

## **Connected drug delivery systems drive improved clinical outcomes**

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### **Summary**

Compliant asthmatic patients are significantly less likely to undergo an exacerbation than their less-compliant counterparts <sup>[1]</sup>. Studies have shown that patient adherence can already be significantly increased by text message reminders <sup>[2]</sup>. Different connected drug delivery systems have been introduced in the respiratory arena in the last years. For example Cohero's platform in connection with their Herotracker and H&T Presspart's eMDI or the solutions of Propeller Health or Adherium. These systems use a sensor to detect usage pattern of inhalers, e.g. metered dose inhalers, dry powder inhalers or nebulizers, and transmit these patterns to hosts, for example mobile phones. Based on the collected information patients can be engaged and their adherence increases. These systems therefore have the ability to improve patient outcomes significantly. The resulting value creates opportunities for the different stakeholders in the health system – pharmaceutical industry, regulators, physicians, insurance companies, patients. The use of these and other electronic monitoring devices (EMDs) is becoming increasingly prevalent in clinical practice to harness cutting edge technology to achieve improved disease control and medication adherence. The systems described above offer extensive potential in both the clinical trials and clinical care environments. Especially in connection with lung function measurement devices, for example Cohero's Spirometer, electronic data capture can furthermore drive improved clinical decision making and overall care management for the pulmonary community.

### **Introduction**

Asthma is a major global disease, more than 300 million people suffer from it worldwide <sup>[3]</sup>. Non-adherence to controller medication is a common problem in patients with an asthma diagnosis leading to avoidable exacerbations <sup>[4]</sup>. This work therefore describes potential solutions to increase adherence and their short to long-term areas of application and market penetration.

### **Main Body of Text**

Asthma affects 334 million people worldwide, including approximately 14% of all children, and pharmacotherapy is essential to prevent symptoms and relieving asthma attacks in this population <sup>[5, 6]</sup>. Currently, \$56 billion dollars are spent in the US annually on direct and indirect costs of asthma <sup>[7]</sup>. In order to provide therapeutic benefit, preventer (i.e. controller) medications need to be taken daily.

However, non-adherence to controller medication is a common problem in patients with an asthma diagnosis <sup>[8]</sup>. Current rates of non-adherence to asthma controller medication are estimated at 45-50% <sup>[9, 10]</sup>. Optimal adherence to inhaled corticosteroids requires patients to take their controller medication at least 80% of the time in order to prevent exacerbations <sup>[11]</sup>. Thus, substantial numbers of patients do not get the maximum benefit of medical treatment; this results in the overuse of reliever medication, increased asthma symptoms, more frequent asthma attacks, and increased hospital admissions <sup>[12, 13, 14]</sup>. The poor adherence with preventive treatments is associated with reduced quality of life and leads to mortality <sup>[15]</sup>. Based on refill data, the risk of an asthma exacerbation is 21% to 68% lower for children who are adherent to controller medications <sup>[16]</sup>.

In General, the use of electronic monitoring devices (EMDs) is becoming increasingly prevalent in clinical practice to harness cutting edge technology to achieve improved disease control and medication adherence. As the cost of such devices is reduced and improvements in technology are made, there is increasing evidence that such interventions can be a cost-effective tool for improving patient outcomes and decreasing healthcare costs <sup>[17]</sup>. Examples can for example be found in diabetes care.

EMDs in the form of connected drug delivery systems have been introduced in the respiratory arena in the last years, for example Cohero's platform in connection with their Herotracker and H&T Presspart's eMDI or the solutions of Propeller Health or Adherium. These systems use a sensor to detect usage pattern of inhalers, e.g. metered dose inhalers, dry powder inhalers or nebulizers, and transmit these patterns to hosts, for example mobile phones. They can be used as a tool – for example in form of an App – to generate discussion of adherence and provide reminders to patients; therewith patients can be engaged. Such technology has the potential to increase adherence significantly and therewith to prevent exacerbations and improve symptom control <sup>[18]</sup>. We expect that this technology will address the need for improved understanding of patient medication use behaviour and that patients using such technology will be better equipped for disease self-management leading to improved asthma control.

The systems described above offer extensive potential in both the clinical trials and clinical care environments. Especially in connection with lung function measurement devices, for example Cohero's Spirometer, electronic data capture can furthermore drive improved clinical decision making and overall care management for the pulmonary community.

In the future, as mHealth and telehealth continue to grow and become more cost-effective, we expect that use of such technology will become standard of care and become integrated into the current clinical workflow. Particularly for those patients who are most at-risk for exacerbations and subsequent hospitalizations, we expect that such technology will be used for improved coordination of care leading to decreased healthcare costs to both patients and to the system at large. The resulting value creates opportunities for all the different stakeholders in the health system – pharmaceutical industry, regulators, physicians, insurance companies, patients.

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