NEW PARADIGM OF DISEASE MANAGEMENT

• 1) poor referral to PR
• 2) poor accessibility
• 3) poor compliance to care plan
• 4) Waning PR effects
  • No change in exercise behavior after PR intervention
  • Stable capacity over time and poor correlation to activity change
• 5) Underwhelmed participants in PR
  • What you see is what you get…(?)
WHAT IS ARTIFICIAL INTELLIGENCE (AI)?

- AI is use of a computer to model intelligent behavior with minimal human intervention
  - started with the invention of robots
- AI is applicable to a broad range of items in medicine
  - robotics
  - medical diagnosis
  - medical statistics
  - human biology, chemistry, cellular reaction, etc...
HOW IS AI USED IN MEDICINE

VIRTUAL
INFORMATICS APPROACHES FROM DEEP LEARNING INFORMATION

- Control of health management systems, including electronic health records
- Active guidance of physicians in their treatment decisions

PHYSICAL
BEST REPRESENTED BY ROBOTS USED TO ASSIST THE ELDERLY PATIENT OR THE ATTENDING SURGEON

- The future is targeted nano-robots, a unique new drug delivery system
LUNG DISEASE IS BEHAVIORAL

REGULAR PHYSICAL ACTIVITY IS ASSOCIATED WITH LOWER RISK OF ALL-CAUSE DEATH

COPPENHAGEN HEART STUDY (2006)
COPD
The time spent in moderate physical activity was reduced in each COPD stage compared to controls*. Activity in COPD patients can be reduced early in the disease.

IPF
Objectively measured physical activity is a novel predictor of mortality in patients with IPF.

Pulm HTN
Routinely used devices detect a significantly lower daily step count in PAH patient. The most strongly endorsed barriers to physical activity were lack of energy, lack of self-discipline, and lack of interest.
In comparison to control subjects, patients with COPD showed stronger activation in the median prefrontal cortex (A) and the anterior cingulate cortex (B) in response to dyspnea word cues. The activity was independently associated with patient responses on questionnaires of depression, fatigue, and dyspnea vigilance.
LUNG DISEASE IS BEHAVIORAL
BEHAVIORAL ECONOMICS OF DISEASE MANAGEMENT

• Analytic: can be complex or simple trajectory predictions
  • Negative Binomial Distribution (complex): estimates the acceptance rates, dropout rates, and other factors from past data to predict the probability to change behavior
  • Heuristic (simple) Observations use self-education to improve change

• Economic: the “Nudge”
  • the complementary nature of traditional economic interventions and behavioral interventions enhances our ability to explain and predict economic behavior

• Behavioral Economic Primer: changing behavior to improve labor, tax, personal finance, and health outcomes
  • In AI, heuristics are used to make computers smart, yet in some corners of behavioral economics, heuristics are still seen as the reason why people aren’t smart
LUNG DISEASE IS BEHAVIORAL
BEHAVIORAL ECONOMICS OF DISEASE MANAGEMENT

The most popular marketing tools, inspired by the behavioral sciences, tend to include **well-established nudges**:  

A. Social proof or scarcity (limited seating makes it valuable)  
B. Personal biases related to loss (the endowment effect, fear of missing out, etc.)  
C. Framing  
D. Defaults  
E. The Decoy Effect  
F. Anchoring.
So, how do you ethically nudge PR recipients, change their behavior, measure that behavior change, and increase economic benefit to the recipient and the PR/CR program?
APPLICATION OF AI IN LUNG DISEASE

- **Symptom change before vital change**
  1. Cough frequency
  2. RR increase from baseline
  3. Nocturnal Awakenings
  4. Saturation change for same level of activity (from baseline)
  5. Telemetry change
APPLICATION OF AI IN LUNG DISEASE

• **Severity change before seeking assistance**
  
  Auto-calculated CAT score / ACT score

• **Behavior change before symptom recognition**
  
  1) Inhaler use
  
  2) more sedentary time
  
  3) Decreased steps per day (from baseline)
AI USE AS AN ADJUNCT TO PR

• Remote Patient Monitoring (RPM): codes [sic, insert]

• Gaining something from nothing
  1) missing data collection
  2) new age wearables are measurables
  3) Hawthorne Effect and benefit: if you see it, will they come (Back)
AI Example Demonstration
DATA CAPTURE
real-world patient data anywhere, 24/7

PERSONALIZED ANALYTICS

ACTIONABLE INSIGHT
Leverage data proactive indicator of patient anomalies
AI patch has the ability to continuously capture multiple streams of data from a wearable biosensor — across the continuum of care.
Concluding Thoughts

Words from Knowledge Leaders

9 Real World benefits of AI in Healthcare
1. Reduces preventable readmissions

“Automated phone call check-ins after a hospital stay are giving clinicians the unique opportunity to check-in with patients on how their recovery is progressing and to receive additional data after they return home. AI is helping to draw connections between what a patient answers in the phone call and determining if a live follow-up call is warranted from a clinician to talk to the patient and prevent a readmission.”

—John Langton, PhD, director of applied data science at Wolters Kluwer, Health
2. Scales real clinical care

“Wearables and digital health today have been like the early days of computer-generated characters in movies. They looked awfully close to the real thing, like real clinical care, but there’s something missing. But now with high quality comprehensive data sets—in our case a million nights of recorded sleep—we can fully utilize AI to design solutions that take what occurs in the clinical setting—personalized high quality coaching—and help professionals scale it so therapies can achieve their full promise in a larger community or patients and experts.”

—Vik Panda, managing director North America, Dreem
3. Predicts best treatments

"AI is being used to identify people who are likely to become sick and determine what medicines and supportive care will prevent onset or progression. For example, The Business Health Care Group (BHCG), a coalition of employers located in Wisconsin covering 200,000 lives, has partnered with GNS Healthcare (GNS), which uses AI to discover best practices of health care to improve outcomes and lower the cost of care. The GNS platform has been used to identify and optimize the treatment of high-risk patients with diabetes and NASH. Additionally, the GNS AI platform has been used to determine whether multiple myeloma patients will benefit from stem cell transplants."

— Robert Goldberg, PhD, CEO, Thrive HealthRx
4. Maps disparate lab data

“The industry standard of Logical Observation Identifiers Names and Codes (LOINC) ... eliminates data ambiguity across disparate systems and can even facilitate new understanding of previously un-coded and non-standard data. By facilitating this interoperability, the new, normalized data enables analytics for reporting, analysis, quality of care, and other AI projects that otherwise would be impossible. Essentially, AI is giving health systems a tool to make sense of their data across the organizations. This also helps clinicians more quickly detect hospital acquired infections, as machine learning can flag warning signs after sifting through patient data.”

—Langton
5. Early identification and intervention

“Healthcare organizations are using AI to identify people with health risks and intervene early, before a high-cost event like an illness or injury occurs. For example, AI systems can predict when a person is at risk of developing diabetes, and can then engage that person in personalized support programs to help them course-correct. Chatbots and other AI-powered engagement tools can also connect people to available resources and benefits, empowering them to shop for the highest quality of care at the lowest cost.”

—Allison Langley, applied AI scientist at Welltok
6. Manages the supply chain

“AI and machine learning are just beginning to be used in supply chain management. There’s a tremendous amount of rich data constantly flowing from EHRs and enterprise resource planning (ERP) systems. AI allows queries like cost variance analysis and procedure/inventory demand intelligence to update in real time as new information comes in. AI will revolutionize the operating room and materials manager’s ability to plan for and deliver critical supplies at the right time and place, and at the right cost.”

—Todd Plesko, CEO, Syft
7. Improves diagnosis decisions

“Machine learning applied to a large volume of clinical and social determinant data can guide physicians’ judgment and result in more effective diagnoses. Automating administrative tasks with AI-driven voice and video transcription, as well as insight mining will enable physicians and the care team to focus on the patient, instead of tasks and procedures.”

—Balu Nair, CTO, Gray Matter Analytics
8. Enables high-touch support

“AI can help facilitate better, more frequent support beyond the walls of care delivery. Rather than replace the work of clinicians, the right technology and data science solutions can extend their reach and help them focus on the patients most likely to benefit from their guidance.”

—Trishan Panch, MD, MPH, chief medical officer, Wellframe
While it won’t happen overnight, AI and machine learning are poised to significantly impact the industry over the next few years. Healthcare benefits accounts (HSAs, FSAs, and HRAs) will become smart and use AI to identify spending and saving opportunities, deliver more personalized experiences across every stage of a consumer’s healthcare journey, and take the guesswork out of healthcare funding decisions. Healthcare is the perfect fit for AI because everyone wins with better healthcare decisions, outcomes, and financial results.

—Steven Auerbach, CEO, Alegeus
Questions?