INTRODUCTION and BACKGROUND

- Medicine has been historically practiced as a reactive process to acute illness episodes with follow-up, which is a method inefficient for managing chronic disease.
- In an ideal healthcare system, the effect of medical interventions would be known and acted upon in real-time.
- Chronic obstructive pulmonary disease (COPD) is an irreversible respiratory disease characterized by narrowing and inflammation of the airways.
- 50-75% of all COPD-related costs are associated with breathing exacerbation episodes. Medicare spends over $475 million annually on COPD readmissions.\textsuperscript{1,2}
- While multiple digital health tools of varying quality have been developed, an evidence-based platform that identifies best practices would yield the best results.\textsuperscript{3}
- Epharmix, described herein, provides a clinically-validated portfolio of electronic prescriptions (Eps) that provides proactive care within the existing infrastructure.
- Remote monitoring may facilitate early detection and improved management of breathing exacerbations leading to lower cost of care, reductions in morbidity and mortality, and improved quality of life.

RESULTS

"It makes me feel as if my doctor is right here next to me, helping me get better.”

"I really like the professionalism of how the system is used. Feels like a personal call even though I know it is machine driven.”

“This system reminds me to quit smoking.”

“I think it’s excellent just as it is. Not too intrusive... gets to the point and doesn’t take a lot of time”

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**REFERENCES**

**Design and Development Methods**

**Epharmix Technology**

1. **Patient Engagement Platform**
   - Facile acquisition of signs and symptoms using existing SMS (cell phones) and IVR (landlines).
   - Smart message frequency to prevent message fatigue.
   - Integrated Voice on the Cloud technology allows rapid deep computational analysis.
   - Alerts can be sent to existing communication tools automatically (text, e-mail, pager, calls).

2. **Provider Engagement Platform**
   - Bayesian branching logic to generate meaningful alerts and reports with optimized sensitivity and specificity.

**HiPAA Compliance & Risk Mitigation**

Safeguards:
1. Secure hosting
2. Verbal consent recorded by Epx
3. Epx verifies patient identity, number, and consent by SMS or phone call
4. Secure automated telephone version available
5. All messages (SMS and phone) are toll-free to the patient
6. Protects against provider-side error by scrubbing all messages of direct identifiers

**Pilot Logistics**

- **Pilot Study**
  1. May 2015-September 2015
  2. 20 subjects enrolled to receive EpiCOPD
  3. All subjects received the phone call version
  4. Based in a primary care medicine clinic
  5. Measured patient response rate, provider response rate, alert rate, and patient satisfaction with the system

- **Randomized controlled trial**
  1. February 2016-February 2017
  2. 150 subjects randomized into two trial groups
  3. Intervention group receives a daily message from Epx with follow-up from the their doctor
  4. Control group receives a daily message from Epx with no physician follow-up
  5. Based in an internal medicine residency clinic
  6. Primary outcome is time to hospitalization
  7. Secondary outcomes include patient compliance, physician compliance with alerts

**Discussion and Conclusions**

- Epharmix is a novel platform for proactive telemonitoring of patients built on a research foundation and through the collaboration of patients, physicians, and medical students.
- Prompt symptom reporting allowed providers to remotely alter subjects plan of care. Typical adjustments included practice on how to use an inhaler or ordering a prescription.
- Over an extended period of time, patient and provider compliance remained high for both SMS and phone calls. The compliance remained above 96% during the pilot study.
- The rate of reported dyspnea fell by 64% over the course of the pilot study.
- Since the conclusion of the 20 subject pilot study, zero of these 20 subjects have been admitted to the hospital for a COPD-related breathing exacerbation.
- EpiCOPD makes some patients patients more conscious of their overall health. By receiving regular messages from the Epharmix system, patients receive a daily reminder to pause and think about personal decisions affecting their health. Epharmix might be an effective tool to assist patients in learning how to manage their chronic conditions.
- Feedback from providers and patients found high satisfaction with the system. The providers reported that the system is simple to use and manage. Many patients feel in greater control of their healthcare decision making.
- The RCT of the EpiCOPD system continues through February 2017 at WUSTL School of Medicine. Enrollment continues to a total of 300 patients.