Introduction:

1. PK modeling:
2. How clinical study go.

The pharmacokinetics (PK) study is a crucial part in the pre-clinical and clinical research. Before the drug ever brought into the market, the must-answered question like the half-life the elimination coefficient, the absorption coefficient must be studied as well as the minimum effect dose and the minimum toxic dose. Conventionally, these information about kinetics coefficients will be revealed based on the group of the patients enrolled in the clinical study of a drug.

Once the kinetics coefficients are answered, the proper dosing regimen of the drug, like the dosage form and the dosing intervals will be determined as the product label. However, because of the limited sample size and the standardized drug administration method of the enrolled patients in the clinical study. The dosing regimen is not optimal for every individual in the whole population. This brought up the issue in personalized medicine whose target is to tailor

1. How modeling work

The pharmacokinetics modeling is the tools to illustrate the time versus drug concentration correlation. The model assumption is that treating the organ and tissue as separable compartment, between them there are connected by influx or outflow of the drug. The rate is controlled differential equation. [Fig]

The most basic model is treating the whole human body as just one compartment in which the influx of the drug and elimination of the drug is just dominated by 2 differential equation [fig]. In a way this model is sufficient enough to explain the drug metabolism behavior but may lack accuracy. This is the model we are using to explore the possibility of our method.

1. Different type of model

The type of pharmacokinetics models varies based on different ways of administration. IV stand for IV bolus injection, in which the whole dosage of the drug will be injected into the blood circulation

PO stands for oral administration, the drug will be absorbed through intestine and the drug concentration will have a more gradual rising.

1. Clinical drug monitoring in personal medicine:

How the drug monitoring in clinical practice [citation][figs] showing the minimum effect and minimum toxic]

Drug monitoring is one critical part in personal medicine, however, very few PK based approaches have been implemented in this process. The PK modeling, most of the time, stay in the clinical and pre-clinical study not the clinical practice. The mere criteria monitored in clinical practice, is the drug concentration in patient. The drug concentration is assumed to be in between the minimum effect and minimum toxic range. The limitation of this approach is that without the model implemented, the clinical practitioner will not foresee the change of patient’s physical condition and make a prediction [Citation: the influence of Physical condition on PK]

By knowing the pharmacokinetics parameters of the drug, theoretically, by just giving the dosage, the oncoming drug concentration can be predicted.

Fig: Single dose/multiple minimum effect dose

Related Work:

1. Current software:

The conventional software used in PK modeling

NCA