CLOSER LOOK

MEMORANDUM

MannKind 4Q17 - Afrezza sales more than double sequentially to $4.5 million; 2018 Afrezza net revenue guidance of $25-$30 million; CGM study investigating time-in-range vs. NovoLog complete, hopeful read out at ADA - February 27, 2018

Executive Highlights

- **In a very strong quarter for MannKind, Afrezza sales more than doubled sequentially and more than tripled YOY to $4.5 million in 4Q17** (from a base of $2 million in 3Q17 and $1.3 million in 4Q16). This was a departure for the Afrezza business, with otherwise struggled throughout 2017 (-8% sequentially in 1Q17, +25% in 2Q17, +28% in 3Q17), and we see 4Q17 as an early sign of increased commercial traction. MannKind announced 2018 guidance of $25-$30 million in Afrezza net revenue. In 2H17, sales of $6.4 million came in at the low end of a $6-$10 million guidance window.
- **New CMO Dr. David Kendall provided a clinical trial update on Afrezza,** highlighting the December 2017 completion of the STAT study comparing time-in-range (with CGM!) between MannKind's inhaled insulin and Novo Nordisk's NovoLog (insulin aspart). The data has been submitted to ADA, and will hopefully be accepted for presentation at the June 2018 Scientific Sessions - we're eager to see it. MannKind CEO Mr. Michael Castagna also pointed to several mentions of Afrezza at ATTD 2018 as a sign of "improved scientific awareness" (talks from Drs. Bruce Bode and Satish Garg).
- **Management referenced the FDA-approved ultra-rapid-acting label claim for Afrezza, granted in early October 2017.** This could continue to be a tailwind for the franchise in 2018.

MannKind provided its 4Q17 update in a call this afternoon led by CEO Mr. Michael Castagna (click for the press release). Sales of inhaled insulin Afrezza totaled $4.5 million, more than doubling sequentially from $2 million in 3Q17 and more than tripling YOY from $1.3 million in 4Q16. This impressive financial performance marks a departure for the Afrezza business, which was otherwise sluggish in 2017 (-8% sequentially in 1Q17, +25% in 2Q17, +28% in 3Q17). Notably, $4.5 million in 4Q17 revenue nearly matches year-to-date Afrezza sales up to 3Q17 ($4.7 million). The product posted $9.2 million for the full year 2017 vs. $1.9 million in 2016.

If 2016 was a year of "survival" for Afrezza (Sanofi terminated its partnership in January, MannKind relaunched the product in August), Mr. Castagna characterized 2017 as a year of "stability." He acknowledged that it was a "challenging" 12 months, and acknowledged that while 4Q17 performance was reassuring, Afrezza could be doing even better. Management noted that 2H17 Afrezza sales of $6.4 million came in at the low end of guidance, projected at $6-$10 million.

MannKind announced 2018 guidance of $25-$30 million in Afrezza net revenue. Mr. Castagna pointed to 2018 as a year of "sustained growth," and shared that the company had $48 million in cash and cash equivalents as of January 1, 2018 (compared to $20.1 million as of September 30, 2017).

In early October 2017, Afrezza received a highly-anticipated label update from FDA, with data added to reflect an ultra-rapid PK/PD profile (faster than Lilly's Humalog). We wonder what impact (if any) this label claim had on 4Q17 sales growth. Management alluded to market research the company has done, revealing that endos, PCPs, and patients are looking for a better, faster mealtime insulin - there's certainly demand for this in the real world, and Afrezza could provide a favorable option, but we imagine the positive impact of the label

change on volume/sales may not appear until 1Q18 or later. This bodes well for Afrezza's "sustained growth" in 2018.

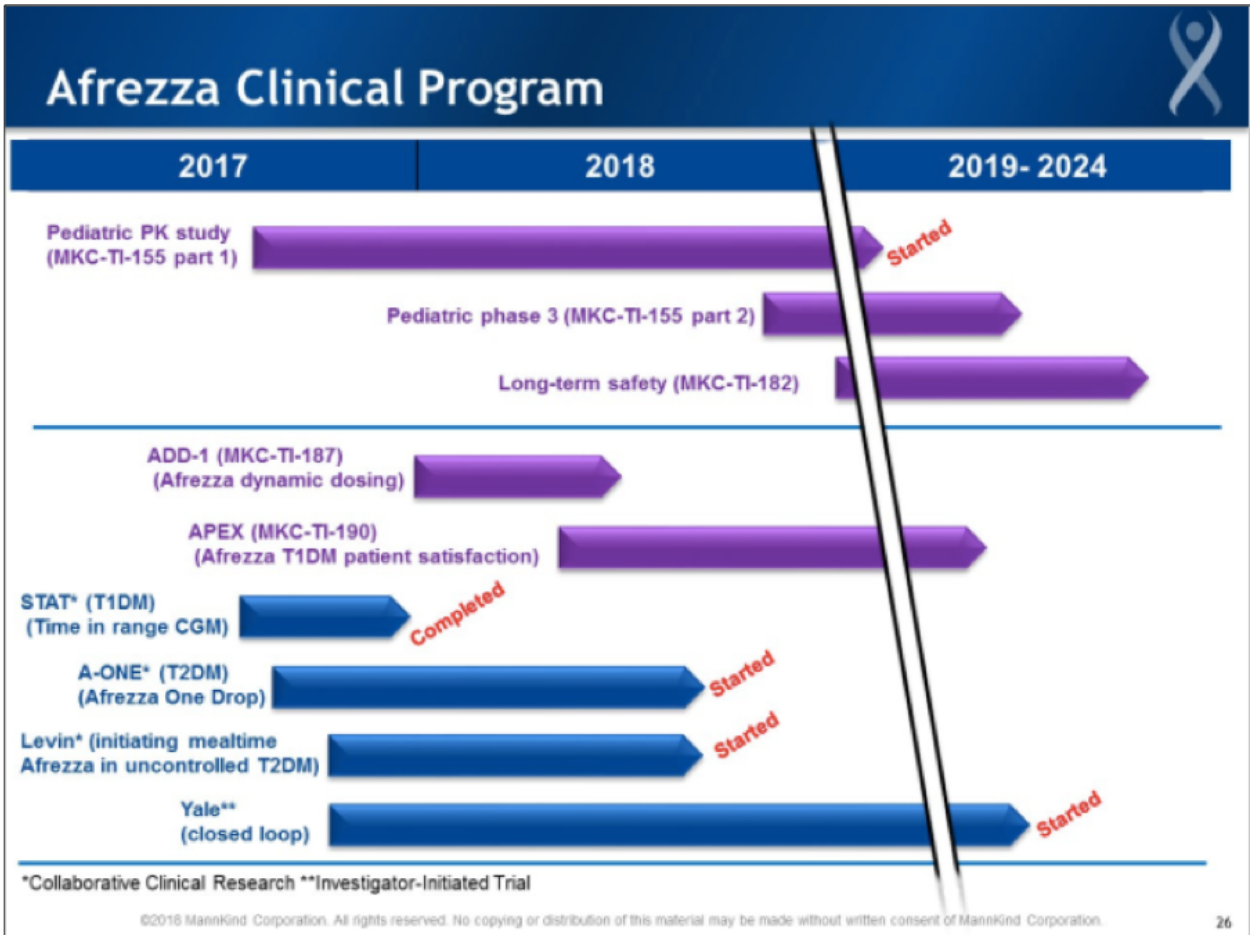
Management emphasized that Afrezza sales to-date have been recorded when a patient picks up a prescription at the pharmacy, which is muted from the amount of product that MannKind ships to wholesalers. In 2018, the company will move to a new method of financial reporting, recording revenue at the point of shipment to wholesalers, which is something to be aware of in analyzing future quarterly results.

Throughout the call, Mr. Castagna and the rest of MannKind's executive team maintained an optimistic view on the health of the Afrezza business: "People now view us as a stable company that will be here for the long run." The company's increase in cash runway as of 4Q17, coupled with Afrezza's remarkable climb in sales, is definitely a positive sign in our view.

Mr. Castagna also introduced MannKind's new CMO Dr. David Kendall (in his 12th day with the company), formerly at Lilly Diabetes (VP of Global Medical Affairs), Amylin (Medical Director), the International Diabetes Center (Medical Director), and ADA (Chief Scientific and Medical Officer), devoting two decades to the diabetes field.

Afrezza Clinical Program

- **Management reiterated that the STAT study was completed in December; abstracts have been submitted to ADA, and the company hopes to present full results at the Scientific Sessions in June.** This trial, which involved none other than Drs. Satish Garg, Bruce Bode, and Anne Peters, used CGM to compare time-in-range between Afrezza and Novo Nordisk's NovoLog (insulin aspart). We absolutely love this emphasis on a glycemic outcome beyond A1c, and we suspect this could be a major differentiating factor for Afrezza, since faster onset/offset means less hyperglycemia and hypoglycemia around meals. The next step will be to evaluate time-in-range with Afrezza vs. next-gen Fiasp, also considered ultra-fast within the diabetes community, although the inhaled vs. injectable routes of administration make both of these products important innovations for people with diabetes.
- **Newly-minted CMO Dr. David Kendall also highlighted:**
    - **The ADD-1 trial budgeted for 2018,** which will help optimize Afrezza dosing;
    - **The pediatric program now underway;**
    - **The One Drop study launched in August 2017;**
    - **The Levin study investigating inhaled insulin in type 2s not at goal on oral agents, basal insulin, and/or GLP-1 agonists** (expected to complete in April 2018); and
    - **A Yale closed loop study.** He walked through the slide below to give an overview of the robust clinical trial program around Afrezza. We're pleased to note MannKind's continued commitment to clinical development of its inhaled prandial insulin.



- **Mr. Castagna called out the mention of Afrezza during multiple presentations at ATTD 2018 earlier this month.** As just a couple examples, Dr. Bruce Bode spoke to positive patient experiences on Afrezza during a talk on the ultra-rapid-acting insulin landscape, and the inhaled agent was a major focus of the Yearbook chapter on "new medications for the treatment of diabetes," presented by Dr. Satish Garg. "This is different from where we were a year ago," Mr. Castagna stated. "Scientific awareness of Afrezza is improving." We'd agree with that assessment. Our sense is that thought leaders support Afrezza based on anecdotal experiences with the drug in clinical practice, and experts agree that an inhaled insulin option is great for expanded patient choice. It's been a slow and steady (and windy) path for this product, but we do see early signs of greater commercial traction, and hope to observe even stronger financial performance from Afrezza in 2018.

Rapid-Acting Insulin Market

- **Of note, Afrezza still comprises a tiny portion of the rapid-acting insulin market.** By our calculations, pooled mealtime insulin sales totaled $6.4 billion in 2017 - Afrezza reflected far less than 1%. In 4Q17, pooled sales were $1.6 billion - again, Afrezza reflected <1%. That said, we see this mealtime insulin as a valuable option for people with type 1 and type 2 diabetes, and based on its relatively strong 4Q17 performance, it seems like it's here to stay for the time being. We imagine Afrezza is facing the commercial obstacles up against all rapid-acting insulins, namely intense pricing pressure as payers view products in this class as largely interchangeable. For a powerful illustration of this, and the adverse impact on patients, read this stirring blog post written by a patient who couldn't get Afrezza covered by UnitedHealthcare (the PBM formulary favors Novo Nordisk's NovoLog and excludes Afrezza).

-- by Payal Marathe and Kelly Close