An Accurate and Objective Tool to Assess Patient Medication Adherence and Optimal Drug Dosage

RCSI UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

Assessing and maintaining adherence to medication usage is critical to the successful and accurate treatment of patients with chronic diseases as well as in the development and trialing of new drugs. The recent development of numerous electronic monitoring devices presents a reliable and unbiased solution to this problem. RCSI researchers have developed a model-based and data-driven approach to medication adherence calculations. The resulting method can be applied to any medication whose use is electronically monitored to enable a novel data-driven method for personalised treatment.

BACKGROUND

Outcomes for patients with chronic respiratory diseases remain poor despite the development of novel drug therapies. In part, this reflects the fact that adherence to therapy is low and clinicians lack accurate methods to assess this issue. In a clinical setting, any attempt to determine the effectiveness of a medication on an individual patient can be skewed by a lack of accurate adherence information, potentially leading to inappropriate usage or over-prescription Current standard methods of adherence assessment are entirely subjective - e.g. patient self-report (SR) - or reliant on heavily biased proxy measures such as prescription refill rate (PR) making it difficult to accurately determine optimum drug dosage and medical effectiveness

VALUE PROPOSITION

Digital technologies hold promise to overcome these barriers to care and can be used to help guide personalised interventions that may have a positive health impact. Novel approaches to data analysis also offer the possibility of statistical algorithms that are better able to predict exacerbations, thereby creating opportunities for preventive interventions that may adapt therapy as disease activity changes. To realise these possibilities, RCSI has developed digital approaches to disease management supported by strong clinical evidence as a clinically effective and cost-effective disease management system which reflects the needs of patients and healthcare providers.
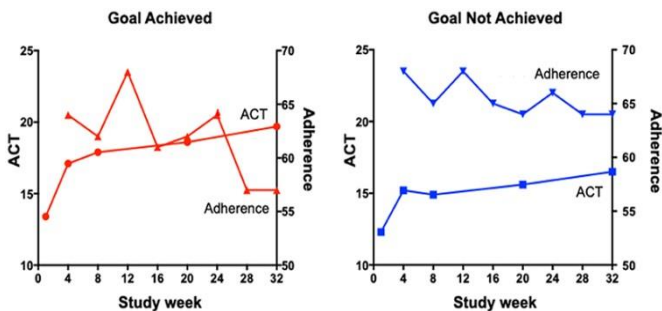

Figure: The relationship between effective inhaler adherence and positive Asthma Control Test Scores

TECHNOLOGY

Objective Adherence Assessment

Beginning with data from INCA^{TM}, an electronic monitoring device for inhalers developed at RCSI, we have derived a **model-based and data-driven approach** to adherence calculations. Our novel algorithm combines monitoring data with clinical measures of patients' wellbeing to model the relationship between dose-timing, drug concentration and health.

Optimised Dosage Calculation

Joint modelling of dose-timing and outcome data allows us to simultaneously assess a patient's adherence, and model the drug concentration needed to maintain optimal health. **As a result we can explicitly calculate the dosage needed to effectively treat a particular condition or patient cohort** therefore reducing inappropriate or over-prescription.

Exacerbation Prediction

Early warnings for clinicians and patients of the risks of disease exacerbation enabling **timely intervention**

Features and Benefits

	Our Method	Self-Report	Prescription Rate
Unbiased	✓	X	X
Objective	✓	X	X
Accounts for Timing	✓	X	X
Accounts for Technique	✓	X	X
Predictive of Outcomes	✓	X	X

TECHNOLOGY READINESS LEVEL

- Patent Filed

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HRB

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