

Improved health by elimination of prescription errors



The Need

Improving patient safety through the prevention of medication errors is one of the highest priorities concerning the healthcare system today. In the US alone, medication errors harm at least 1.5 million people every year and cause the annual premature death of more than 220,000 patients. Adverse drug events are among the most common medical errors. Out of the 4 billion medical prescriptions that are written up annually in the US, 8 million contain life threatening errors.

The introduction of Electronic Medical Records (EMRs) and electronic prescribing systems, combined with clinical decision support systems, has only somewhat helped in reducing the number of prescription errors. However, these systems also introduce new and hazardous types of prescription errors, such as selecting the wrong drug (i.e. picking the wrong medication from a pull-down menu) and selecting the wrong patient (i.e. assigning the drug not to the patient intended, but rather to the one whose record was currently open). The currently available solutions for alerting and preventing prescription errors are focused mainly on drug interactions, dosages and allergies. These solutions detect only a fraction of the actual errors and suffer from a high false-alarm rate, leading to “alert fatigue.”

Therefore, there is a real and substantive need for a solution that can detect a wider range of prescription errors and with higher precision than the existing systems.

MedAware’s Solution

MedAware provides an innovative solution to the above-mentioned need by introducing a new approach. The underlying assumption behind this solution is that most physicians perform well most of the time. Consequently, prescription patterns of thousands of physicians treating millions of patients can be used to determine the “normal” treatment spectrum. A prescription largely deviating from this spectrum is likely to be erroneous. One can find many similarities between this approach and the one successfully employed for fraud detection at the point of sale. Both apply cutting edge big data analytics capabilities to identify outliers from a trend or practice in order to identify suspicious or erroneous transactions.

MedAware’s patent-pending technology uses big data analytics and machine learning algorithms to analyze large scale data of EMRs. By deploying MedAware’s proprietary algorithms to mine the data gathered via millions of electronic medical records, MedAware’s engine builds a mathematical model which represents real-world treatment patterns. Whenever a physician enters a new prescription through the Computerized Physician Order Entry system, MedAware’s software performs a real-time evaluation of the prescribed drug against the specific and up-to-date patient profile. When it identifies a deviation from the normal treatment spectrum of similar patients, it sends an alert to the physician, highlighting the potentially hazardous error. The physician may respond by accepting or dismissing the alert. The system also keeps track of all active medications and provides additional alerts if new incoming data (such as blood tests, procedures, diagnoses, etc.) renders one of the active medications hazardous.

MedAware’s system is self-learning. Based on the physician’s response to the alert, it automatically fine-tunes the model so that an alert that has been repetitively rejected will not be repeated, thus avoiding alert fatigue.

¹ Academy of Managed Care Pharmacy <http://amcp.org/WorkArea/DownloadAsset.aspx?id=9300> Last accessed December 2013.

² John T. James, *Journal of Patient Safety*, 2013

³ Partnership for Patients- <http://partnershipforpatients.cms.gov/about-the-partnership/what-is-the-partnership-about/lpwhat-the-partnership-is-about.html>

⁴ How to reduce prescribing errors, *The Lancet*, Volume 374, Issue 9706



Saving lives and reducing healthcare costs



Recently, MedAware conducted a large proof-of-concept study, involving 44 million prescriptions of 24,000 inpatients and 425,000 primary care outpatients. MedAware's system accurately identified life-threatening prescription errors in more than 2% of the inpatients and more than 1% of the primary care patients. Only prescriptions that passed the existing rule-based prescription alert systems were analyzed, meaning that these errors were not identified by current solutions. The specificity of the alerts generated by MedAware was more than 90%. Patients, in whose records MedAware found prescription errors, had experienced a 20%-40% increase in short-term mortality, 0.6-1.3 additional admissions, and 2.4-4 day longer hospital length of stay. While reviewing a sample of the patients' records in which MedAware flagged an alert, it turned out that in most cases the prescribing physician was unaware that the error had occurred.

Samples of prescription errors that were identified by the MedAware's study, which were not identified by existing detection mechanisms:

- **Drug mix-up: A 28 year old healthy male, prescribed with GLEEVEC (a tyrosine kinase inhibitor for Chronic Myeloid Leukemia)**
- **Patient mix-up: A boy under 5 years of age, prescribed with Viagra**
- **Unawareness of Critical Data: Aspirin prescribed to a patient with thrombocytopenia and active bleeding**

MedAware's solution can be used not only to provide real-time alerts on erroneous prescriptions, but also to reduce alert fatigue of other alerting systems. MedAware analyzes actual prescription patterns and provides critical statistics as to the probability of a rule (i.e. drug interaction alert or a manually curated rule) to be a false alarm in different clinical scenarios. For example, if co-prescribing drugs A and B are signaled as a wrongful interaction by the current system, but in fact that drug combination is used commonly, there is a good chance that this rule generates false alarms.

MedAware's Unique Value Proposition

The MedAware's solution saves lives, improves patient safety and significantly reduces healthcare costs resulting from prescription errors and adverse drug events. The solutions that are currently available in the market for detection of prescription errors rely on databases and pre-defined sets of practice guidelines and rules. These systems provide a partial solution and they usually suffer from the following disadvantages:

- They identify a very narrow range of prescription error types, such as drug-drug interactions, allergies, demographic contraindications and dosage errors. Other potential hazardous error types, such as drug or patient mix-ups, are not identified by current solutions.
- They have a low precision rate, leading to severe alert fatigue and user attrition deficit. It is not uncommon for alert rules to be turned off due to unacceptably high rates of false alerts.
- The creation and updating of rules requires continuous input and updates from experts (physicians, pharmacists, etc.), resulting in high maintenance cost.
- Rule-based alerting systems are rigid and difficult to tune to the environments in which they are deployed.



Elimination of prescription errors using big data analytics



MedAware's proprietary technology addresses the apparent drawbacks of the existing systems. It identifies a wider range of prescription errors, with accuracy of more than 90%. The algorithm is based on continually updating historical data, thus saving the maintenance costs attached to the existing systems.

MedAware's solution is highly personalized, taking into account the profile of the specific patient as well as the practice of the prescribing physician and institution. Furthermore, the system is self-learning and improving over time: the more historical data is accumulated, and the more physicians' responses to alerts are captured by the system – the higher its accuracy will be.

MedAware's Competitive Advantages

	MedAware	Current Solutions
Error identification	High	Low
Alert fatigue reduction	High	Low
Personalization	High	Low
Self-learning capability	High	None
Cost reduction	High	Low
Maintenance cost	Low	High

The Business Opportunity

Based on MedAware's study results and conservative extrapolation of hospitalization data, the annual US direct cost saving by using MedAware is more than \$13 billion, comprising unnecessary hospitalizations and re-admissions, as well as excessive hospitalization length of stays.

MedAware targets healthcare providers, pharmacy benefit management companies, large pharmacy chains and EMR vendors.

About MedAware

MedAware was founded in 2012, with its headquarter in Israel. The company is led by an expert team with extensive clinical, business and technical experience.



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