Design Considerations for Packaging, Storage and Disposal Options to Enhance Opioid Safety

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Overview

- Addressing the Problems
- A Conceptual Design Approach
  I. Analyze Opioid Use Problems for Associated Behaviors
  II. Consider Design Options (Examples)
  III. Validate with End Users
- Design Principles
- Questions

Addressing the Problems of Opioid Use

- Each opioid use problem (accidental exposure, misuse, third party access, excess supply) has an associated set of behaviors
- Attempts have made to deter/manage these problems with different design options
  - Historically, some repurposed from other applications (e.g., adherence systems)
  - More recently, more innovative designs targeting associated behaviors
- A conceptual approach to analyzing, designing and validating design options, including some examples* will be presented

*Examples are for illustration and not an endorsement of any one approach over others

A Conceptual Design Approach

Analyze

Analyze Opioid Use to Identify Associated Behaviors

- Analyzing how the opioid medication use system may fail is a starting point for identifying associate behaviors as possible targets for designing interventions

Failure	Associated Behaviors	Possible Option Designs
Patient does not securely store medication	Patient unaware, patient forgot	Protected storage, tamper evident packaging, tracking
HCP prescribes excessive amount of medication	HCP unaware, HCP habit	Unit of use blister package with limited supply
Patient retains excess unused medication	Fears delay in future access	Deactivation/disposal system

- Evidence-based analytical methods (e.g., Failure Mode and Effects Analysis, Probabilistic Risk Assessment) can help the designers of such options…
  - Anticipate how the opioid medication use system may fail
  - Identify the potential causes of these failures
  - Prioritize associated behaviors as targets for applying or designing interventions

Design

Consider Design Options

Existing Options

Use, repurpose or enhance existing options

Novel Options

Develop new options to prevent/deter, detect/track, or monitor/manage the targeted behavior(s)

Integrated Approaches

Redesign, combine and/or integrate options into management programs and/or healthcare systems

- Redesign an existing option
- Combine to concurrently address multiple targeted behaviors
- Integrate options within broader management programs (e.g., REMS) and/or healthcare delivery system programs
- Others

Existing Options

Use, Repurpose or Enhance Existing Options

- Calendar/blister packaging
- Limited supply packaging (e.g., “Z-pack”)
- Controlled access systems (e.g., locking caps)
- Tamper detecting/resistant packaging (e.g., individual dose package)
- Deactivation/disposal options (e.g., charcoal pouches)
- Medication adherence support systems

Example*: Zithromycin (“Z-Pack”)

- Marketed option that limits medication supply, tracks use in blister/calendar packaging, and communicates instructions
- Pros: Lower technology, does not alter patient routines, adds opportunity to include risk messaging or instructions
- Cons: Lacks access controls or features to control rate of consumption

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Example*: Locking Caps

- Marketed option that controls bottle access
- Pros: Lower technology and lesser impact on typical patient routines
  - Opaque bottle conceals contents
- Cons: Does not limit frequency of openings or number of tablets that can be accessed at each opening; may slow intended patient access; could incur out of pocket costs

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Example*: Medication Deactivation Systems

- Marketed options that deactivate or destroy unused medication
- Pros: Lower technology, may be used for multiple dosage forms
- Cons: Requires additional discretionary step(s) that are not routine; could incur out of pocket costs

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Novel Options

Develop new options that target behaviors associated with opioid use problems

- Identify target behavior(s), then design options that prevent/deter, detect/track, +/or monitor/manage target behavior(s).
- Examples*
  - Bluetooth bottle cap reports openings
  - Ingestible sensor reports pill ingestions
  - Cell module reports blister opening
  - Controlled dispensing manages/tracks consumption rate
  - Others
- Pros: More targeted, more informational
- Cons: More complex, higher technology, more costly, generally less “passive”, may not be available universally

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Example*: Abilify MyCite

- Tablet embedded with ingestible sensor sends signal via wearable patch to smartphone app and web-portal for HCPs and caregivers
- Pros: Intended to confirm ingestions, HCP oversight (with permission), individualized pill tracking numbers
- Cons: Active requirements, high tech, cost, HCP's time to ensure patient capable/willing to use, does not manage access or consumption, possible skin patch irritation, ingestion detection may be delayed or not occur

FDA approves pill with sensor that digitally tracks if patients have ingested their medication

New tool for patients taking Abilify

For Immediate Release

November 13, 2017

Summary

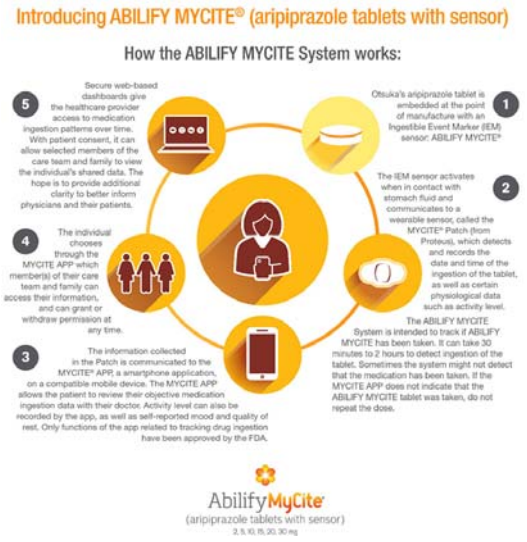
FDA approves Abilify MyCite, a pill with a sensor that digitally tracks if patients have ingested their medication

Release

The U.S. Food and Drug Administration today approved the first drug in the U.S. with a digital ingestion tracking system. Abilify MyCite (aripiprazole tablets with sensor) has an ingestible sensor embedded in the pill that records that the medication was taken. The product is approved for the treatment of schizophrenia, acute treatment of manic and mixed episodes associated with bipolar I disorder and for use as an add-on treatment for depression in adults.

The system works by sending a message from the pill's sensor to a wearable patch. The patch transmits the information to a mobile application so that patients can track the ingestion of the medication on their smart phone. Patients can also permit their caregivers and physician to access the information through a web-based portal.

"Being able to track ingestion of medications prescribed for mental illness may be useful for some patients," said Mitchell Mathis, M.D., director of the Division of Psychiatry Products in the FDA's Center for Drug Evaluation and Research. "The FDA supports the development and use of new technology in prescription drugs and is committed to working with companies to understand how technology might benefit patients and prescribers."



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Integrated Approaches

Redesign, combine and/or integrate options within management programs and/or healthcare systems

- **Redesign an existing option** to address identified target behavior(s)
- **Combine redesigned and novel option(s)** for multiple target behaviors e.g.*,
  - Limited supply/blister pack + ingestion tracking + disposal pouch
- **Integrate above within safety programs and/or delivery systems** e.g.,
  - Within broader medication safety management programs (e.g., targeted education in patient labeling, REMS HCP training)
  - Within other healthcare delivery system programs (e.g., prescription drug monitoring programs, pharmacy medication therapy management (MTM) programs, health plan care management programs)
- Others

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Example*: Lazanda (fentanyl nasal spray)

- Combines **several existing interventions**…
  - Child-resistant container
  - Counter that tracks doses used and remaining
  - Limits total supply to 8 doses per bottle
  - Packaged with a separate disposal pouch

  …**within the TIRF REMS** Access program
  - HCPs must enroll and review REMS educational materials
  - Outpatients must understand risks and benefits and sign a Patient-Prescriber Agreement
  - Pharmacies must enroll in the program and agree to comply with the REMS
  - Wholesalers and distributers must enroll and distribute only to authorized pharmacies.
- Does not control rate of dosing and vulnerable to errors in use (e.g., forgetting to re-store the spray bottle)

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A Conceptual Design Approach

Validate

End-User Validation

- Validate safe and effective use, acceptance and usability by end users
  - Confirm that the option(s) target the problem(s) and associated behavior(s)
  - Demonstrate option(s) address patient needs
    - Patients find acceptable and willing to use
    - Patients able to comprehend how to use
    - Patients can demonstrate that they can use
    - Design considers patients' preferences
  - Culmination of testing done iteratively during the design process
  - Resulting data may support regulatory submission

Validate

End-User Validation

- Consider and mitigate potential implementation barriers
  - Passive vs. active systems i.e., reflect existing patterns rather than alter routines
  - Automatic vs. manual
  - Sustainable vs. not sustainable over time
  - Unanticipated consequences
  - Need for redundancy
  - Integration into delivery system: feasibility of distribution, timeliness of availability for legitimate patient use, availability for repeated use, affordability, etc.

4 Design Principles to Consider

1. Use **evidence-based approach** to analyze use problem and identify associated behavior(s) as target(s) for intervention
2. Design **with the end-user in mind,** addressing one or more targeted behaviors, while minimizing foreseeable use errors and implementation barriers
3. Anticipate potential **second order effects** of the option
4. Consider **real-world programs and/or systems** into which design will be used


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