Leveraging Digital Health to Support the Cancer Careforce

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Samuel Takvorian, MD
Fellow, Division of Hematology & Oncology
Associate Fellow, Leonard Davis Institute
Perelman School of Medicine, University of Pennsylvania

University of Pennsylvania Abramson Cancer Center

Penn Center for Cancer Care Innovation

Disclosures

- I have no relevant financial relationships to disclose
- University of Pennsylvania may receive royalties in connection with products developed by Patient.ly

Changing oncology landscape

- Increasing ambulatory focus, accelerated by widespread use of oral anticancer agents (OACAs)
- Routine collection of electronic patient-reported outcomes (ePROs) associated with overall survival benefit
- Role for patient-targeted strategies that leverage digital health and artificial intelligence?

Greer *Oncologist* 2016;21:354-76; Zerillo *JAMA Oncol* 2018;4(1):105-117.
Basch JCO 2016;34:557-65; JAMA 2017;318:197-8.

Contextual inquiry

- Interviewed patients admitted to solid oncology service for poorly controlled symptoms, and learned that patients:

  …want to be engaged ***outside of office visits***

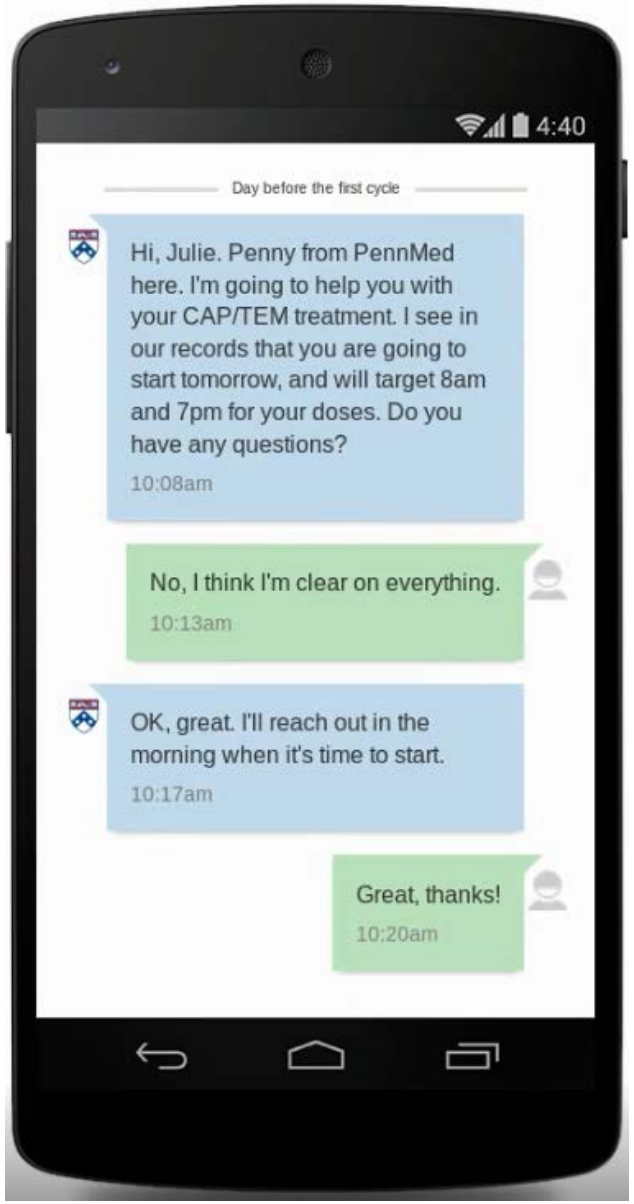
  …are accepting of ***mobile phone-based*** methods of engagement

  …prefer ***text-messaging*** to apps or telephone calls

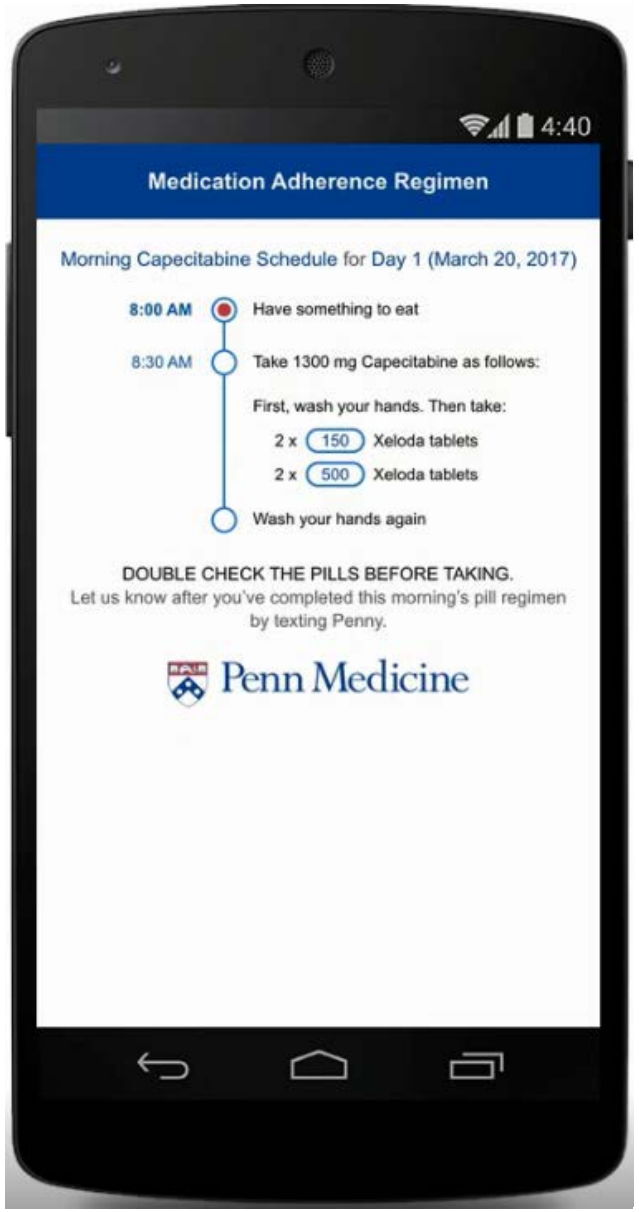
Tenets of new paradigm

1) Real-time **conversational engagement** of patients via text messaging, with motivational feedback
2) Patient-targeted use of **artificial intelligence** and **machine learning** to support symptom management and medication adherence
3) Seamless **EHR integration** allowing for longitudinal monitoring and triggered provider team alerts

Virtual care team member, available at all times



Bidirectional communication



Provides **step-by-step personalized guidance** to support adherence behavior

Real-time dosing instructions

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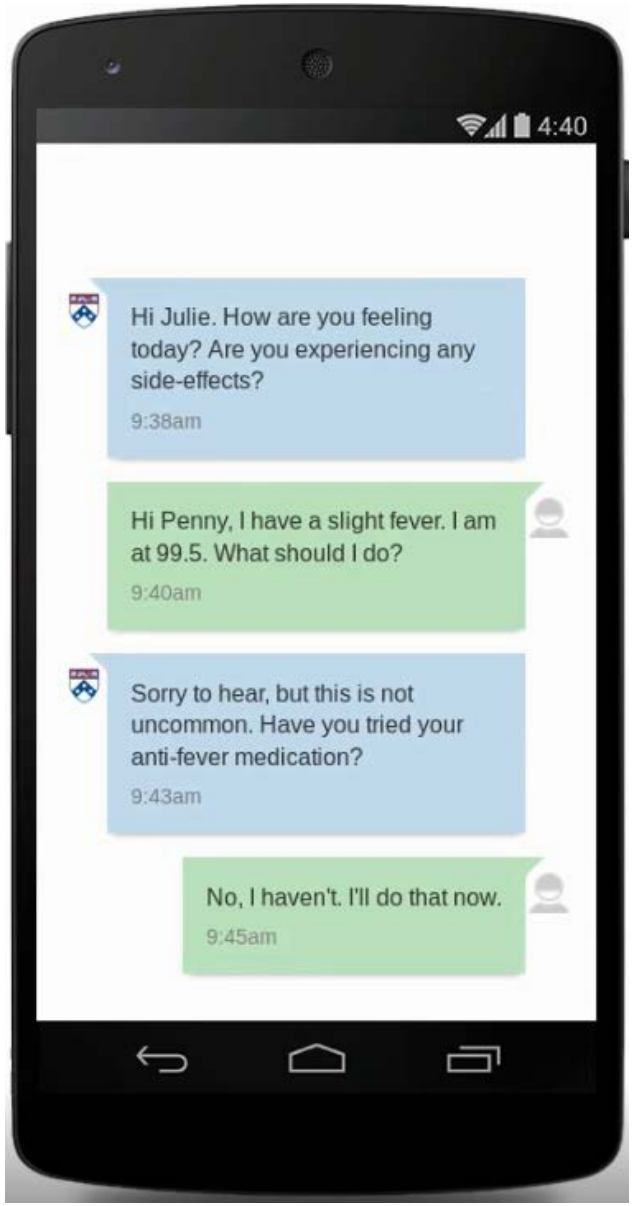
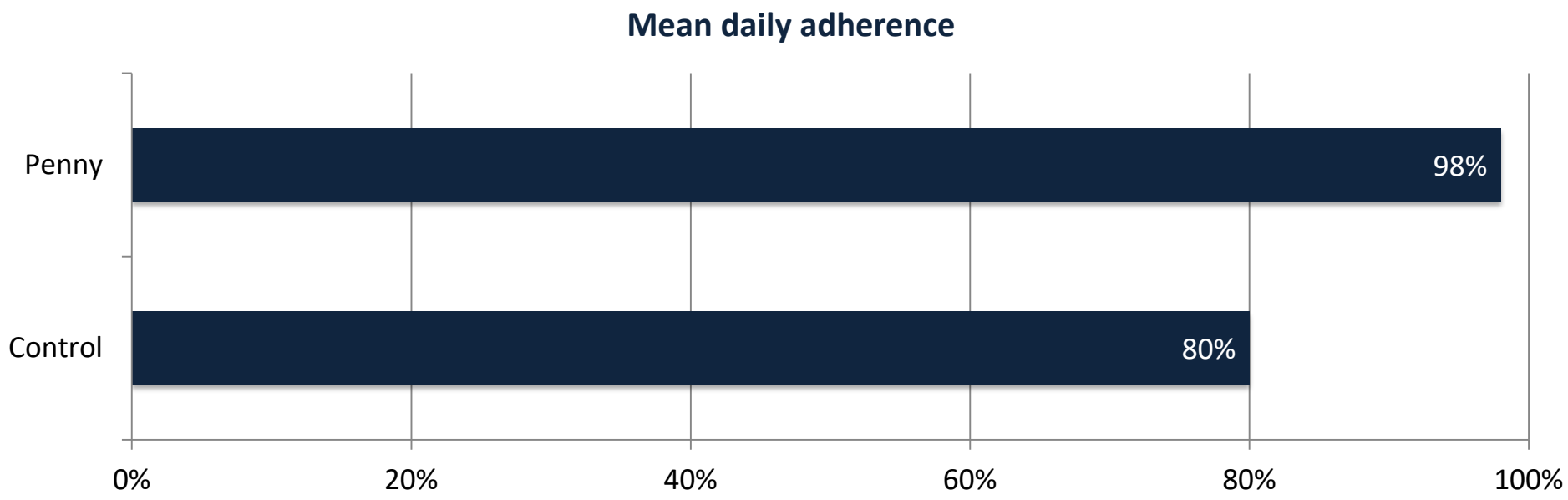
Adaptive rules engine to
monitor & respond to symptoms reported by patients



Preliminary data

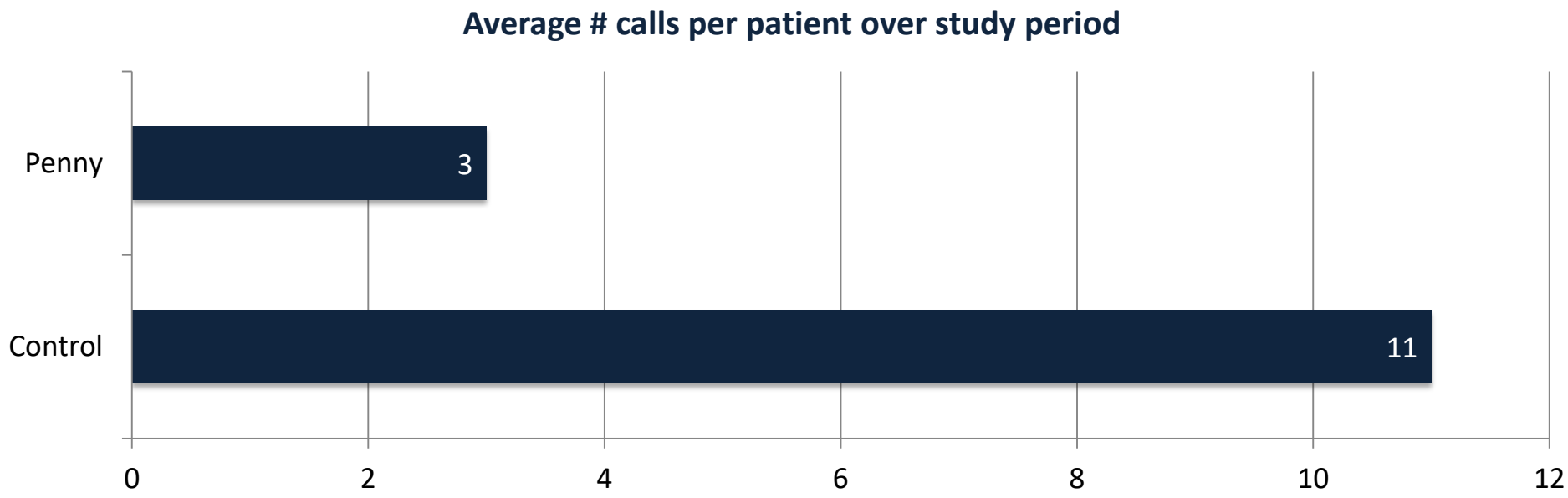
- Pilot study Dec 2017 - Aug 2018
- 11 pts on CAP/TEM approached; 10 agreed to participate (ages 45-71)
- Conducted structured qualitative interviews at monthly intervals for first 12 weeks of follow-up to evaluate feasibility and usability
- **High participant satisfaction** (Net Promotor Score 100)
- **High fidelity and reliability** across combined 85 participant-months, with accurate grading and triage of side effects

Improved adherence



Simons *Support Care Cancer* 2011;19:1009-18.

Reduced call volume



Penny 2.0 is projected to handle **78%** of the calls placed by patients

Avoidance of ED Visits

3

ED visits avoided

N = 10 patients

"When you are in the moment feeling that sick you aren't thinking straight... Penny is that straight-thinker we needed at those times."

Conclusions and next steps

- In preliminary testing, Penny was a **feasible and acceptable** means of supporting OACA adherence
- Substantially **reduced call volume** and **improved provider triage** demonstrate potential of conversational agents to support cancer care workforce
- Phase I study to rigorously assess safety and reliability across expanded cohorts is currently underway
- Phase II study (randomized) to assess efficacy is anticipated Summer 2019

References

1. Greer JA, Amoyal N, Nisotel L, et al. A Systematic Review of Adherence to Oral Antineoplastic Therapies. Oncologist 2016;21:354-76.
2. Zerillo JA, Goldenberg BA, Kotecha RR, et al. Interventions to Improve Oral Chemotherapy Safety and Quality: A Systematic Review. JAMA Oncol 2018;4(1):105-117.
3. Basch E, Deal AM, Kris MG, et al. Symptom Monitoring with Patient-Reported Outcomes During Routine Cancer Treatment: A Randomized Controlled Trial. J Clin Oncol 2016;34:557-65.
4. Basch E, Deal AM, Dueck AC, et al. Overall Survival Results of a Trial Assessing Patient-Reported Outcomes for Symptom Monitoring During Routine Cancer Treatment. JAMA 2017;318:197-8.
5. Simons S, Ringsdorf S, Braun M, et al. Enhancing adherence to capecitabine chemotherapy by means of multidisciplinary pharmaceutical care. Support Care Cancer 2011;19:1009-18.