Medication optimisation

Valorisation

Polypharmacy is defined as the simultaneous use of more than a certain number of drugs, regardless of their appropriateness [1]. Polypharmacy increases as people get older and it is estimated that 20% of patients 65 of older is polymedicated [2]. Previous studies have shown that polypharmacy increases the risk of drug related problems (DRPs) and can lead to hospitalisation [3].

Medication optimisation aims at improving health outcomes by optimising the use of medication, taking into account the benefits and safety aspects of the used drugs; It consists of medication surveillance and medication reviews. Medication surveillance is daily (digitally) performed by physicians and/or pharmacists to assure a beneficial and safe use of drugs and combinations of multiple drugs. It alerts for drug-drug interactions, drug-disease interactions (contraindications) and incorrect dosages. Medication reviews are structured evaluations of a patient's medicines, patient's characteristics, and laboratory values performed periodically (manually) aiming at optimal pharmacotherapy. Medication optimisation, the combination of medication surveillance and medication reviews, is thus aimed at detecting DRPs so that interventions can be recommended to prevent unplanned hospital admissions [1].

The fact that medication reviews are performed, at its best, periodically, emphasizes that this traditional way might be out of date, as it is a snapshot of a patient's medication list, characteristics and laboratory results [4, 5].

A transition towards a more up to date method is essential to guarantee a high-quality medication optimization process, hopefully showing in clinically relevant outcomes. In this way, a computerised decision support system (CCDSS) seems a plausible answer. These systems were created in the 70's to support the clinician on making diagnosis and treatment decisions. CCDSS are typically designed to integrate a medical knowledge base, patient data and an inference engine to generate case specific advice [6].

This thesis puts in perspective the methodological aspects of the medication optimization process and discusses new strategies in the form of CCDSS.

We have shown that even when having all the available information which could lead to a high-quality medication review, its quality leaves much to be desired

Different healthcare professionals (community pharmacists, hospital pharmacists, nursing home physicians, general practitioners and geriatricians) ranked the importance of different covariates in order to perform a high-quality medication review. From this survey, we could establish that drug's indication, use of patients' medical history, use of guidelines, reviewer's professional field, and use of laboratory values are the top 5 covariates that would lead to a high-quality medication

review. Subsequently, these covariates were used to perform medication reviews and we demonstrated the large variability on their quality.

The Dutch healthcare inspectorate (IGZ) demands a medication review to be performed twice a year and yearly for all nursing homes residents and elderly home residents, respectively. Taking into account the time required to perform a medication review, the disappointing quality of the medication reviews performed and the lack of proven efficacy, it is surprising that the healthcare inspectorate requires the medication reviews to be performed. A multidisciplinary working group is adapting the guidelines which patient should be reviewed in order to make it more feasible for general practitioners and pharmacists. They suggest an increase of both the age and the number of drugs used, thereby discarding the view that early detection of DRP's leads to prevention and minimising damage.
Given these facts and taking into account the time needed to perform a medication review, a more efficient way is needed to fulfil the expectations. Furthermore, a longitudinal or continuous medication therapy management would be a better approach than a cross-sectional approach to assure optimal pharmacotherapy.

This thesis shows which aspects should be considered to optimise the efficiency when performing medication review supported by a CCDSS

Using a CCDSS to perform medication reviews might lead to a significant time reduction increasing the process efficiency.

The content of a CCDSS is known as clinical rules which are the algorithms generating patient-specific assessments or treatment recommendations. Clinical rules assign sign- or symptom-based probability scores to risk stratify patients for specific prognoses and/or diagnostic assessments.

Optimising the clinical rules is the first step towards a high-quality medication optimisation. In this way alerts are generated only when action is required. For example, an alert is generated according to renal function value and drug dose. In the basic medication surveillance, an alert is generated for each drug whose dose should be adjusted to the renal function without taking into account either the renal function or the dose. In order to prevent alert fatigue on one hand, but also missing important alerts on the other hand, we aim at a clinical efficacy of 80%. We realise however that this 80% is not evidence based. This might be a topic for future research.

Simple clinical rules can be used to identify patients eligible for treatment optimisation, making the screening process more efficient and objective

Clinical rules can also be used to select a group of patients eligible for a specific treatment based on beforehand established parameters. Within this project a clini-

cal rule to promote the discontinuation of chronically used BZ/Z for insomnia in the nursing home setting was developed.

Even though the discontinuation rate was rather low, we have shown that a simple clinical rule can screen more than 800 patients and generate a list within minutes of the patients which according to guidelines are qualify for discontinuation. In addition, when using a clinical rule no patient is missed and the same criteria is objectively applied to screen all patients. This approach makes it possible to run this clinical rule more frequently, e.g. on a weekly basis.

We have validated an automated delirium prediction model which by means of a clinical rule can predict patients at risk of delirium within 5 days after analysis

Delirium is an under-diagnosed, severe, and costly disorder, and 30-40% of cases can be prevented [7]. A fully automated model to predict delirium (DEMO) in older people was developed and has been validated in this thesis.

Patients admitted in the hospital are automatically screened within 24 hours from admission. DEMO predicts patients at risk of developing a delirium within 5 days after analysis. The high sensitivity and specificity found in the validation study make the model satisfactory to be applied in clinical practice to facilitate earlier recognition and diagnosis of delirium. Nevertheless, important factors that could predict delirium (previous delirium, cognitive impairment, severity of disease, visual impairment, etc.) are not included in this model as these data are not yet electronically available.

Using a CCDSS will drastically reduce the time to perform a medication review and hopefully demonstrate a positive effect on clinically relevant outcomes compared to traditional medication review

Clinical trials are not widely applied for medical informatics. In addition, there is a lack of focus on the impact of a CCDSS on clinical outcomes. We present a RCT study design focused on both hard endpoints (i.e., patient relevant outcomes) and surrogate out-comes, aiming at demonstrating a positive effect on clinically relevant outcomes when using a CCDSS vs traditional medication optimisation in the nursing home setting.

The overall goal from the medication optimisation viewpoint is to improve patient care; thus, the use of a CCDSS should be evaluated on clinical outcomes. This should be the subject of future re-search, of which the first steps already have been undertaken.

In addition, using a CCDSS to support the medication review process decreases the time needed to evaluate the appropriateness of medication so that healthcare professionals can focus on what is important and perform a high-quality medication review.

References

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