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## Development of a protocol to investigate the stability of drugs used by Qatar's National Ambulance Service in rapid response vehicles

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### ABSTRACT

**Background:** Paramedics need a range of medications that are stored in bags for easy transportation to the patient's side and are exposed to temperature variations, especially in a hot country like Qatar<sup>1</sup>. The thermal stability of some medications was examined in previous studies<sup>2,3</sup>.

**Methods:** A safe and practical solution had to be found and should be approved by the Production committee to investigate the thermal stability of a range of 13 medications over different periods of time (Table 1).

**Results:** Six medication bags have been specially prepared with the drug samples presented in Table 1. While one data logger was fixed to the metal net divider at the back of the rapid response vehicle, each bag contained a radio-frequency identification (RFID) tag for tracing, two data loggers to measure the temperature and humidity every 10 minutes over a 3 to 12-month period, and an initial total of 15 drug samples (Table 1). The bags have been labeled "For research purpose" and placed at the back of rapid response vehicles (Figure 1). At collection times, 3 samples of each medication will be removed for analysis and replaced by new samples. Similarly, data loggers will be collected and replaced with new ones. As per Qatar Ambulance Service's standard operating procedures, paramedics are required to always keep their medication bag with them when they leave their vehicle for a break or to treat a patient, but for practical and safety reasons it will not be the case with the research samples. Although this means that the research bags will have less exposure to the outdoor environment, they will still be subjected to temperature variation in case the vehicle is parked without air conditioning<sup>1</sup>. The collected samples will be kept at 4°C until analyzed by high-performance liquid chromatography.

**Conclusion:** Based on the findings of this study, the results may have a significant impact on how some of the drugs are handled in the pre-hospital setting, especially, possible modification of the recommended expiration date specified by manufacturers to ensure patient safety.

**Keywords:** Prehospital, Thermal stability, Medications, Ambulance Service, Emergency Medical Service

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**Table 1.** The list of medications with a schedule of sample collections.

Item Name	Group 1		Group 2		Group 3		Group 4		Group 5		Group 6		Group 7	
	Insertion Date	Collection Date	Insertion Date	Collection Date	Insertion Date	Collection Date	Insertion Date	Collection Date	Insertion Date	Collection Date	Insertion Date	Collection Date	Insertion Date	Collection Date
Adenosine 3 mg/ml														
Atropine 0.5 mg/ml (1:1,000) Amp														
Diphenhydramine 50 mg/ml														
Epinephrine (Adrenaline) 1 mg/ml (1:1,000) Amp														
Furosemide 20 mg/2ml														
Naloxone 0.4 mg/ml														
Ondansetron 4 mg/2ml	01-01-21		01-04-21		01-01-21		01-07-21		01-01-21		01-10-21		01-01-21	
Phenylephrine 10 mg/ml														
Salbutamol 0.5 mg/ml (Albuterol amp)														
Insulin Regular 100IU/10ml -> 1 month out of fridge														
Rocuronium Bromide 10 mg/ml -> 84 days out of fridge														
Glyceryl Trinitrate 5 mg/5ml														
Paracetamol 1 G/100ml														

(All dates are formatted as dd/mm/yy)

**Figure 1.** Research bag containing drug samples and data loggers.

**Ethical approval:** The research protocol was approved by Hamad Medical Corporation Ambulance Service Production Committee, Doha, Qatar.

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