No conflicts to declare.

ISPOR 2020
Workshop 10

Advancing Real-World Evidence to Incorporate Patient-Generated Health Data
Advancing Real-World Evidence to Incorporate Patient-Generated Health Data
Digital health technology in clinical trials and beyond: A regulatory perspective

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Speaker Disclaimer

• The views expressed in this presentation are those of the speaker, and do not necessarily represent an official FDA position.
“Electronic capture of PRO data (ePRO) is also becoming standard, providing a rich pipeline of structured clinical data.

...mobile wearable technologies can complement traditional PRO surveys by generating objective, continuous activity and physiologic data.

Obtaining reliable wearable device data on activity level, coupled with direct patient report on their ability to carry out important day to day activities, can provide information on physical function that is directly relevant and important....”
Digital Health Technology (DHT)

- Digital health technology can be thought of as the convergence of computing power, connectivity, sensors, and software used in healthcare.

- Uses of DHT include (but are not limited to):
  - As a medical product or incorporated into a medical product
  - As a tool to develop or study a medical product (e.g., in study endpoints)
  - As a companion or adjunct to a medical product, including diagnostics and therapeutics
  - As a method of gathering insights into the patient experience
Person-Generated Health Data

• Growth of person-generated health data (PGHD) is enabled by DHT

• PGHD is wellness and/or health-related data created, recorded, or gathered by individuals for themselves (or by family members or others who care for an individual)*
  – Term “Patient-generated health data” is also used

• The individual or patient controls data collection and sharing

Assessment of Clinical Benefit:
How do we measure how patients feel and function?

Traditional Approaches

Novel Approaches
DHT and remote data capture: Opportunities

• Fewer barriers to clinical trial participation (e.g., travel)
• Larger, more inclusive, and more generalizable trials and evidence generation
• Enhancement of endpoints that matter to patients in daily life
• Ability to collect data from patients who cannot report (e.g., scratching in infants with atopic dermatitis)
• Ability to detect intermittent or rare events (e.g., falls, seizures, arrhythmias)
• Novel measures (e.g., behavior patterns in patients with depression)
Defining the endpoint

- Defining the endpoint rests on what is meaningful to patients and caregivers and what is expected to improve with a given treatment.
- Input from multiple stakeholders is important: patients/caregivers, regulators, disease experts, clinicians, engineers, and others.
- Considerations for a wearable activity monitor, for example, include:
  - Parameter definition (e.g., step counts, total distance walked, walking speed).
  - Determination of appropriate assessment periods (e.g., in a day, in a week).
  - Minimal time requirements for device wearing (e.g., during the day).
  - Data analysis: How do we summarize a large amount data over an extended period of time?
  - Data interpretation: How do we describe the benefit and what amount of change matters to a patient?
Examples of measures using DHT in development*

- Physical activity accelerometry assessment for analgesic clinical trials
- ActiMyo® in Duchenne muscular dystrophy
- Actibelt® in sarcopenia after surgical treatment of hip fracture
- Activity monitor based endpoint in chronic heart failure
- Virtual Reality Functional Capacity Assessment Tool (VRFCAT) cognition in patients with schizophrenia (a performance outcome assessment)
- Others

*For further information, please see CDER’s Drug Development Tool (DDT) Clinical Outcome Assessment (COA) Qualification Program website
Real-world data to assess variation in opioid prescribing and use for acute pain

- FDA collaboration with Yale-Mayo CERSI*
- 1,550 patients from diverse populations prescribed short-acting opioid analgesics for new onset pain
- Hugo, a novel health data-sharing platform, will be used to collect:
  - Pain control and opioid use
  - Electronic medical records and pharmacy data
  - Activity and sleep patterns using wearable devices
  - Information about what patients did with unused opioids
- Goal: Evidence-based recommendations for opioid analgesic-prescribing

*Center of Excellence in Regulatory Science and Innovation
Closing thoughts

• DHT offers unique opportunities in assessing patient experience, both within trials and in the real world context

• Considerations include (but are not limited to):
  ─ Selection of important concept(s) to be assessed in the target population consistent with the medical product development goals
  ─ Development of a meaningful endpoint
  ─ Practical aspects of implementation, including analysis and interpretation

• Engage multiple stakeholders, including patients and caregivers, beginning as early as possible
Thank you!

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Resources

• Guidance for Industry: Patient-Reported Outcome Measures: Use in Medical Product Development to Support Labeling Claims

• CDER’s Patient-Focused Drug Development Webpage:

• Guidance for Industry: Electronic Source Data in Clinical Investigations

• Clinical Trials Transformation Initiative (CTTI) Novel Endpoints Project

• Clinical Outcome Assessment Qualification Program

• Opioid Prescribing project
What is PGHD and how can it be valuable in medical product development and RWD/RWE data generation?

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ADVANCING REAL-WORLD EVIDENCE TO INCORPORATE PATIENT-GENERATED HEALTH DATA | ISPOR 2020

May 19, 2020
Background: Person-Generated Health Data (PGHD)

Case Studies

1. Cognitive Impairment
2. Weight Loss Surgery
3. Asthma
Patients and their outcomes have historically been characterized using limited, visible-to-the-system data sets.
Person-Generated Health Data (PGHD) is wellness and/or health-related data created, recorded, or gathered by individuals for themselves (or by family members or others who care for an individual).

**PHENOTYPIC LABELS**
Collected via questionnaires / ePROs
- Age
- Gender
- Ethnicity / race
- Education
- Household
- Zip code
- Employment status
- Employer
- Insurance carrier
- Height / weight
- Medical diagnoses
- Prescription drugs
- Smoking
- Patient-reported outcomes
- Fast food consumption
- Supplements
- Quality of life
- Alcohol use
- Major medical events
- Sleep quality

**OBJECTIVE EVERYDAY DATA**
Collected via sensors and apps
- Functional mobility
- Sleep reliability
- Weight range
- Routine/consistency
- Digital utilization
- Responsiveness
- Exacerbation events
- Treatment utilization
- Disease progression

**EXAMPLE DIGITAL MEASURES**

Definition: https://healthpolicy.duke.edu/sites/default/files/atoms/files/_determining_real-world_datas_fitness_for_use_and_the_role_of_reliability.pdf
Person-Generated Health Data (PGHD) can be obtained from a variety of sensors, services, and self-report methods.

**Sensors**

![Sensor Images]

**Services**

![Service Images]

**Surveys / ePROs**

![Survey Images]

Background: Person-Generated Health Data (PGHD)

Case Studies

1. Cognitive Impairment
2. Weight Loss Surgery
3. Asthma
Case Study #1: Evidation, along with collaborators at Eli Lilly and Apple, recently completed a study using PGHD in participants with cognitive decline.

Objectives

1. Assess the feasibility of collecting and processing data from multiple smart devices of older adults with and without cognitive impairment in their daily lives.

2. Test whether data from these devices can differentiate between healthy controls and participants with cognitive impairment.

- **113 participants**
  - **82 Healthy Control (HC)**
  - **24 Mild Cognitive Impairment (MCI)**
  - **7 Mild Alzheimer’s Disease Dementia (AD)**
  - **31 symptomatic participants**
Participants were given an iPhone, Apple Watch, and Beddit sleep monitor to use as their primary devices over the course of the 12 week study, as well as an iPad to complete at-home cognitive tests.

We processed, aligned, and combined data from all the different data sources to create a single behaviorgram for each participant.
It also serves as a tool for data exploration, hypothesis generation, and as a way to inspect the quality of the data.
Although exploratory, preliminary outcomes indicate that PGHD generated from consumer devices can identify symptomatic patients.

**Study Outcomes.**

Important features for identifying symptomatic individuals during modeling:

- Slower typing
- Less regularity and later first steps
- Fewer text messages
- Greater reliance on helper apps
- Poorer survey compliance
Case study #2: PGHD can reveal important insight into postoperative behavior and physiology that is convenient, sensitive, scalable, individualized, and continuous

Study overview

- Self-reported surgical procedure and date
- Linked activity data spanning 12-weeks pre/postoperative
- Computed the weekly mean of each feature for each participant for each week of the observation window
- Compared each observed week to week -12 (baseline)
- Evidence that postoperative trajectories derived from PGHD can indicate important changes in behavior and physiology.
Case study #3: Connecting directly to patients provides unprecedented resolution into asthma control and the true disease burden in everyday life.

Both Individuals

- Persistent moderate/severe asthma
- Currently taking LABA/ICS
- Adhering to physician-prescribed treatment
- Non-smokers
- Use the same brand of wearable device

Both Individuals Percentage of time asleep while in bed (nightly)

- Reports waking up often (every night or almost every night) when asked how often they wake up at night due to asthma symptoms
- 49% time asleep while in bed over last 90 days

- Reports waking up 2 or fewer days per month when asked how often they wake up at night due to asthma symptoms
- 96% time asleep while in bed over last 90 days

Note: time asleep data is objectively-derived from wearable devices; comparison is illustrative only and not controlled for any variable.
evidation

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Sponsor Approach to Incorporating Patient-Generated Health Data into Real-World Evidence Plans

Kalahn Taylor-Clark, PhD, MPH
Global Head of Patient Solutions, Sanofi
The views expressed in this presentation are those of the presenter and do not necessarily represent an official company position.
Why Patient-Generated Health Data and Insights in Pharma?

Unique Me In 3D

- Consumer data
- Claims data
- Clinical Data
- Diet
- Lifestyle
- Environment
- Genetics
- Behavior
- Exercise
- Preferences
- Work
- Family
- Social media
- Apps
- Wearables/sensors
LEVERAGING BEHAVIORAL SCIENCE TO CLOSE THE GAP BETWEEN REAL-WORLD EFFECTIVENESS AND EFFICACY

<table>
<thead>
<tr>
<th>CLINICAL TRIAL EFFICACY*</th>
<th>REAL WORLD EFFECTIVENESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOMES GAP</td>
<td></td>
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</tbody>
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**FACTORS CONTRIBUTING TO GAP:**

- **PATIENT**
  - Self-management, adherence, co-morbidities, concomitant medications, etc.
- **HCP**
  - Clinical inertia, patient interactions, care coordination, Rx behavior, etc.
- **SYSTEM**
  - Access, formulary, reimbursement, quality of care, affordability, etc.
- **CONTEXTUAL**
  - SES, zip code, race, ethnicity, social support, family, etc.

- **Goal is to reduce gap** between clinical trial efficacy and real world effectiveness
- **PISO Team bridges this gap** through evidence-based interventions, including:
  - Understanding patient factors behind gap and associate them with outcomes
  - Designing interventions to influence key factors that will lead to improved outcomes

Behavioral Science can address clinical inertia, patient activation and non-adherence which are critical to reducing the gap and improving outcomes

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*Relative scale of impact for patient factors, HCP, health system, and contextual factors varies case by case. Broader results/outcomes differences in clinical trial efficacy and real world effectiveness may vary on a case by case basis.
THE PROBLEM TO SOLVE: UNCOVER NOVEL DATA SOURCES AND METHODOLOGIES FOR PATIENT EVIDENCE GENERATION

What are the promising practices? How can we industrialize them?

The need is increasing for:

NEW DATA SOURCES
Real time data, Behaviors

NEW ANALYTIC METHODS
SVR Machine Learning
Sanofi Pasteur – Evidation DiaFlu Retrospective study

A retrospective study using multiple data sources, and wearable device demonstrated that:

- Influenza increases rates of pneumonia, heart disease, and abnormal glucose levels among people with T2DM,
- Influenza also negatively impacts daily activities compared to controls
Thank you!

Kalahn Taylor-Clark, PhD, MPH
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1. PGHD provides the opportunity to enhance endpoints that matter to patients in daily life by:
   - More frequently and sensitively measuring a patient’s real-world experience with a disease or condition outside the clinic
   - Revealing new insights about treatment toxicity, quality of life, functional mobility, sleep, pain, mood, and more

2. PGHD can be incorporated into real-world evidence plans to better understand safety and clinical benefit, and differentiate medical products
It’s time for some polling Q&A!

Please type your questions for speakers into the Q&A feature while the polling questions load.
Question 1

Have you launched a drug where payers wanted more info about patient functioning?

- Yes
- No
Question 2

Are you incorporating digital measures into your RWE plans?

a) Already doing it
b) Plan to do in future
c) No plans
Question 3

Which barriers if any have you faced internally to including digital measures in your evidence generation plans?

a) None
b) Funding
c) Culture not open to innovative approaches
d) Not incorporated early enough in evidence generation plans
e) Clinical or operational feasibility
Questions for speakers?
Thank you!

Join our Twitter chat continuing the conversation immediately after this workshop: @evidation
#PGHDinRWE

For any further questions, please email: bpatricklake@evidation.com