FDA Perspective on Closed-Loop Studies

Practical Ways to Achieve Targets in Diabetes Care
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What is an Artificial Pancreas (AP)?
Artificial Pancreas

- Many still struggle to maintain good glycemic control
- Hypoglycemic unaware individuals at risk
- Risk of nighttime hypoglycemia
- Better quality of life needed

- FDA believes that development of an Artificial Pancreas will improve outcomes for people with diabetes

- Challenges:
  - Device limitations – pump imprecision, sensor inaccuracy/unreliability
  - Biology – complicated
  - Inter-individual variability – one size fits all possible? Smart algorithms?

- Good news - Brilliant people working on these problems….
Background

• Where we were 10 years ago
• CGM approval/improvement
• Open loop studies / Algorithm development
• Compensating for CGM/pump failures
• Gradually increasing confidence in algorithms
Current Status

• AP Clinical studies – much progress!
  • Clinic – close monitoring, oversight
  • Camp – stresses the system
  • Outpatient/Hotel – managed supervision
  • Home – flexible, can be monitored, use of companions
Current Status

• Medtronic MiniMed 530G Threshold Suspend System Approved in October 2013

• First step toward an AP

• Suspends insulin delivery when CGM value reaches a set threshold (e.g., 60 - 90 mg/dL)
Opportunities – Device Consolidation

• Challenges for patients
  • Difficult being a patient with diabetes
  • Medical devices help, but can also contribute to frustrations and non-compliant therapy
  • Must carry - Cell phone, pump, meter, CGM receiver, insulin pens, strips, etc…

• Potential solutions
  • Efforts to consolidate devices onto fewer platforms (e.g., meter, CGM, pump receiver in one)
  • Requires good coordination between companies in many instances

• FDA is creating and communicating policies to encourage device company collaboration
Opportunities – Mobile Apps

• To facilitate device consolidation, mobile platforms are key
  • Nearly everyone now carries a cell phone
  • enable functions to allow for medical device interaction from that platform

• Challenges include
  • Security, hacking – specialized communication protocols essential
  • Android vs. Apple OS

• FDA is working closely with industry on requirements/process for market entry, upgrades, etc.
  • Guidance on Mobile Medical Apps – provides more clarity and transparency

• Promises to be more convenient for patients and better for AP development
Opportunities – Component AP Systems

• Traditional pathway = one company sells whole AP device (sensor, pump, algorithm)

• Alternate pathway = different companies sell the components of an AP (e.g., algorithm on app that communicates with pump and sensor)

• More choices/access

• Working on Policies to Foster this Innovation:
  • Who is responsible? (for adverse events, etc.)
  • Impact of Device modifications/generations
Opportunities - Commercialization

• Investigators beginning to think more about commercialization

• Previous focus on algorithm development/tweaking

• Much more attention on how to translate their discoveries/innovations into real medical devices

• Very significant and exciting change in tone!
Common Misconceptions

• An AP does not have to develop/approve in a measured progression
  • Some thought FDA would require a slow progression (e.g., threshold suspend, predictive suspend, treat-to-range, full AP)
  • No reason not to try to develop the fully closed loop device if the technology is ready!

• Remote monitoring can be a good safety mitigation in studies, but is not always required
  • There are many ways to mitigate the risk in clinical studies
  • Appropriate tools depend on study design
Common Misconceptions

• Clinical studies in children is allowed
  • Some have thought FDA will not allow AP investigations in children
  • Often can design studies to incorporate pediatric patients
  • Have been many pediatric trials already
  • Investigators should consider device differences between populations
    • e.g., DexCom G4 approved in pediatrics, but studies show the sensor much less accurate in children than adults (particularly in the hypo range)
    • Study mitigations and algorithms may need to account for device performance differences

• HbA1c is not the only endpoint FDA will accept for AP studies
  • Some have thought only HbA1c is accepted
  • Endpoint should be what makes sense for the claims being tested
Common Misconceptions

• Enacting safety mitigations for studies does not mean that these mitigations have to be part of the final system
  • Some have thought that if remote monitoring is used to mitigate risks in a clinical study that it will also be needed once the device is approved
  • Study mitigations are for the safety of study participants and are not part of the device itself

• Artificial Pancreas devices do not have to be perfect with zero risk to be beneficial
  • Approval decision is a benefit/risk decision
  • Approval Decision made in the context of the significant risks people with diabetes face every day due to their disease
Where do we go next?

• Continue to work with Investigators and Companies who are developing these devices to encourage their development

• Continue to learn from patients and healthcare providers about the needs and desires of this community

• Continue to develop policies that promote rather than prohibit AP availability

It will happen, and sooner than you think!
Thank you!

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