SUMMARY

Nowadays for a large number of patients admitted to a hospital intravenous infusion of fluids is an important part of their treatment. These fluids serve as a correction of the fluid and/or electrolyte balance, as a carrier for drugs, as a substitute to oral nutrition or to compensate the loss of blood. Despite the fact, that many infusions are accompanied by a lot of problems, coherent and basical investigations into the origin of these problems have hardly been done. At the same time there are no criteria for the choice, judgement and use of available, sometimes very sophisticated infusion equipment.

In this thesis an analysis of problems is described. It is tried to solve problems in such a way that a scheme for daily practice can be obtained.

Hydrodynamical and pharmacokinetical principles form the basis for this study.

In chapter I available data from literature are given. It follows that problems are described at random and without connection. The chapter is concluded by the description of the direct reason to do the study.

In chapter II it is described how to control infusion rates based on hydrodynamical principles. Apart from system dependent variables, physical properties and patient dependent variables are the main factors for fluctuations in infusion rates.

An in vitro study, based on calculations as presented in chapter II, is described in chapter III. Electronical and disposable infusion rate controllers are studied extensively.

Besides, costs connected to the use of these controllers, are calculated and recommendations are done.

Chapter III describes also the study of drop counting in the counting chamber of the infusion system to control the infusion rate.

Main factors which influence drop volume and the connecting infusion rate are studied. Rules are given for daily practice. They show very clearly the necessity of an extensive standardization of the entire infusion process.

In chapter IV the magnitude of fluctuations in the blood level of a drug due to variations in the infusion rate is described.

The half-life and the therapeutic margin of the used drug are important parameters. Besides, the accuracy of infusion rate controllers is calculated.

In chapter V problems connected with parenteral nutrition are described.

These problems have their own place, as a result of the very different physical properties of the used infusion fluids when compared to normal fluids.

A scheme for infusion rate control based on theoretical considerations and in vitro studies is tested in daily practice with the aid of some model substances.

The results are described in chapter VI and VII.

Chapter VI presents the results of an in vivo study with disposable infusion rate controllers using aminophylline as a model substance for drugs with a long half-life (>1h).

In addition, this study has provided a good deal of information about the model substance itself. It is concluded that the infusion of aminophylline has generally speaking no further role to play as maintenance dose.

In this study the disposable infusion rate controllers satisfy very well.

In chapter VII the results of a study with two $beta_2$-sympathomimetics used for the inhibition of preterm labor is described.

Fenoterol serves as a model substance for drugs with a short half-life (<1h).

It is compared with ritodrine to study the influence of different pharmacokinetical parameters on clinical effect.

Chapter VIII describes some new developments.

Finally, in chapter IX conclusions of the theoretical considerations, in vitro and in vivo studies are described.