







# Validation of drugs separation in a multiplexing infusion system

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#### **Overview**

### **Preventable hospital errors related to infusion systems**

Intravenous (IV) infusion errors are a significant source of harm to patients.

- IV infusion setups seem uncontrolled due to flow rates and pressure differences between syringe pumps[1].
- Hygiene problems present when transporting patient (connected to infusion lines) between operating room and intensive care unit[2].
- Drug multiplexing means separating successively flowing drug portions by a gaseous medium.

## Method

## Measuring absorption for concentrations identification

- Dyes with different concentrations were prepared to mimic drugs.
- Dyes separated by CO<sub>2</sub> or air portions of  $\mu$ L volume were flowed through an optical measuring cell.
- UV-VIS absorbance measurements were done to explore dyes concentrations.
- Concentrations deviation from known original values means that the contaminants are present in the following portions of the flowing dyes.



Optical setup for measurements of light absorption.

#### Results

#### **Contamination measurement of multiplexed drugs**

Contamination [%]

• Due to its high solubility in blood, CO<sub>2</sub> was used as separating medium in the experiments.

 Measurement were repeated 8 times with Polyvinyl chloride (PVC) tubes of 0.6 mm and 1 mm inner diameter.

• Volume of 4.26  $\mu$ L CO<sub>2</sub> served as separating medium effectively.

•  $CO_2$  flow rate < 0.1 mL/ min.

• The showed results represent the mean value of 4 measurements.



Separation quality using air and  $CO_2$  in PVC tubes.

Tube inner diameter: 0.6 mm 100 (Separation medium: Air) 90 Tube inner diameter: 0.6 mm 80 (Separation medium: CO2) 70 Tube inner diameter: 1 mm 60 (Separation medium: Air) 50 Tube inner diameter: 1 mm 40 (Separation medium: CO2) 31,6 28.3 30 20 10 1,3 Contraction of 2 5 3 Number of portion

### Conclusion

- Infusion line diameter plays a vital role in drug multiplexing.
- Better separation is achieved with smaller inner diameter of the tubes.
- The smaller the line diameter, the less volume of CO<sub>2</sub> needed to eliminate contamination of drugs.

#### References

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