Wearables for Precision Health

Kay Connelly
IU Grand Challenge
Precision Health Initiative

The goal of the IU Precision Health Initiative is to position Indiana University among the leading universities in discovering and developing better treatments, preventions and improved health outcomes in specific human diseases through a more precise understanding of the genetic, developmental, behavioral and environmental factors that contribute to an individual’s health.
<table>
<thead>
<tr>
<th>Genomic Medicine</th>
<th>Cell, Gene &amp; Immune Therapy</th>
<th>Chem Biology &amp; Biotherapeutics</th>
<th>Data &amp; Informatics</th>
<th>Psychosocial, Behavioral &amp; Ethics</th>
<th>Regenerative Medicine &amp; Engineering</th>
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</thead>
<tbody>
<tr>
<td>MULTIPLE MYELOMA</td>
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<tr>
<td>TRIPLE NEGATIVE BREAST CANCER</td>
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<td>PEDIATRIC SARCOMA</td>
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<td>TYPE 2 DIABETES</td>
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<td>ALZHEIMER'S DISEASE</td>
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IU Precision Diabetes Program

PI’s: Drs. David Haas and Kay Connelly
Gestational Diabetes (GDM)

14% of pregnancies

60-70% develop T2D in 5-10 years
Phase I Overview

- **Leaders**: David Haas & Kay Connelly
- **Hypothesis**: Genetic, blood-based, and behavioral/digital biomarkers can be identified that distinguish gradations of risk for future Type 2 diabetes beyond usual clinical measures

Provide novel discoveries regarding GDM-related diabetes risk that inform preventive care strategies regarding pathways to diabetes in this unique subset of diabetes.
Phase II Overview

- **Leaders**: Tami Hannon & Jen Wessel
- **Hypothesis**: Genetic and other molecular information, together with psychological and sociodemographic features of the individual, can inform the delivery of prevention intervention and enhance the effectiveness and patient-centered value of these interventions
Behavioral Data: Wearable… But Which One?

- Analog
- Battery
- Activity & Sleep
- Viewability
- Synching
Behavioral Data: Wearable… But Which One?

Evaluation Framework

Usability Study

Pilot Study

Narrowing Selections → Final Selection → Testing & Understanding Use

1 2 3 4 5 6

Wearables

Pregnant Birth Mothers

Grand Challenge
Precision Health Initiative
Evaluation Framework

Physiological measures
Motivation
Notifications
Clock
Manual inputs/reminders
Connectivity to other apps

Device/data access
Cost
API: data
API: scalability
API: notification
API: maturity
Open source/API reference
Developer support

Ease of setup
Ease of physical controls
Wearable display viewability
Wearable display interpretability
Mobile app ease of use
Wearability
Water Resistance
Wearable device battery
Mobile battery
Syncing
Aesthetics
Customization

Infrastructure
Functionality
Privacy
Everyday Use
Narrowing Selections

• Identified 10 devices at proper cost point (<$150)

• Prioritized features for women of young children (e.g. active lifestyle => battery life, water proof, etc…)

• Narrowed to 3 devices:
Usability Study

tasks

preferences

Garmin Vivosmart HR
Pilot Study

- 38 participants, 8 weeks before & after birth
- Wearable feedback: Did they like the form? Features? App?
- Wearable usage: Did they wear it? Charge it? Synch regularly?
- Did the feedback or usage change pre/post birth?
Pilot Study: Major Findings

Form Factor

“The only issue thus far has been that it is a bit bulky/unnatural feeling to wear. I am not in the habit of wearing bracelets, watches, etc., so I have found it particularly noticeable. I have been removing it at night for comfort, so have not been able to take advantage of sleep monitoring.” [A007]
Pilot Study: Major Findings

Post Pregnancy Use

• Drop in usage post-pregnancy
• Participants noted being “too busy” and/or “too tired” to be exercising
• Viewed device to be an exercise tracker rather than a lifestyle tracker
Behavioral Data: Wearable

Data Collection Infrastructure
Phase I Overview

- **Leaders:** David Haas & Kay Connelly
- **Hypothesis:** Genetic, blood-based, and behavioral/digital biomarkers can be identified that distinguish gradations of risk for future Type 2 diabetes beyond usual clinical measures

**Target Outcomes:**

Provide novel discoveries regarding GDM-related diabetes risk that inform preventive care strategies regarding pathways to diabetes in this unique subset of diabetes
GDM Models

- NuMoM2B
  - EHR+survey models being produced now
  - Genomic data added in fall
- Hoosier Mom’s Cohort
  - 500 women recruited in their first trimester
    ➔ Current recruitment at n=50
- Data:
  - EHRs, surveys, genomics
  - + food diaries, wearables
- Model with behavioral data >1 year out
Questions?

Collaborators: Katie Siek, Cassie Kresnye, Haley Molchan, Rashmi Bidanta, Novia Nurain

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