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## A protocol to investigate the stability of 0.9% sodium chloride IV fluid bags in the prehospital setting of Qatar

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### ABSTRACT

**Background:** 0.9% sodium chloride (NaCl) fluid bags are commonly stored in ambulances. Despite that the ambulances normally use air-conditioning during operational shifts, NaCl bags are exposed to deviations from the controlled environmental conditions that could affect their integrity<sup>1,2</sup>, as all ambulances are not constantly in use. Although stress tests performed in a laboratory Binder Convection Oven<sup>3</sup> showed that NaCl maintained its stability, these findings need to be validated. This study aims to develop a protocol to evaluate the thermal stability of NaCl under real-life conditions in Qatar.

**Methods:** Key aspects were considered to subject the research samples to the routine environmental conditions under which NaCl bags are stored in ambulances. The study bags are used for research purposes only, thus should not be used on patients (to avoid hindering the work of paramedics) and need to be tested after various exposure durations.

**Results:** The agreed-upon study protocol is to be replicated on 5 ambulances over 12 months and includes 4 collection cycles of three 500 mL NaCl study bags and three 10 mL NaCl vials following different exposure durations (Table 1). Hence, 12 NaCl bags and 12 vials marked "for research-use-only" will be stored in a locked cabinet in the ambulance patient compartment alongside a temperature and humidity data logger taking measurements every 30 minutes (Figure 1). Control samples will be stored under manufacturer's recommended conditions. Following each collection cycle from the 5 ambulances and controls, samples will be stored at 4°C and protected from light until being visually inspected (for discoloration, turbidity, bulging), diluted, and tested using ion-exchange chromatography to measure sodium and chloride levels.

**Conclusion:** This study performed under real-life conditions will help determine the effect of exposure to actual ambulance operational conditions on NaCl bags and may have a significant impact on how they are handled in the prehospital setting in countries with a hot/arid climate.

**Keywords:** 0.9% sodium chloride, Stability, Prehospital settings, Ambulance Service, Normal Saline

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**Figure 1.** Storage location of the sodium chloride study samples and data logger within an ambulance.

**Table 1.** Schedule of sample collection of the 0.9% sodium chloride study bags.

Groups	Research Samples	Sodium Chloride Insertion Date	Collection Date
Group 1	3 fluid bags, 3 vials	01/01/2021	01/04/2021
Group 2	3 fluid bags, 3 vials	01/01/2021	01/07/2021
Group 3	3 fluid bags, 3 vials	01/01/2021	01/10/2021
Group 4	3 fluid bags, 3 vials	01/01/2021	01/01/2022
Controls	12 fluid bags, 12 vials kept in the Industrial Pharmacy Laboratory at College of Pharmacy, Qatar University at time 0 (01/01/2021) with 3 fluid bags, 3 vials analysed on planned dates		Analysis dates: 01/01/2021 01/04/2021 01/07/2021 01/10/2021 01/01/2022

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

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