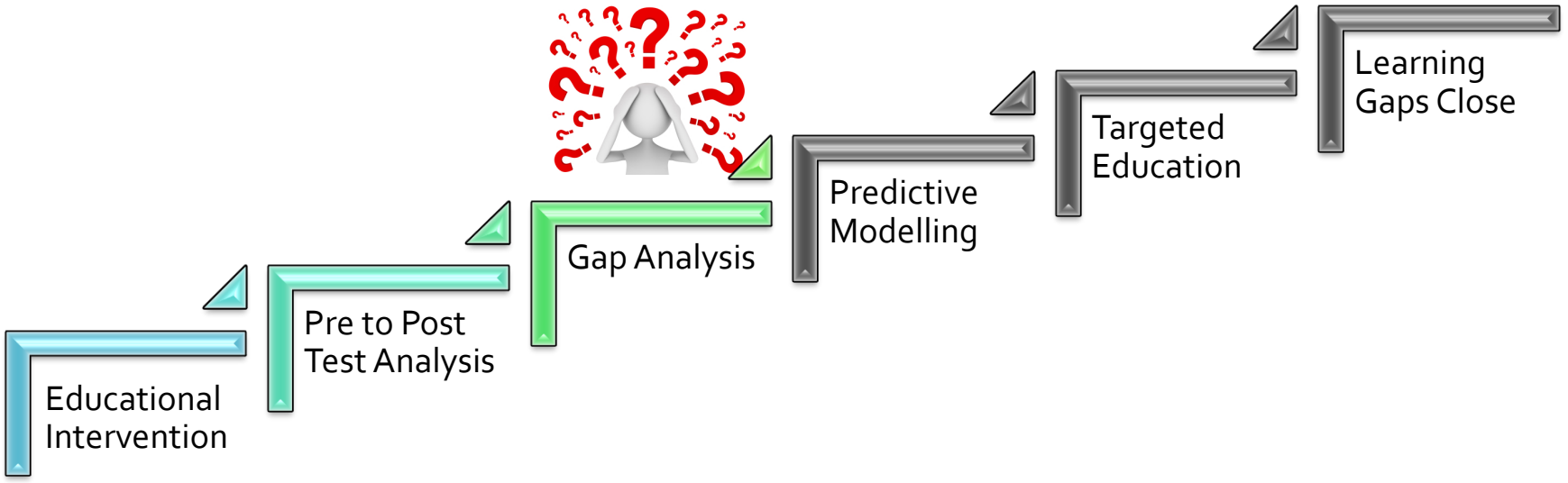
Item-Level/Gap Analysis
(Including Analysis of Demographic Correlations)



Knowledge

Question Symptoms of CHF

Which of the following findings on physical examination has high specificity for heart failure and is independently associated with adverse outcomes in heart failure?

Correct Answer	Choice	Pre-Test (N =469)	Post-Test (N = 513)
	1. Ascites	9.6%	11.7%
	2. Peripheral edema	37.7%	6.8%
	3. Heart rate > 70 bpm	2.6%	6.8%
X	**4. Presence of third heart sound**	**50.1%**	**74.7%**

Question Predictive value of BNP testing

A serum BNP level of 650 pg/mL in a clinically appropriate patient has what approximate predictive value for heart failure?

Correct Answer	Choice	Pre-Test (N = 467)	Post-Test (N = 495)
X	**1. High positive-predictive value**	**42.2%**	**68.3%**
	2. High negative-predictive value	5.8%	15.2%
	3. Modest positive-predictive value	49.0%	14.9%
	4. Modest negative-predictive value	3.0%	1.6%

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Competence

Question Optimizing treatment

A 64-year-old African American woman presents with a history of NYHA class II/stage C heart failure with left ventricular ejection fraction 30%, hypertension, and dyslipidemia. She reports shortness of breath ONLY when climbing stairs, but no other symptoms. BP 116/78 mmHg, HR 64 bpm, potassium 4.7 mEq/L, and eGFR 34 mL/min/1.73m^2.
Meds: metoprolol succinate 200 mg qd, furosemide 40 mg bid, lisinopril 20 mg qd, eplerenone 50 mg qd, atorvastatin 80 mg qd, and aspirin 81 mg qd.
Which of the following might be appropriate at this time?

Correct Answer	Choice	Pre-Test (N = 459)	Post-Test (N = 526)
	1. Patient is stable; maintain current regimen	41.4%	13.1%
	2. Discontinue metoprolol and initiative	10.5%	12.2%
X	**3. Initiate fixed-dose isorbide dinitrate/hydralazine**	**20.5%**	**55.9%**
	4. Discontinue lisinopril and initiative sacubitril/valsartan after 36 hours	27.7%	18.8%

Confidence

Question Managing CHF using guidelines/evidence

Please rate your confidence in your ability to manage patients with heart failure in accordance with current guidelines and evidence:

Choice	Pre-Test (N = 470)	Post-Test (N = 390)
Not at all confident	39.8%	4.9%
Slightly confident	34.3%	25.6%
Moderately confident	19.6%	41.3%
Pretty much confident	5.1%	22.1%
Very confident	1.3%	6.2%

Learners' self-reported Confidence at Pre-Test was very low, with learner responses largely ranging from "not confident at all" (40%) to only "slightly confident" (34%). Post-Test Confidence improved by 108%, providing evidence that the curriculum met an area of educational need. Learners remain restrained regarding their Confidence, at Post-Test, indicating an awareness of their deficits.

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Practice Strategy

Question Optimizing therapy and race/ethnicity

How often do you consider a patient's race/ethnicity when optimizing medical therapy for chronic heart failure?

Choice	Pre-Test (N = 470)	Post-Test (N = 390)
Never	39.8%	4.9%
Rarely	34.3%	25.6%
Sometimes	19.6%	41.3%
Often	5.1%	22.1%
Always	1.3%	6.2%

At Pre-Test, learners' self-reported practice strategy responses indicated that learners did not consider race/ethnicity when optimizing medical therapy for CHF; however, at Post-Test the majority of learners reported that they were going to do so "sometimes" or "often" demonstrating that learners are starting to recognize the importance of considering race/ethnicity when optimizing CHF treatment.

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The RealIndex

A 68-year-old white man, NYHA class II/stage C heart failure and left ventricular ejection fraction 30%, CAD, hypertension, and dyslipidemia presents for a checkup. He reports shortness of breath ONLY when he walks up stairs, but no other symptoms. BP today is 122/74 mmHg, HR 78 bpm, eGFR 38 mL/min/1.73m2, and potassium 4.5 mEq/L.

Meds: metoprolol SR 100 mg qd, furosemide 40 mg bid, enalapril 10 mg bid, rosuvastatin 40 mg qd, eplerenone 50 mg qd, aspirin 81 mg qd

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

Consistent	**Not Consistent**
Consider discontinuing enalapril and initiating sacubitril/valsartan after 36 hours. **(61.30% BL → 89.66% FINAL)**	Initiate fixed-dose isosorbide dinitrate/ hydralazine. **(50.47% BL → 83.49% FINAL)**
Consider adding ivabradine to current medications. **(58.85% BL → 62.68% FINAL)**	Add sacubitril/valsartan to current regimen **(65.28% BL → 46.63% FINAL)**

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Non-Matched ARS Questions: Case Presentations

Case #1

A 72-year-old Asian female with Class II HFrEF and Asthma

- Previously treated with carvedilol, but reported pulmonary symptoms when dose titrated to 6.25 mg bid
- Reports frequent wheezing despite use of inhaled LABA/ICS
- Switched to bisoprolol 5mg but wheezing did not improve
- Reduced dose to 2.5 mg qd after phone consult
- Wheezing still interferes with her sleep and walking up stairs

Case #1 (cont'd)

Medical History:

- Stage C, NYHA class II HF; LVEF 30%
- NSTEMI 3 years ago; hypertension; dyslipidemia; non smoker

Physical examination:

- BP 108/64 mmHg, heart rate 84 bpm, resp. 18 bpm, afebrile
- Normal sinus rhythm; wheezing without rales or crackles; trace edema

Medications:

- Lisinopril 20 mg qd, furosemide 80 mg qd, eplerenone 50 mg qd, bisoprolol 2.5 mg qd, atorvastatin 80 mg qd, aspirin 81 mg qd, fluticasone propionate/salmeterol 250/50mcg, albuterol 2 puffs BID PRN

Labs:

- Creatinine 2.0 mg/dL, eGFR 34 mL/min/1.37m^2

Non-Matched ARS Questions: Case Presentations

Case #2

A 60-year-old white female presents for a checkup

Medical history:
- Diagnosed with HF 1 year ago, LVEF 38%
- CAD treated with stent
- Hypertension, T2DM, and dyslipidemia

Chief complaint:
- Evaluated 4 weeks ago for chronic cough without fever
- Lisinopril discontinued and valsartan started
- Over past 2 weeks, cough resolving
- Moderate SOB after walking 1 block

Medications:
- Metoprolol succinate 200 mg qd, valsartan 160 mg bid, furosemide 40 mg bid, ASA 81 mg qd, atorvastatin 80 mg qd, clopidogrel 75 mg qd

Case #2 (cont'd)

Physical examination:
- BP 135/80 mmHg, pulse 70 bpm, resp. 18 bpm, afebrile
- Trace pedal edema
- Weight has been stable
- Otherwise unremarkable

Blood tests:
- CBC: WNL
- Metabolic panel: WNL
- Cardiac troponin: 0.04 ng/mL (normal < 0.04 ng/ml)

Non-Matched ARS Questions: Case Presentations

Case #2 (cont'd)

Medication changes:

- Initiated sacubitril/valsartan at 49/51 mg
- Titrated to 97/103 mg 4 weeks later
- Patient reports good exercise tolerance (NYHA class II)

Case #2 (cont'd)

1 week later, presents to ER with chest pain

- Denies dyspnea, PND, orthopnea

Physical examination:

- BP 120/72 mmHg, pulse 68 bpm, resp. 16 bpm, afebrile
- Otherwise unremarkable

Studies:

- CBC, metabolic panel: WNL
- Cardiac troponin X: WNL
- BNP: 600 pg/mL (normal ≤ 100 pg/ml)
- Chest X-ray: cardiomegaly but no pulmonary congestion

Non-Matched ARS Questions: Case Presentations

Case # 3

58-year-old AA woman

Medical history:

- Non-ischemic cardiomyopathy and hypertension
- Frequent SOB during normal daily activities
- "1 pillow" orthopnea
- Hospitalized 6 months ago for HF
- Dilated LV; LVEF 38%; mild mitral regurgitation; no history CAD

Physical examination:

- BP 125/80 mmHg, pulse 68 bpm, weight 255 lbs
- No JVD; lungs clear; regular rate and rhythm; grade 2/6 systolic murmur; abdomen soft non tender; extremities 1+ bilateral edema

Medications:

- Valsartan 160 mg qd; carvedilol 25 mg bid; furosemide 40 mg bid. Allergic to enalapril

Case #3 (cont'd)

Clinical Pearl #1

- Patient has NYHA Class III HF, moderately symptomatic
- Patient was recently hospitalized due to HF
- During this follow up visit:
  - evaluate for ongoing/new symptoms
  - optimize evidence-based therapy to improve symptoms, reduce hospitalization and increase survival

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

Question 1 Case 1

What course would you follow at this time?

Correct Answer	Choice	Internal Item (N = 411)
	Switch from bisoprolol to atenolol	4.6%
X	Discontinue bisoprolol and initiate ivabradine	**54.0%**
	Discontinue bisoprolol and maintain other current medications	11.2%
	Discontinue lisinopril and initiate ARB	30.2%

Question 2 Case 2

Patient has moderate SOB with exertion. What change, if any, would you make to her medication regimen?

Correct Answer	Choice	Internal Item (N = 370)
	No change	3.8%
X	**Add aldosterone antagonist**	**22.7%**
	Add isosorbide dinitrate/hydralazine	35.7%
X	**Stop valsartan and start sacubitril/valsartan**	**37.8%**

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

Question 3 Case 2

Why is BNP elevated in this patient?

Correct Answer	Choice	Internal Item (N = 397)
	Exacerbation of HF	40.6%
	Myocardial infarction	10.%
X	**Expected effect of sacubitril/valsartan**	**42.3%**
	None of the above	6.8%

Question 4 Case 3

What would you add to this patient's medication regimen to reduce risk for CV events and improve survival?

Correct Answer	Choice	Internal Item (N = 395)
	Digoxin	4.1
	Ivabradine	20.0%
	Sacubitril/valsartan	25.6%
X	**Isosorbide dinitrate/hydralazine**	**50.4%**

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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 Competence.
  - **Knowledge** gain of 80% from low Pre-Test average scores of 46% were achieved by learners.
  - **Competence** gain of 231% from very low Pre-Test average scores of 19% were achieved.
    - While gains were substantial and significant, learners continued to struggle, at Post-Test, with the Competence.
  - **RealIndex** gains were more modest, but reflected an improvement of 26%, at Post-Test, which is well above established benchmarks.
- Learners' **Confidence** ratings were incredibly low at Pre-Test, and while statistically significant gains of 108% were achieved, learners Confidence remained moderate at Post-Test suggesting awareness of deficits, particularly, for items related to treating CHF.
- At Post-Test, the majority of learners indicated their **practice strategy** would be to carefully consider their patients' race/ethnicity when optimizing medical therapy for CHF.

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Summary of Gap Analysis

The RealIndex

A 68-year-old white man, NYHA class II/stage C heart failure and left ventricular ejection fraction 30%, CAD, hypertension, and dyslipidemia presents for a checkup. He reports shortness of breath ONLY when he walks up stairs, but no other symptoms. BP today is 122/74 mmHg, HR 78 bpm, eGFR 38 mL/min/1.73m2, and potassium 4.5 mEq/L.

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Consider adding ivabradine to current medications. **(58.85% BL → 62.68% FINAL)**	Add sacubitril/valsartan to current regimen **(65.28% BL → 46.63% FINAL)**

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. **Competence** related to optimizing CHF treatment for patients proved challenging to learners at Post-Test.
2. **Performance behavior (RealIndex)** related to "consider adding ivabradine to current medications." proved difficult with 37% of learners incorrectly responding at Post-Test.
3. **Performance behavior (RealIndex)** approximately 53% of learners failed to indicate that "add sacubitril/valsartan to current regimen" is not consistent with current clinical practice.
4. **Knowledge** of predictive value of serum BNP testing for confirming CHF in clinically appropriate patients was improved, from Pre-Test, but learner results suggest there is further room for growth.
5. While **Confidence** improved significantly, learners would benefit from further education that reinforces Knowledge, Competence, and Performance related to optimizing treatment for CHF patients, as they reported modest Confidence levels, at Post-Test.

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Retention: 4 Weeks Post-Curriculum (*N* = 55)

Knowledge & Competence

- Learners demonstrated sustained proficiency for Knowledge of findings on a physical exam including the presence of a third heart sound as well as the predictive value of serum BNP testing for confirming CHF.
- Slippage from Post-Test was observed for Competence; learners struggled with optimizing treatment for a for a 64 YO AA women presenting with a history of NYHA class II/Stage C CHF. This issue of slippage for treatment optimization was evident throughout the curriculum, at Post-Test and the 4 week follow-up.

Performance (RealIndex)

- Slippage for performance related items related to treatment optimization were evident on the RealIndex (Performance Metric), at the 4 week follow-up, with one notable exception:
  - Learners demonstrates proficiency for "consider discontinuing enalapril and initiating sacubitril/valsartan after 36 hours", but otherwise struggled with the items related to treatment optimization, at the 4 week follow-up.

Persistent Learning Gap

- Learners' retention at the 4 week follow-up was mixed. They performed well on Knowledge items measuring diagnostics, however, they demonstrated a persistent lack of proficiency with treatment optimization including difficulties with both Competence and RealIndex performance measures of measuring treatment optimization.
- The predictive model that follows will identify drivers that can help prevent slippage, facilitate attainment and lead to higher Confidence. This includes the predicted magnitude of change expected if the learning gaps are successfully addressed.

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Clinical Challenges In Individualized Heart Failure Treatment
(**Comments received from attendees at 4 week follow-up**)

What specific *skills* or *practice behaviors* have you implemented for patients with CHF since this CME activity?

- "I monitor patients CV drugs more carefully"
- "I work more closely with my cardiologists"
- Heart sounds re-evaluate treatment for each individual
- "I pay more attention to BP control and addressing risk factors like smoking"
- "I order more Echocardiograms to adjust medications appropriately"
- "I monitor weights more carefully in patients"
- "I have been using more evidence based medicine to treat heart failure patients"
- "I feel like I can do a better job of diagnosis and follow-up"

What specific *barriers* have you encountered that may have prevented you from successfully implementing strategies for patients with CHF since this CME activity?

- Cost of medication
- Patient language barriers
- Patient compliance with treatment
- Insurance formulary limitations
- Patient resistance to changing their medications
- Time restraints
- Insurance coverage

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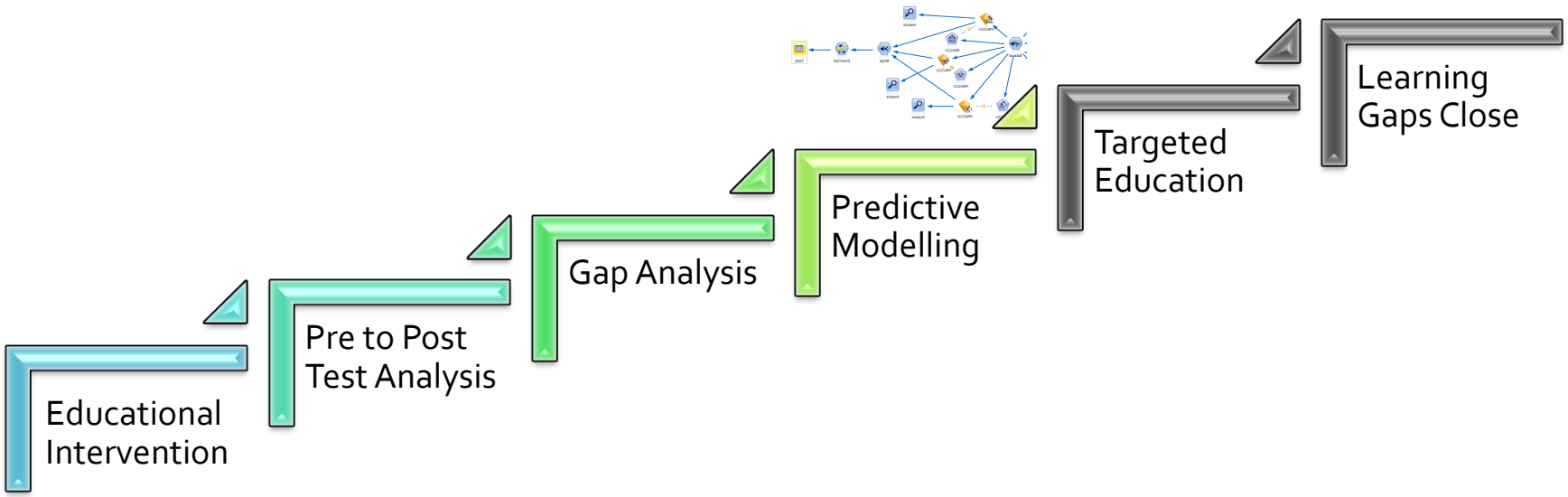
Predictive Modeling



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.

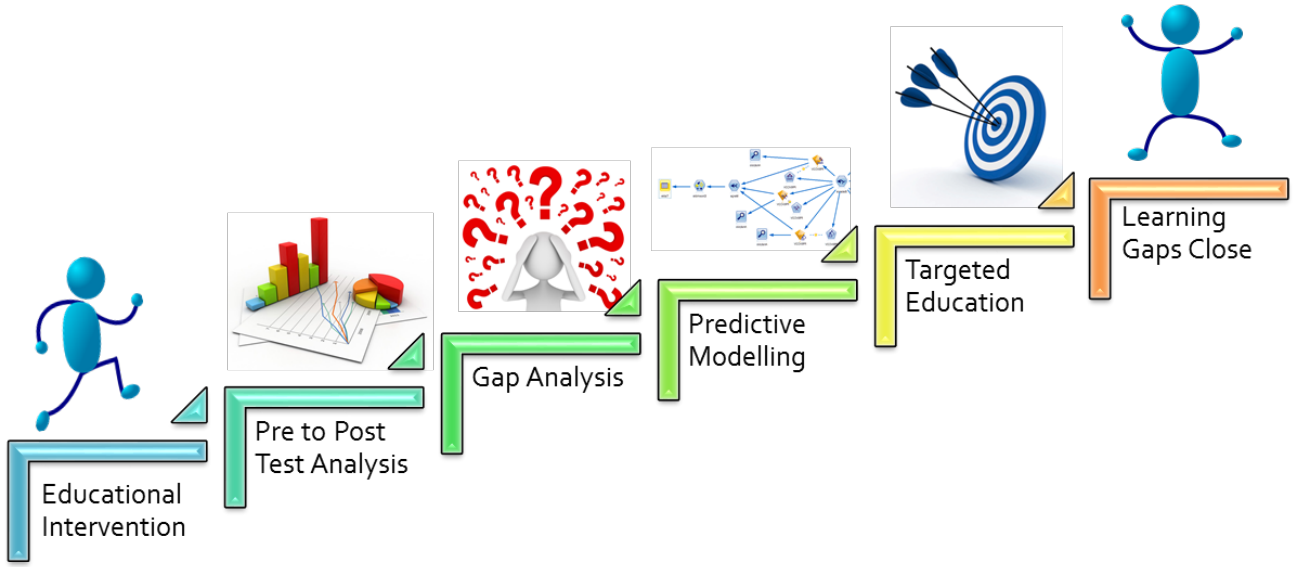
Learner demographics, as well as the remaining knowledge, competence, confidence, practice strategy and clinical performance items are modeled against the target gap score (Post-Test) to identify areas that can not only reduce these gaps, but provide guidance on how to develop education proactively.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

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.



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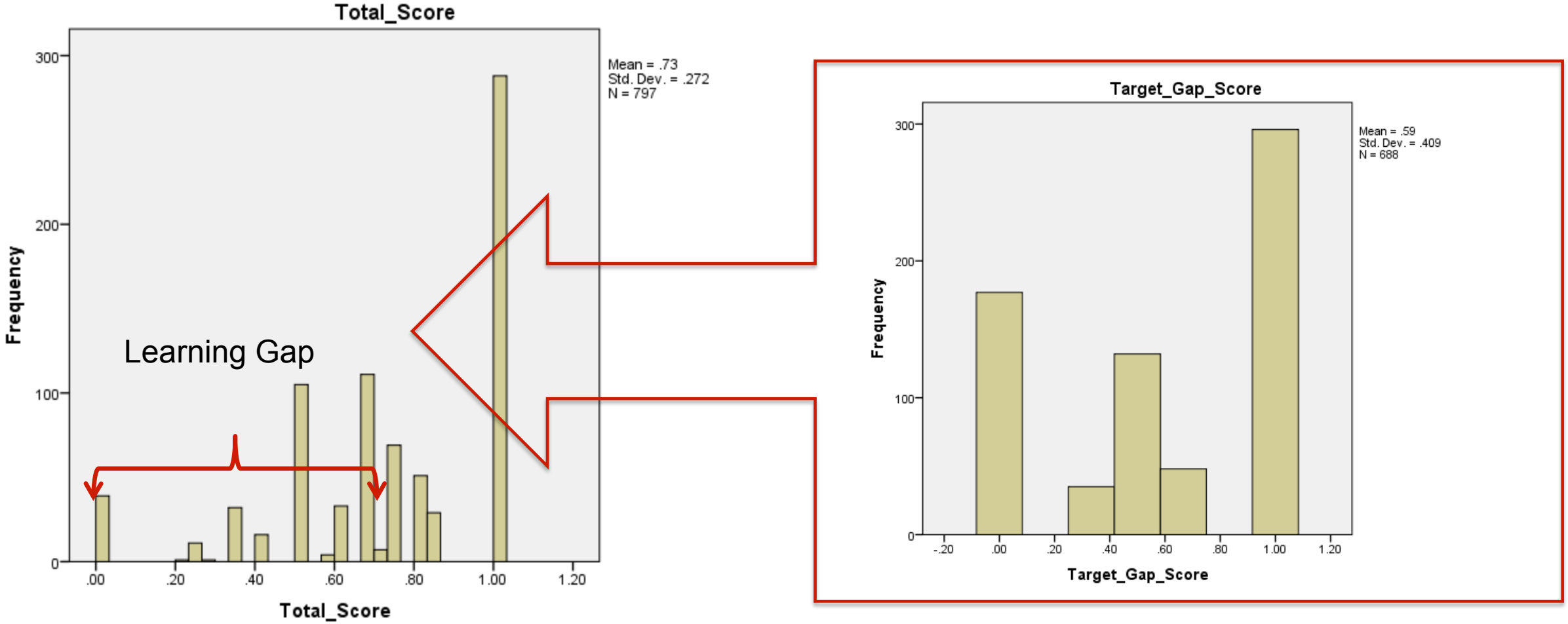
Target Gap Score:

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: Optimizing Treatment for CHF**

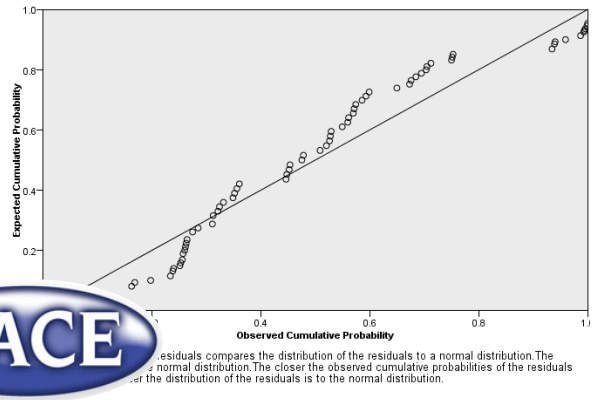


The Model: Identifying Significant Drivers

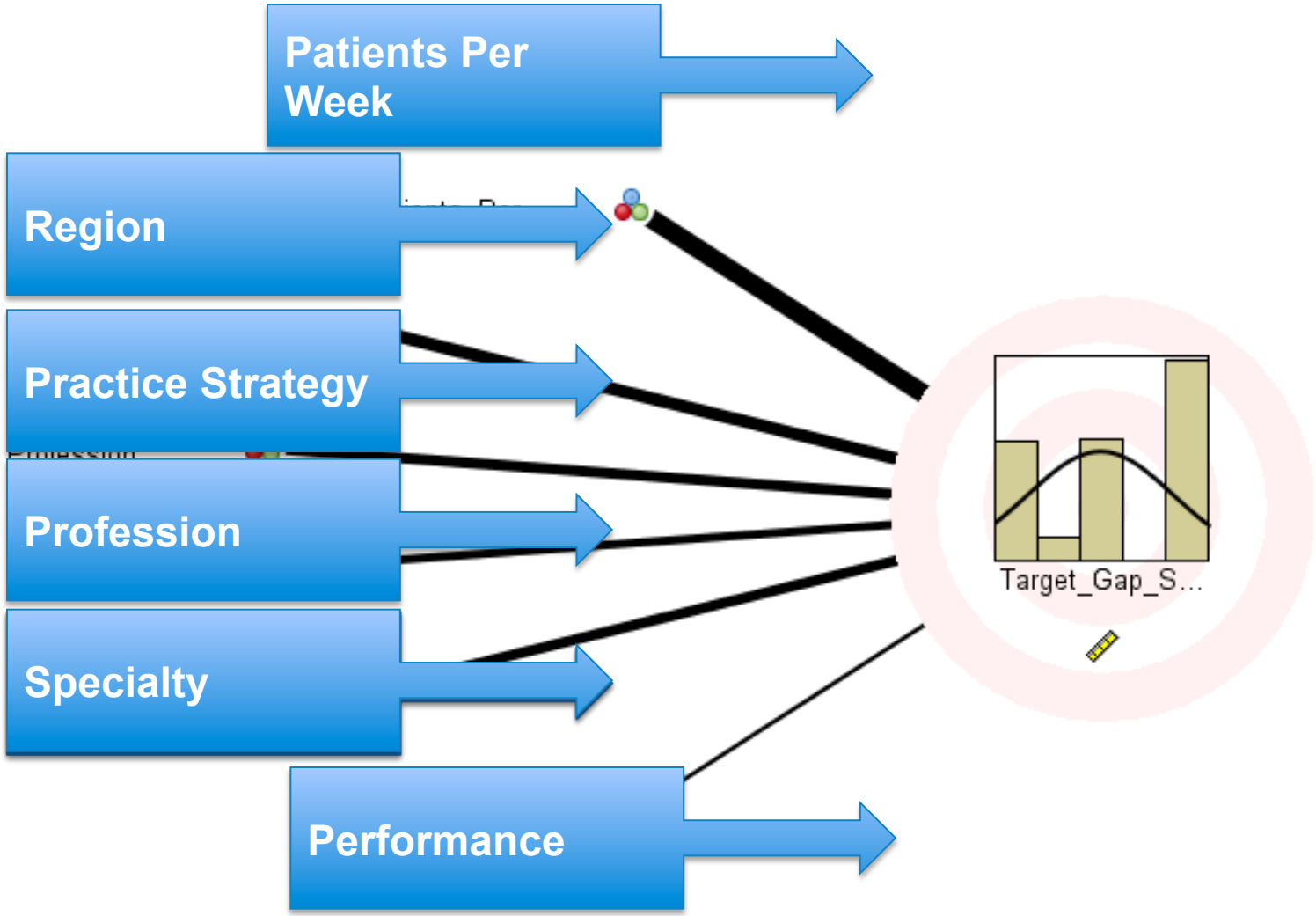
All questions across the learning domains (including knowledge, competence, confidence, and practice strategy), as well as learner demographics were analyzed to identify positive and/or negative predictors of learners' target (or gap).

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

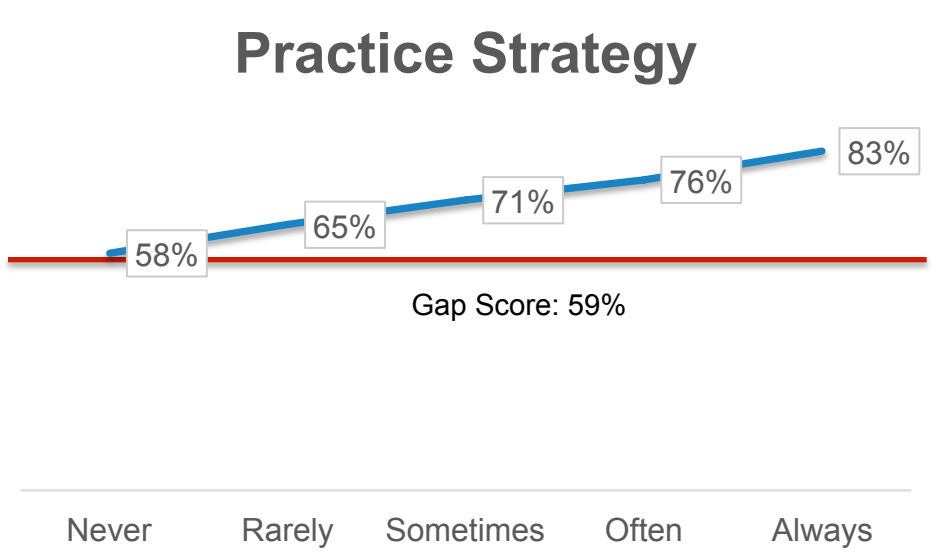
It is important to note that drivers can *facilitate* or *hinder* learners' performance. This means they can have either a positive or a negative influence on performance.

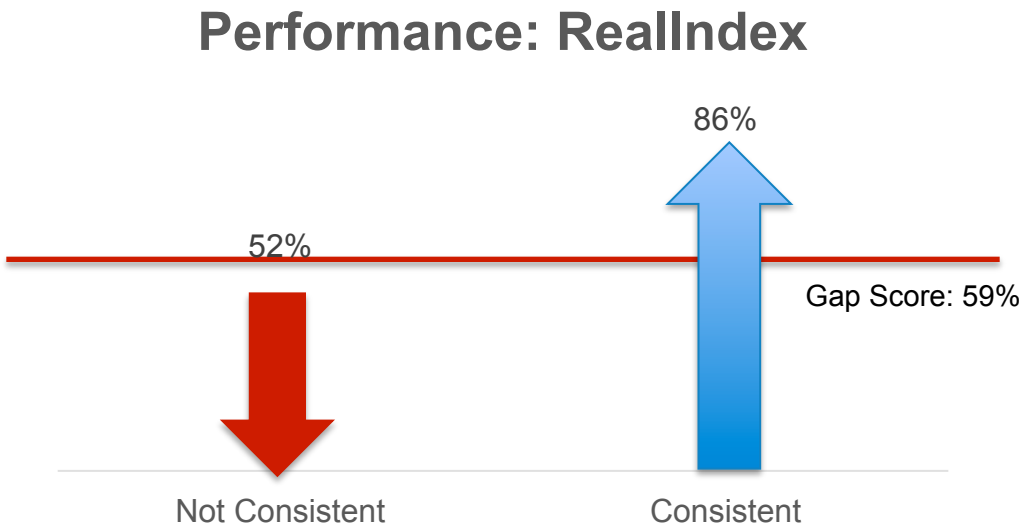


esiduals compares the distribution of the residuals to a normal distribution.The normal distribution.The closer the observed cumulative probabilities of the residuals er the distribution of the residuals is to the normal distribution.

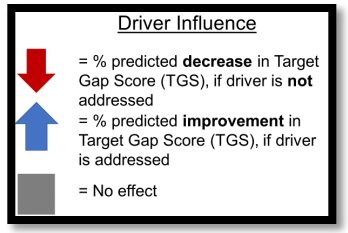


Education Drivers





- Predicted scores provide evidence that learners would benefit from a better grasp of clinically appropriate practice strategy. More specifically, reinforcement of the importance of considering racial/ethnic differences when optimizing patients' treatment of CHF.
- Equally, learners would benefit from education that underpins the optimization of treatment for patients with CHF; precisely when to modify current treatments, including appropriate medication selection/combination to improve patient outcomes.



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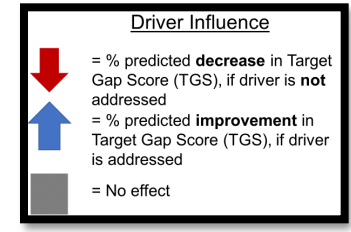
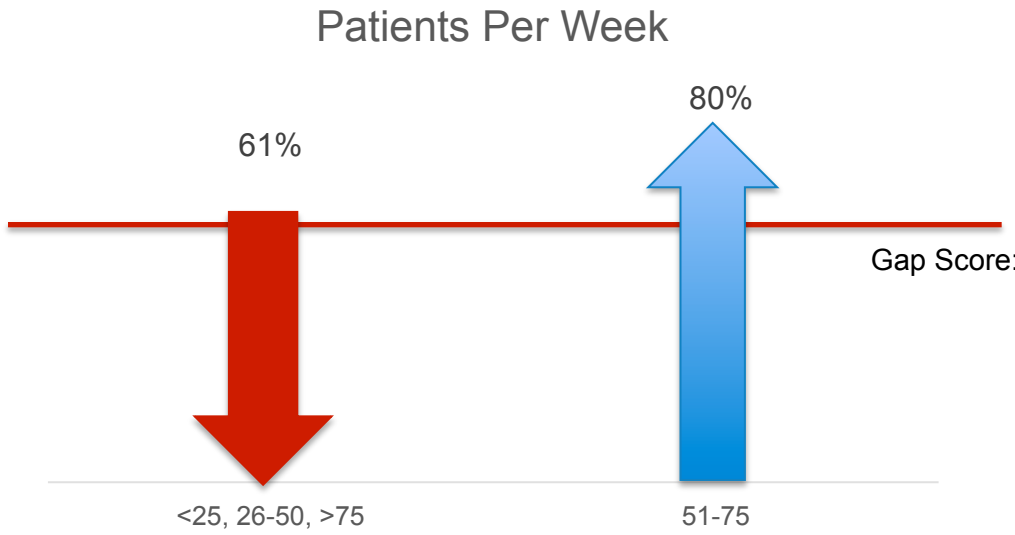
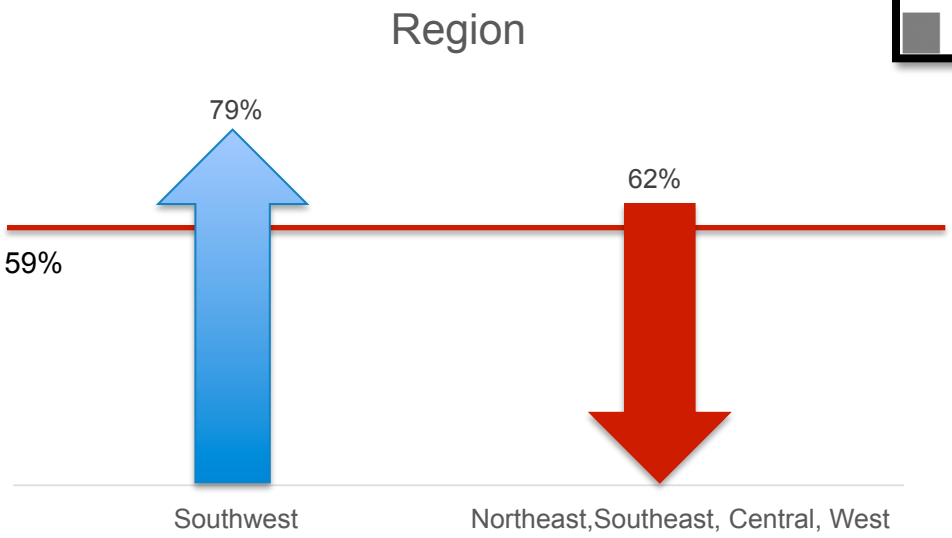
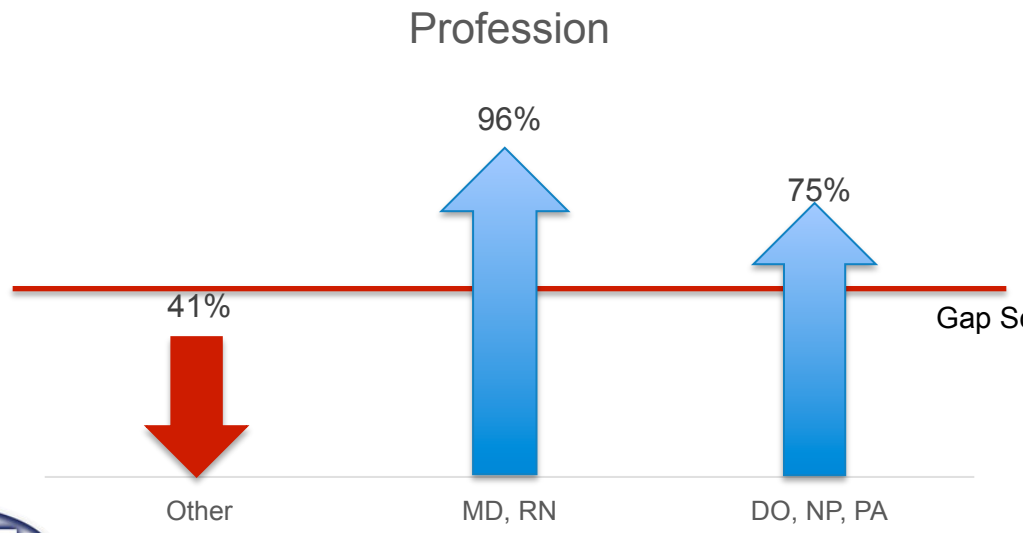
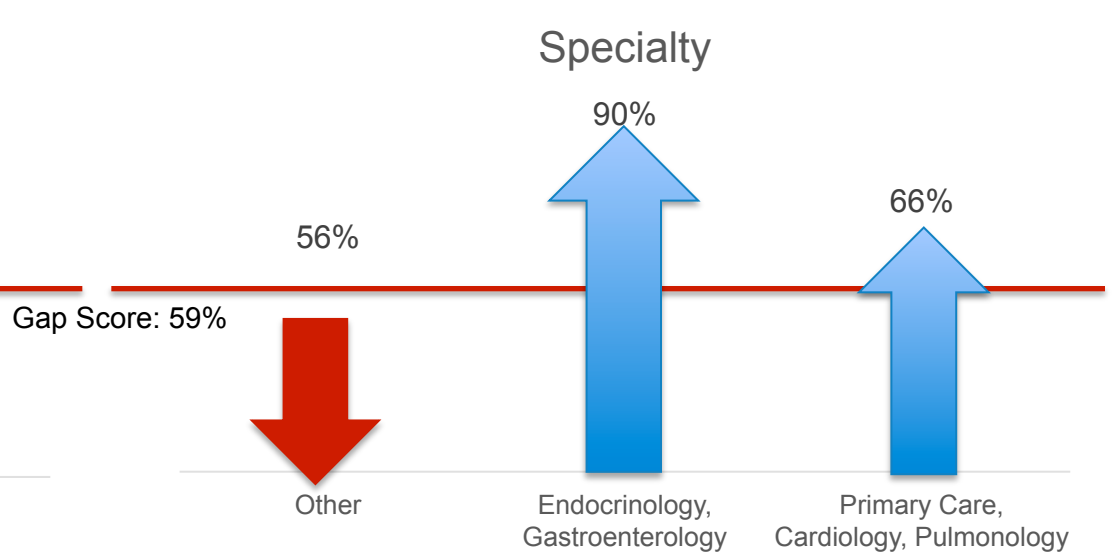
Demographic Drivers











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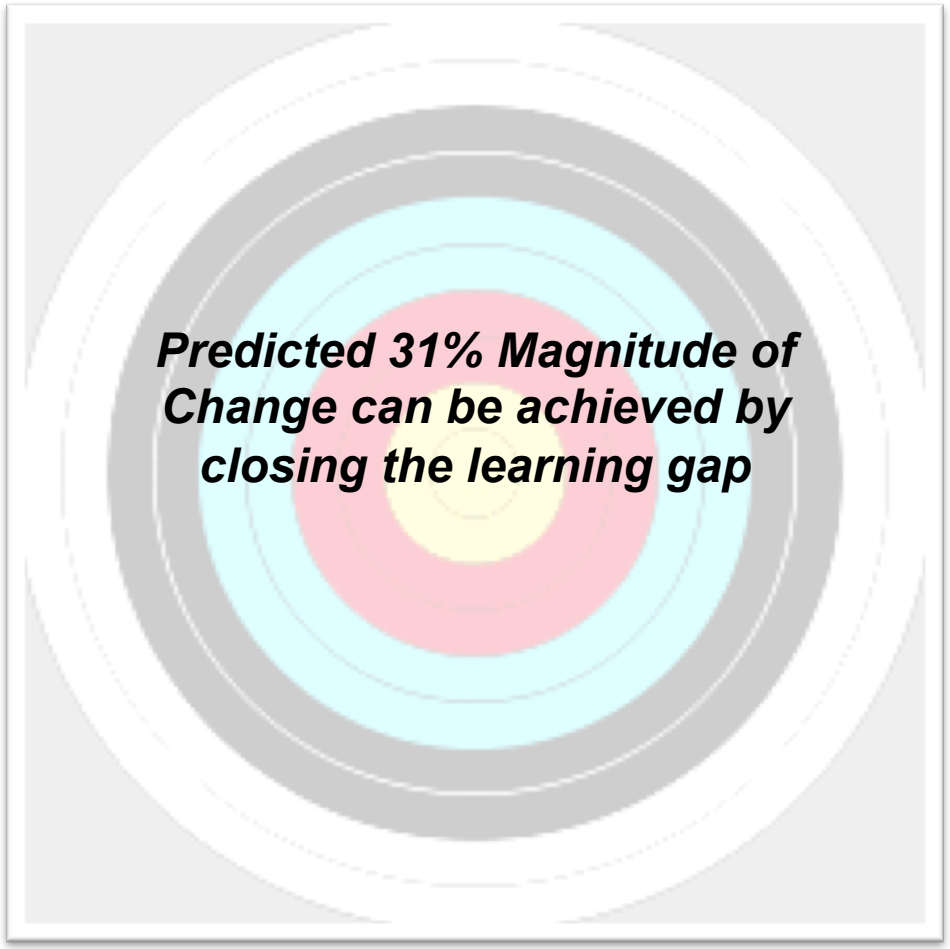
Predicted Magnitude of Change

By addressing these drivers a 31**%** **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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CHF Predictive Model: Summary of Findings

- Results from the final advanced analysis revealed an educational gap **regarding optimizing and individualizing CHF treatment for patients.**
- The final predictive modeling procedure identified drivers that, if addressed in future education, will lead to an estimated 31**% (magnitude of change) improvement in learners' overall proficiency in this area**.
  - Drivers (areas of focus to improve identified gap):
    - **Practice Strategy:** Importance of race/ethnicity
    - **Performance (RealIndex):** Treatment selection/optimization
    - **Patients Per Week:** <25, 26-50, >75
    - **Region:** Northeast, Southeast, Central, & West
    - **Profession:** DO, NP, PA & Other
    - **Specialty**: Primary Care, Cardiology, Pulmonology & Other

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CHF Application of Findings – Applying the Outcomes

Addressing the identified learning gap & drivers

Demographic Targeting

- **Patients Per Week**: <25, 26-50, >75
- **Region:** Northeast, Southeast, Central, & West
- **Profession:** DO, NP, PA & Other
- **Specialty:** Primary Care, Cardiology, Pulmonology & Other

Content Focus

- Treatment optimization proved most challenging for learners, at Post-Test. This area of educational need should incorporate:
  - Ethnic/racial differences to facilitate learners' abilities to effectively treat CHF across the population of CHF patients.
  - Medication selection, including appropriate treatment management to optimize patient outcomes.

Instructional Design

- Curricula that incorporate case-based patient challenges would enable learners to develop a more nuanced approach to individualization and optimization of CHF treatment.
- Serialized learning opportunities can be utilized to facilitate retention and address deficits in performance metrics and Confidence.
- Using "missed opportunities" and/or '' what if" scenarios to further develop learners' abilities to optimize treatment could prove particularly beneficial.

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