



MACHINE LEARNING & AI
FOR **HEALTHCARE**

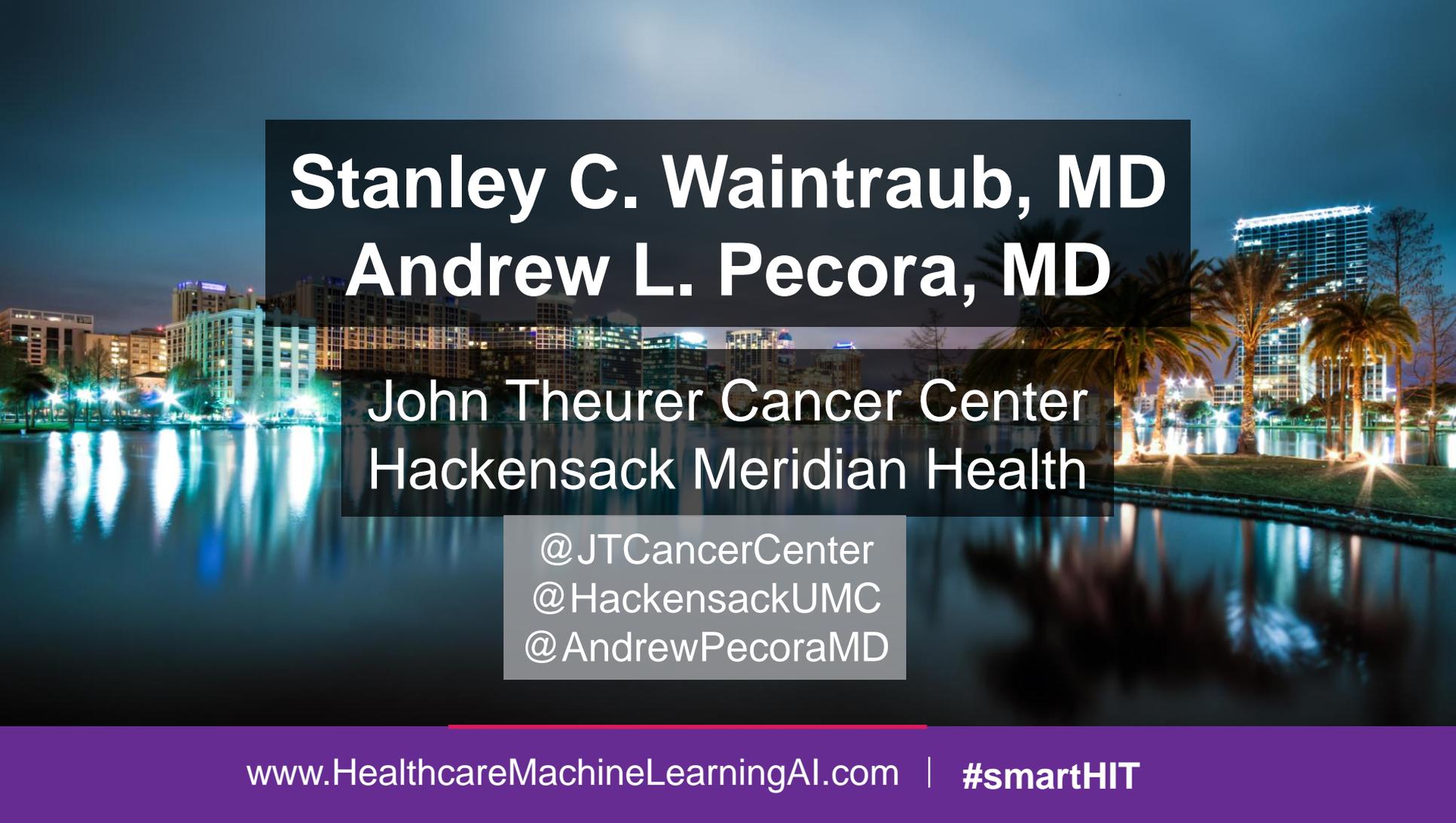
A HIMSS EVENT

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ORLANDO, FL



Cognitive Computing & Real World Data in a Breast Cancer Clinic

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A nighttime photograph of a city skyline reflected in water. The scene is dominated by palm trees in the foreground and several illuminated buildings in the background. The lights from the buildings and palm trees create bright reflections on the water's surface. The sky is a deep blue, suggesting twilight or early night.

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Practice of Oncology has become exceedingly complex

The oncologist looking for treatment guidance may have to search:

- Medical journals
- National guidelines (example: NCCN)
- Paid recommendation websites (example: UptoDate)
- Primary literature websites (example: Pubmed)
- Clinical trial websites (example: clinicaltrials.gov)
- Institutional or payer driven sites



Explosion of biomedical information becomes overwhelming during a busy clinic schedule

What would help?

A Point-of-care decision support:

- available in the clinic at the time of treatment selection,
- that synthesize this diverse medical information,
- while accounting for unique patient factors and
- correcting for local capabilities.



IBM Watson for Oncology (WfO) is a cognitive computing point-of-care system that provides confidence-ranked, evidence-based treatment options:

Cognitive computing refers to systems that

- **learn at scale, reason with purpose, and interact with humans naturally**

WfO formulates treatment options based on

- **structured and unstructured data from the medical literature,**
- **treatment guidelines,**
- **medical records,**
- **imaging, lab and pathology reports, and**
- **is guided by expert Memorial Sloan Kettering Cancer Center training**



Patients treated in routine clinical practice may not have the same characteristics as research subjects enrolled in clinical trials

Presenting “real world” treatment patterns and outcomes as a component of decision support systems may enhance recommendations.

Benchmarks drawn from patients with similar characteristics treated at the same center or elsewhere in the country can provide rationale for practice transformation.



Cota has:

- **Amassed a large real world observational database of cancer patients (abstracted from electronic medical records)**
- **Categorized each patient based on multiple relevant prognostic factors to build cohorts of “medically similar” patients that can be used for easy comparison**

The Cota Nodal Address; JCO-CCI Pecora et al: 2018



A combined point-of-care solution is undergoing testing within our Breast Cancer Clinic

WfO with Cota RWE (WfO/Cota) point-of-care decision support tool:

- ingests patient attributes from the electronic health record (EHR),
- assigns a digital classification (Cota Nodal Address; CNA) to facilitate comparisons against similar patients, and
- displays color-ranked treatment options based on Memorial Sloan Kettering Cancer Center training and medical literature.
- Provides real world most common treatments and outcomes



For the point-of-care support tool to be useful it must:

- 1. Produce recommendations that experts agree are reasonable**
- 2. Be needed (routine care must be lacking otherwise why buy?)**
- 3. Be able to influence decision making**
- 4. Track long term outcomes and costs so that future decisions are better.**



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Concordance of WfO Treatment Options with Disease Specific Expert Opinions

3 Breast cancer experts reviewed 223 cases from our clinic

Physician Type	Green Recommended	Orange For consideration	Red Not recommended
Expert without WfO	78.5% (175 of 223 cases)	9.4% (21 of 223 cases)	12.1% (27 of 223 cases)

**An acceptable WfO treatment strategy was chosen in 87.9% cases
(We agree with WfO most of the time !)**



Disagreements?

Seven of the 88 cases (8%) generated 59% of non-concordant responses with >2 doctors disagreeing with Watson for Oncology.

Interestingly, one of our breast cancer experts previously worked at MSKCC (the WfO training site) – agreed most with the system, suggesting a center effect

A cognitive learning system however can, over time, adapt to local treatment algorithms



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***Concordance of WfO treatment options
with Historical Matched (CNA technique) Controls
in the Real World COTA Observational Database***

Physician Type >10,000 cases in the database	Green Recommended	Orange For consideration	Red Not recommended
Cota Real World without WfO	69.3% (61 of 88 cases)	11.4% (10 of 88 cases)	19.3% (17 of 88 cases)

**Since We thought the Recommendations were Reasonable,
Decision Support is Needed in the Real World**



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Influence of WfO with Cota RWE on Decision Making by Oncologists NOT specializing on Breast Cancer

4 “solid tumor” and 6 “heme malignancy” physicians reviewed cases

Physician Type Non-expert	Green Recommended	Orange For consideration	Red Not recommended
Without support	62.5% (212/ 339 cases)	13.0% (44 of 339 cases)	24.5% (83 of 339 cases)
With support	87.9% (298/ 339 cases)	7.4% (25 of 339 cases)	4.7% (16 of 339 cases)

Treatment choices moved towards data driven recommendations with the system



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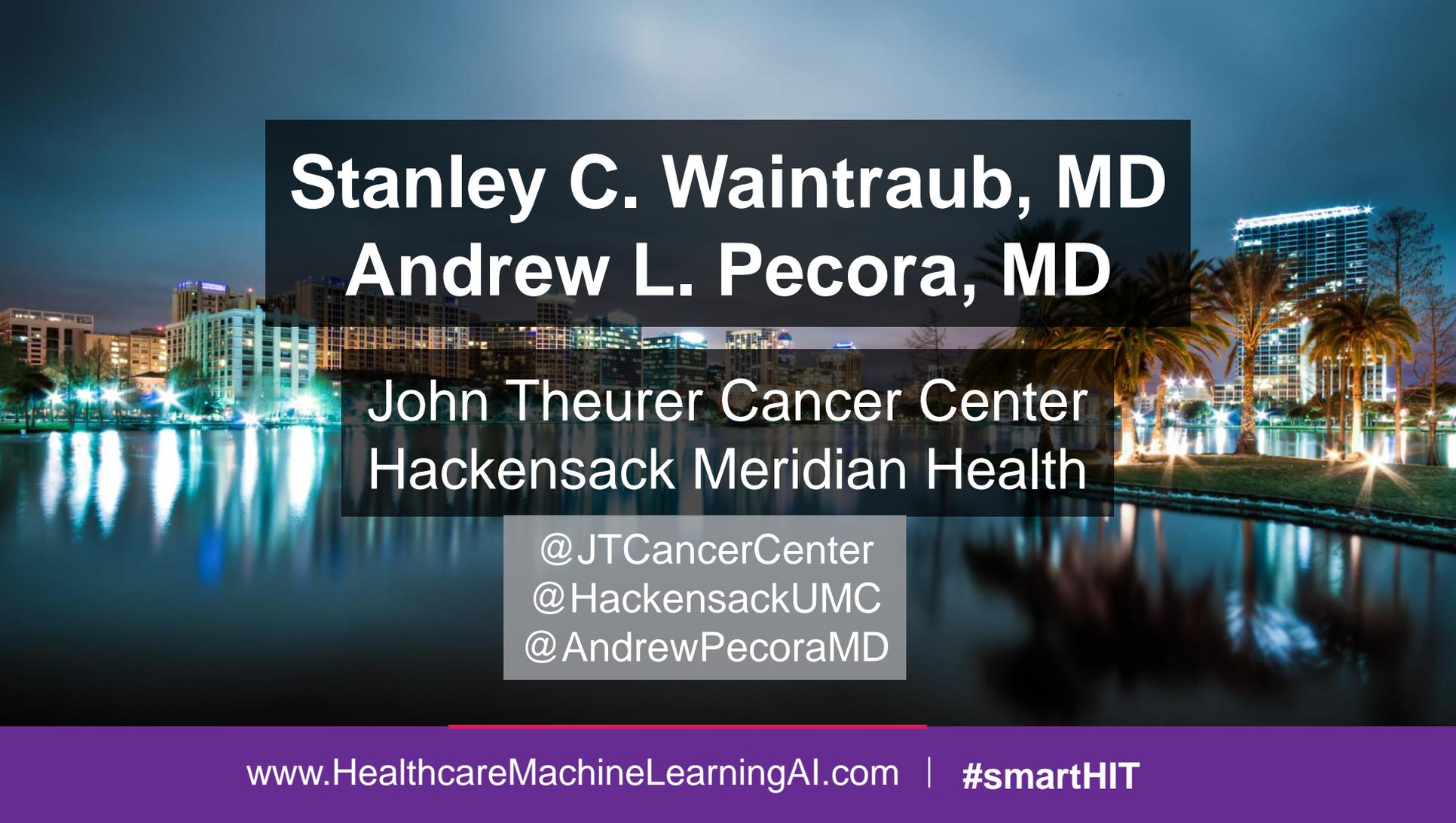
Our breast cancer program is discussing ways with Cota to further enhance the real world application of decision support by

- **Adding center specific most common treatment selection history**
- **Adding 1 and 3 year survival outcomes by treatment choices**
 - **(based on the observational database)**
- **Incorporating cost information**
 - **(or bundle assignment information for value based programs)**



A Cognitive Computing Point of Care Decision Support System supplemented by Real World Data has the potential to:

- 1. Improve treatment selection in complex diseases, such as breast cancer, especially when delivered in non-expert care settings**
- 2. Provide valuable insights on treatment patterns and outcomes**
- 3. Highlight unwarranted variances in care that drive up costs**

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