

Relationship between Chloride infusion and Base Excess in initial treatment of pediatric diabetic ketoacidosis

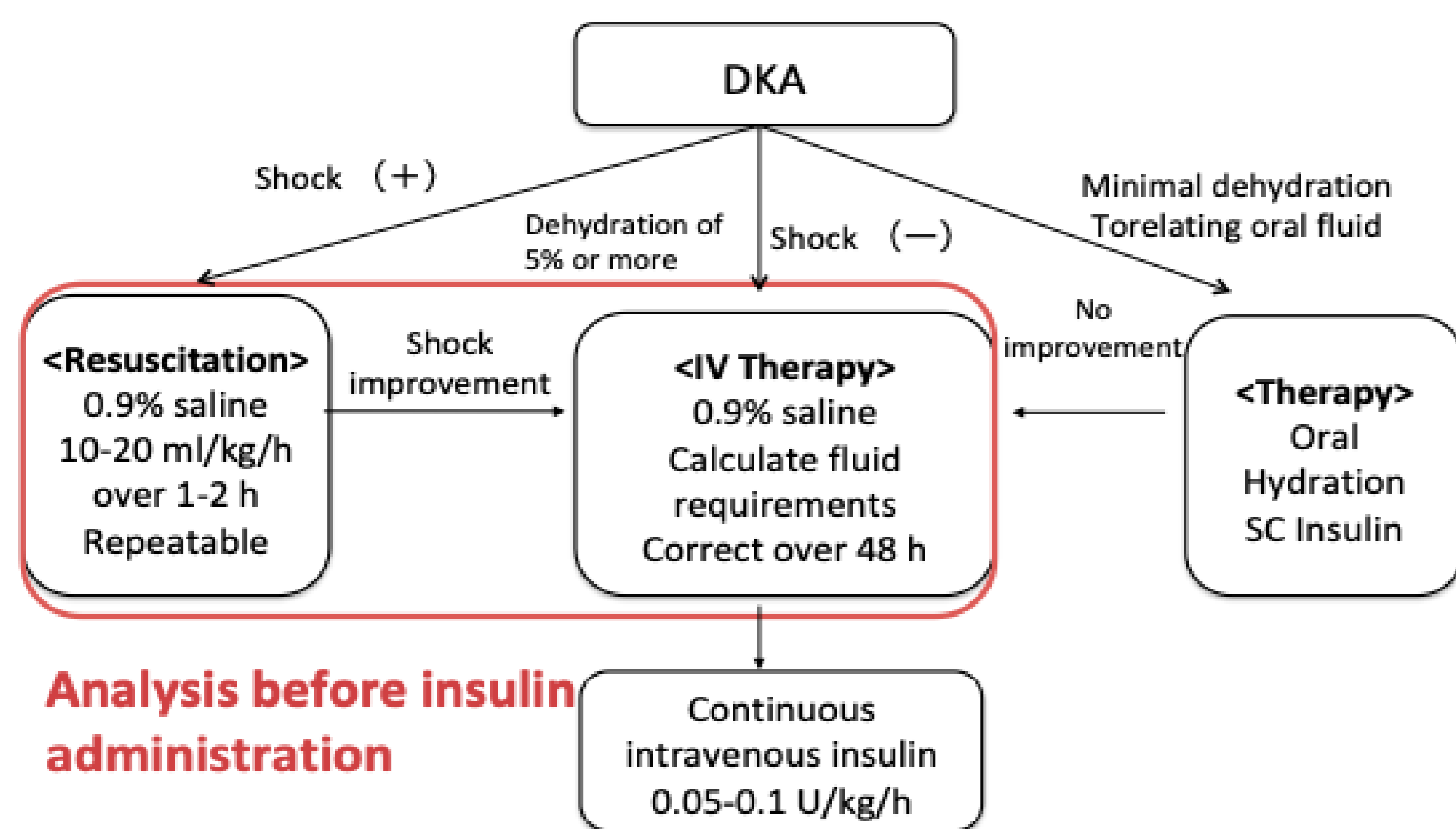
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Introduction

- In initial treatment of DKA, 0.9% saline is mostly used before insulin to restore the peripheral circulation.
- The use of large amounts of chloride-rich/bicarbonate-free fluids may cause the rapid development of hyperchloremic metabolic acidosis.¹⁾
- The severity of DKA, defined by pH, HCO₃⁻, Base Excess (BE), is one of the factors in the prognosis. Advanced acidosis is a risk factor of cerebral edema, which is known to be the major event in term of the life prognosis.

Initial Treatment of DKA²⁾



Purpose

- Can large amounts of Cl-rich fluids lead to worsening of acidosis before insulin administration?
- Is the development of acidosis Cl-dose-dependent?

Objective

- Patients with DKA admitted to 7 institutions between 4/1/2010 – 3/31/2018
- Age < 15 years
- Those with two or more Blood Gas Analyses being performed.

<Excluded>
Those with insulin being administered in the previous hospitals.
Those for whom bicarbonate was used.

Methods

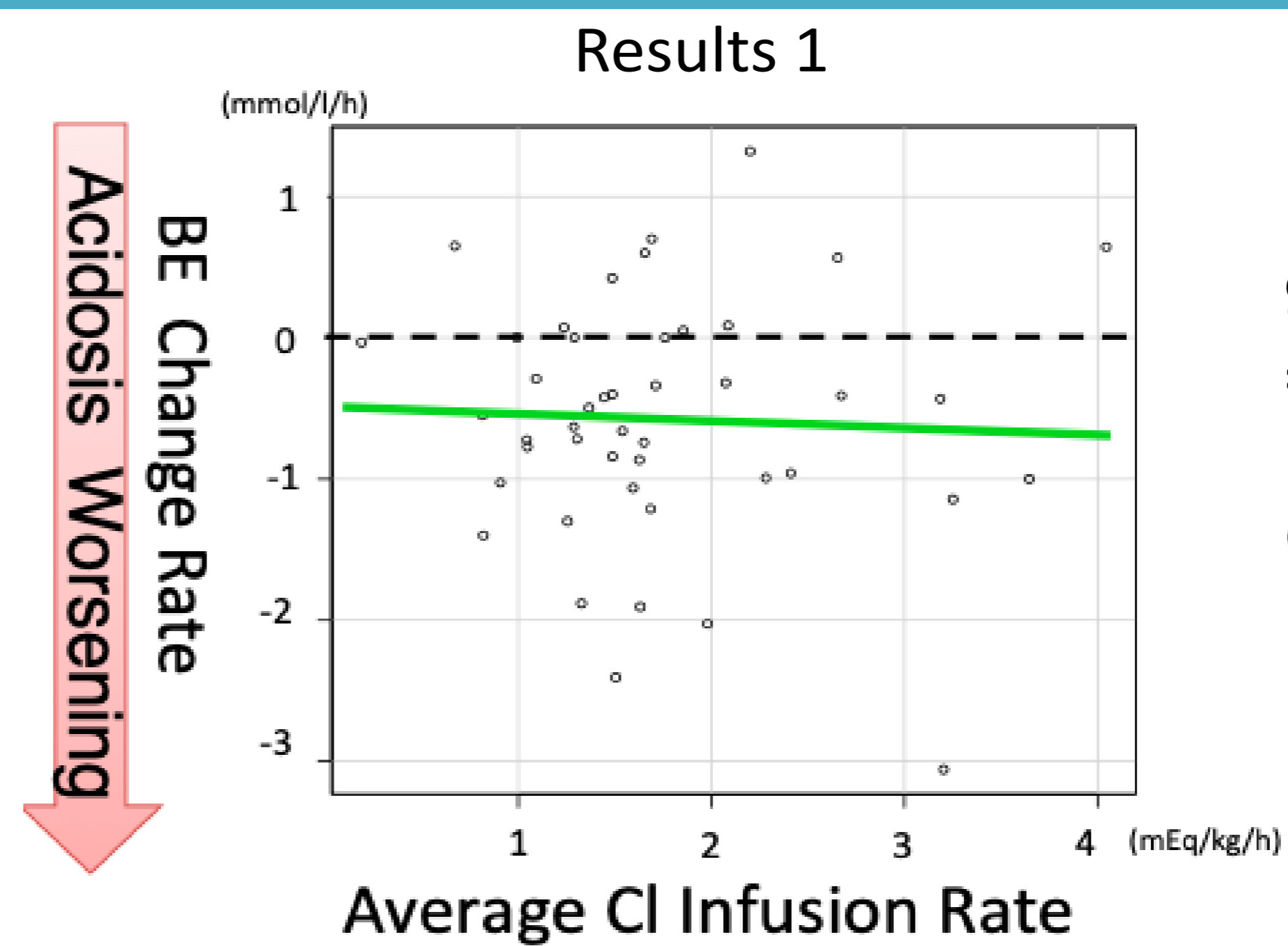
- As an indicator of acidosis, BE was used to remove respiratory factors.
- We analyzed the average Chloride infusion rate (mEq/kg/h) and BE change rate (BE change/hour) from the start of infusion to before insulin administration.
- We also divided the children into two groups according to average Chloride infusion rate.

Group Slow (Group S) (N = 21) : less than 1.54 mEq/kg/h
Group Rapid (Group R) (N = 24) : 1.54 mEq/kg/h or more

Cl 1.54 mEq/kg/h = 10 ml/kg/h 0.9% saline

Sex	Male	27 cases
	Female	18 cases
Age	Mean	7.1 y (2.1-12.1)
	Infusion type	0.9% saline only 37 cases 0.9% saline → 0.9% saline+KCl 1 case Ringer's acetate → 0.9% saline 2 cases 0.9% saline → Ringer's acetate 5 cases
Infusion time	Median	2.0h (1.67-2.82)

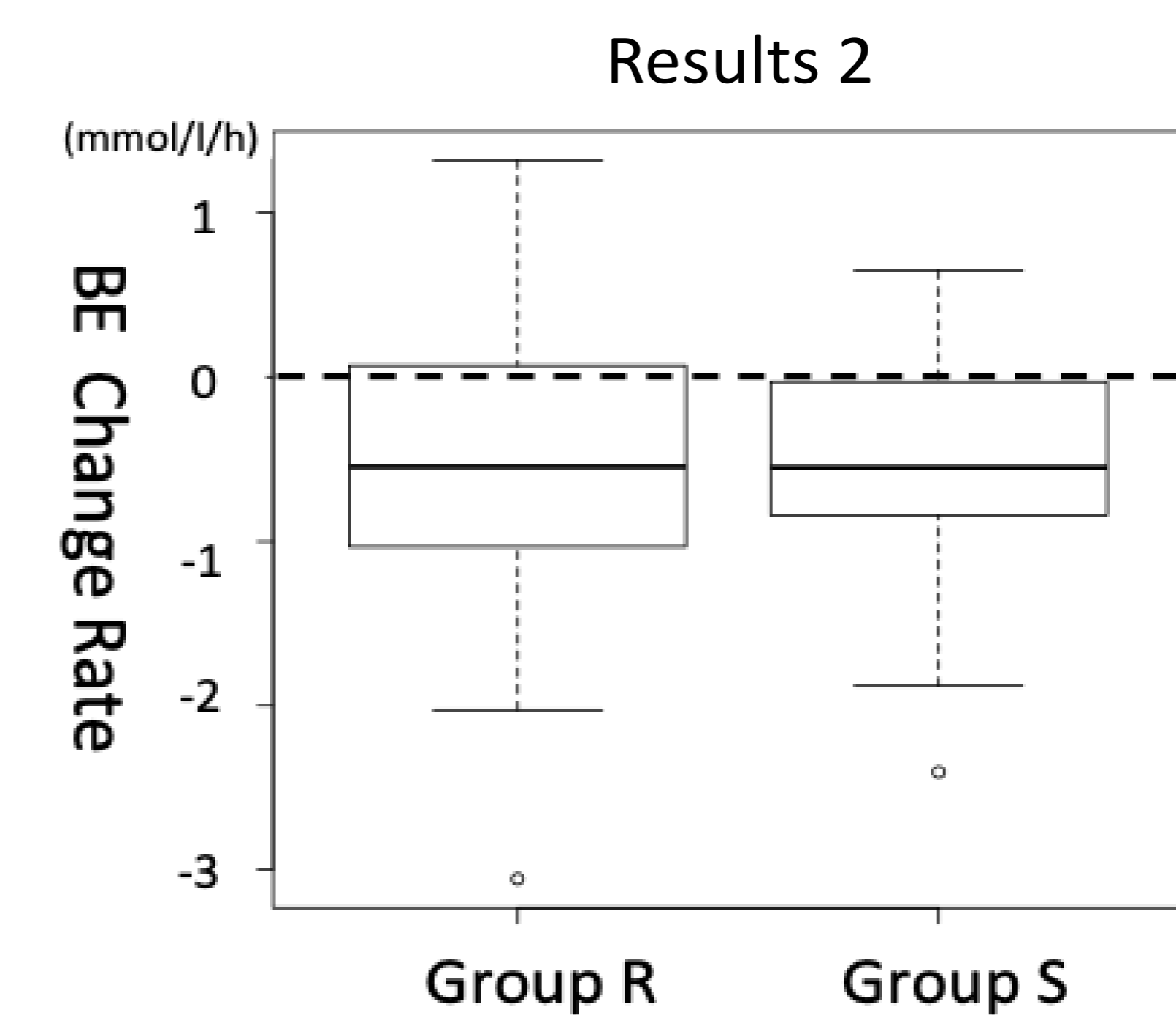
Results



BE Change Rate = $-0.57 (\pm 0.87)$

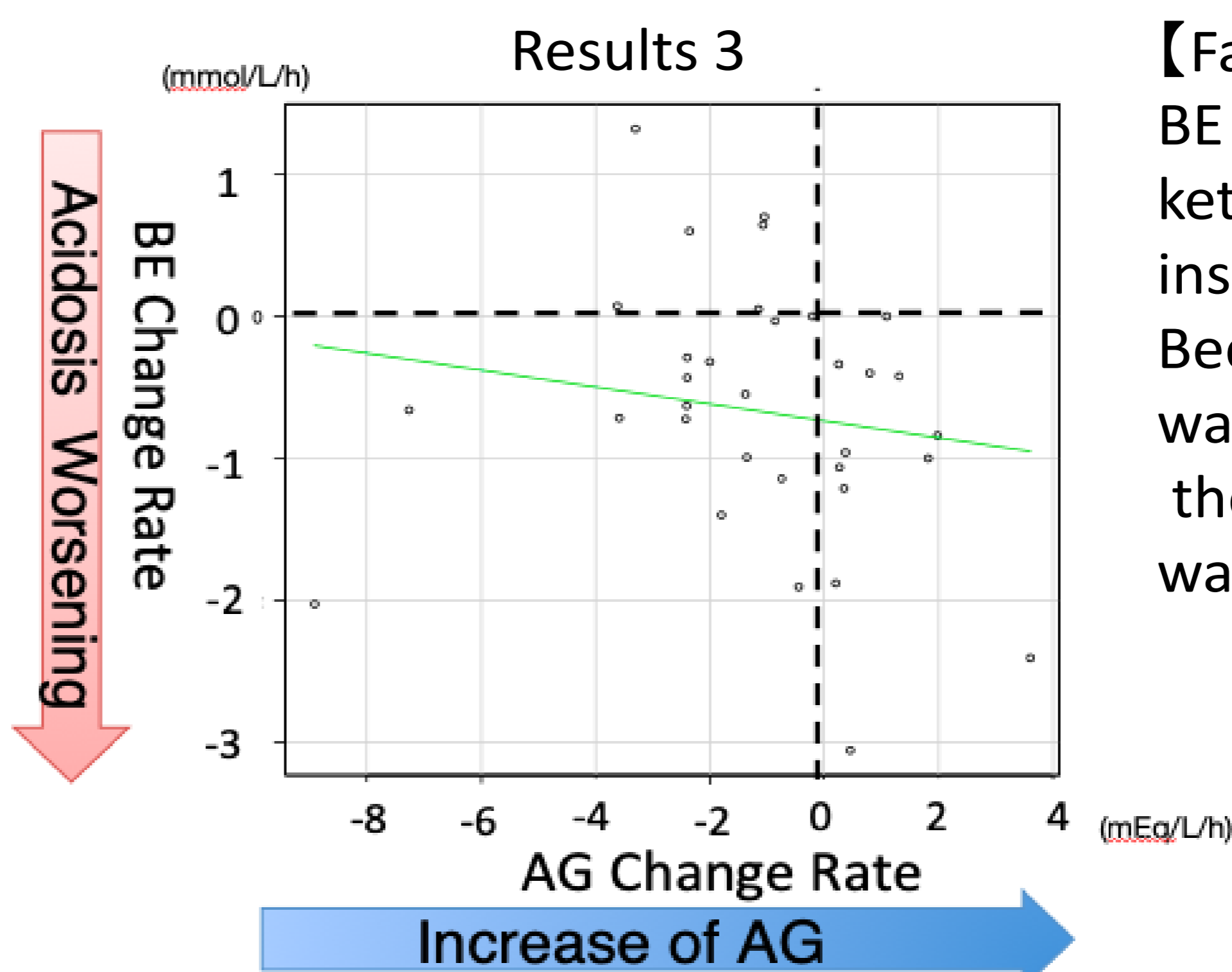
95% confidence interval = $-0.831 \sim -0.309$

Correlation coefficient = 0.00527
No Correlation



No significant difference

$p=0.973$



【Factors of BE decrease】

BE may be decreased due to ketone body production before insulin administration. Because ketone body over time was not be collected, the change of anion gap (AG) was evaluated.

Correlation coefficient = -0.159

No Correlation

Discussion

- 95% CI of the mean of the BE change rate was below zero.
→ Acidosis worsened after Cl-rich fluids in DKA initial treatment.
- The BE change was not Cl-dose-dependent.
→ Physicians should know this possible worsening of metabolic acidosis during the phase of initial Cl-rich fluid therapy before insulin administration regardless of Cl infusion rate.

Limitation

It is not clear whether the BE change was caused by influence of Cl dose or infusion volume.

Conclusion

BE decreased after administration of chloride-rich fluids in the initial treatment for DKA before insulin administration.

References

- 1) Wolfsdoef JI, et al. Pediatric Diabetes 2014;20:154-179
- 2) Wolfsdoef JI, et al. ISPAD clinical practice consensus guideline 2018