

Evaluation of elastomeric pump flow rate variation

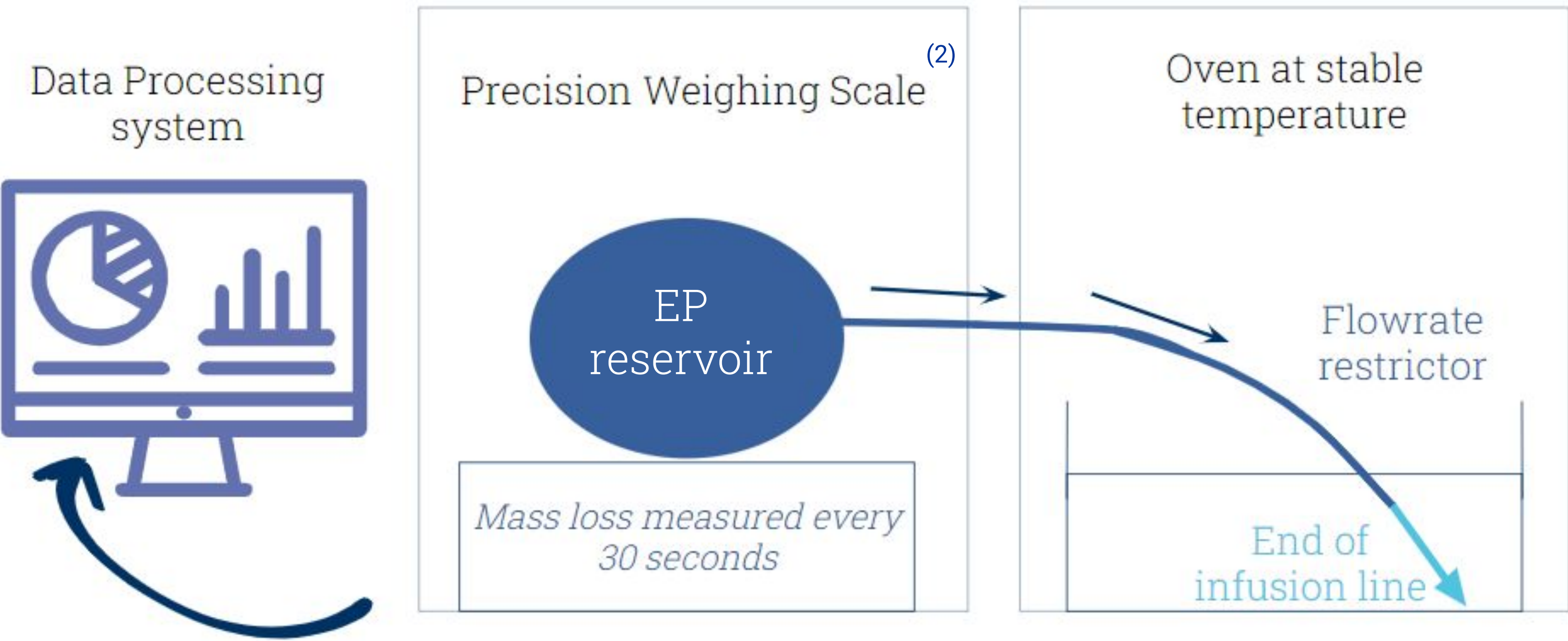
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Introduction

Outpatient Parenteral Antibiotic Therapy (OPAT) services have expanded throughout the world thanks to elastomeric pumps (EP). The flow rate is known to vary by $\pm 15\%$ ⁽¹⁾. Experience shows that the variation can be greater in the patient's home, though the mechanism is not well understood. This can impact treatment effectiveness (total dose administered and drug stability) and the organization of care at home. An **in vitro study** was conducted, following the guidelines of EP and drug manufacturers, to describe the impact of the **volume, composition and temperature** of the infused solution on the flowrate.

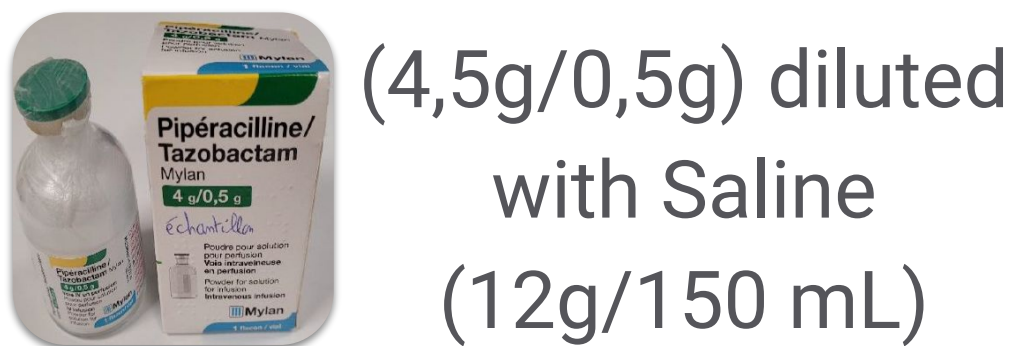
Methods



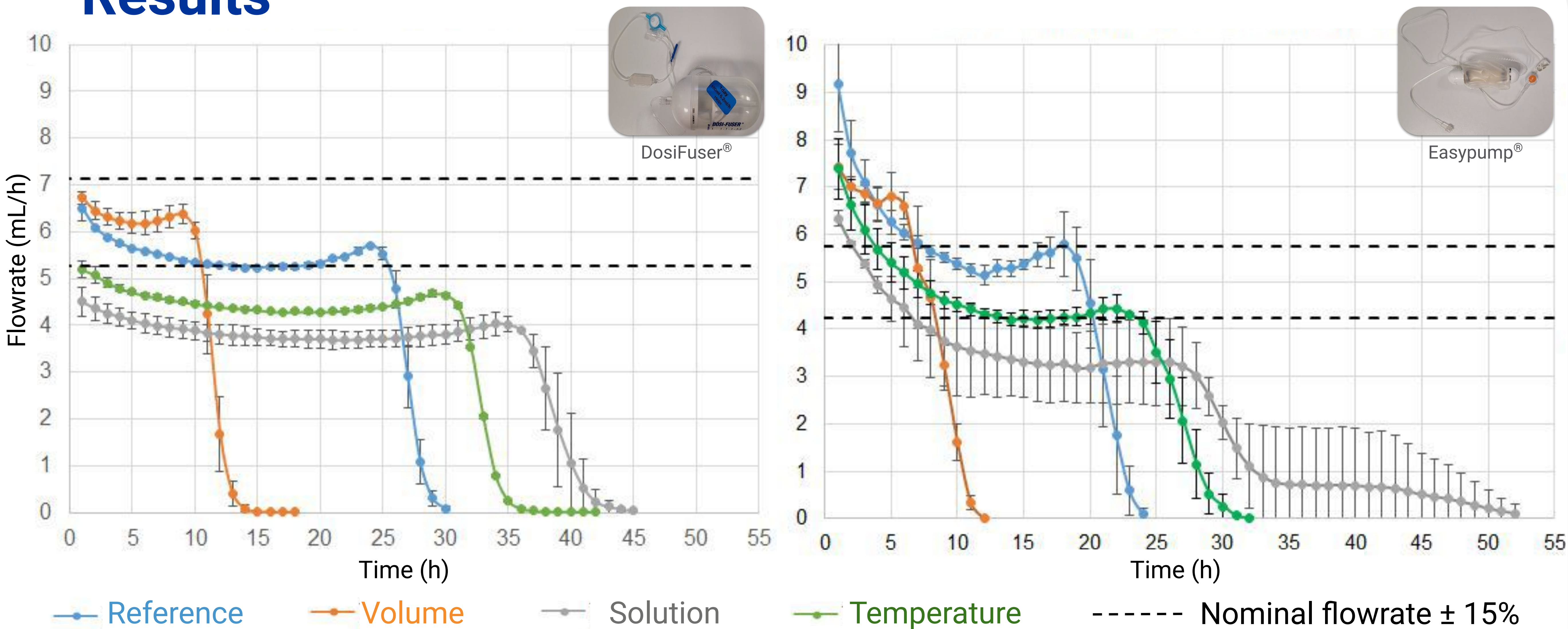
- Each testing condition was tested 3 times with 2 different EP brands: DosiFuser from Asept Inmed®; Easypump from BBraun®
- Calculation of the real time and averaged mass flow over the total infusion time

Testing condition	Filling volume	Composition of the infused solution	Flow restrictor temperature
Reference	Recommended *	Saline	Recommended *
Volume	Minimal **	Saline	Recommended *
Solution	Recommended *	Tazocillin® *** 0,08 g/mL in Saline	Recommended *
Temperature	Recommended *	Saline	22 °C

* 125 mL at 31°C for Easypump® and 150 mL at 32°C for Dosifuser® ⁽³⁾
** calculated as 60 mL for Easypump® and 72 mL for Dosifuser®
*** Piperacillin/Tazobactam



Results



- Even following the manufacturer's instructions (Reference test), the mean flow rate varies **up to $\pm 18\%$** .
- At minimal filling volume, EP flow rates remain within the expected range with a variation **up to $\pm 9\%$** .
- When the flow restrictor temperature is lowered to 22°C, the flow rate varies by **up to -28%**.
- When the EP is filled with a Tazocillin solution, flow rate variation reaches **-37%**.

Conclusion

For some drugs such as Tazocillin, the hourly dose may not be administered as prescribed, failing to reach Minimal Inhibitory Concentration targets, and/or the total prescribed dose may not be delivered, which might impact treatment effectiveness.

More research is necessary to determine the combined effect of temperature and solution viscosity on flow rate. To date, manufacturer data is not sufficient to provide safe and effective treatment via elastomeric pumps.

⁽¹⁾ NF ISO 28620, ⁽²⁾ XS1203S, Mettler Toledo, ⁽³⁾ respecting the manufacturer's calibration conditions