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| **Organization-wide Protocol** |

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| **Target Group:**  All Physicians and Nurse Caregivers treating DKA Patients | **Protocol Number:** XXX\_PTL\_XXX  **Version**: 1 | **Date of Issue:**  04 May 2015 | **Date of Review:**  23 May 2017 |
| **Approved by:**  Tomislav Mihaljevic, MD  Chief of Staff | **Date Approved:**  03 May 2015 | **Prepared by:**  Rabih Hijazi, MD | **Date of Revision:**  23 May 2017 |

**Purpose**

To provide physicians and nurses at CCAD with a protocol for using intravenous insulin infusion to treat patients with hyperosmolar hyperglycemic syndrome (HHS)

**Protocol**

1. Ordering
   1. This protocol will be initiated by a physician order.
   2. Subsequent orders specified by the protocol will be entered by a nurse as ‘per protocol’.
   3. Subsequent orders not specified in the protocol will require a physician order.
2. Insulin protocol
   1. Discontinue all previous orders for insulin and other glucose lowering agents.
   2. Ensure that the patient has been adequately volume resuscitated prior to starting insulin
   3. Intravenous (IV) insulin solution.
      1. Regular insulin in 0.9% NaCl (1 unit per 1mL).
      2. Must use infusion pump and run with maintenance fluid.
   4. Monitor blood glucose every hour.
   5. Record all blood glucose measurements in Epic.
   6. Contact physician prior to starting insulin drip if K < 3.5 mEq/L
   7. Patient must be NPO while drip is infusing.
   8. Patient is to remain on nursing unit while IV insulin is infusing unless accompanied by RN or physician.
   9. Administer a bolus insulin of 0.1 unit/kg and start infusion at a rate of 0.1 unit/kg/hour: The goal of insulin therapy is to decrease blood glucose slowly by 2.8-4.2 mmol/L/hour (50-75 mg/dL/hour).
   10. Adjust the insulin infusion according to the following table **until the blood glucose reaches 16.6 mmol/L (300 mg/dL):**

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| BLOOD Glucose CHANGE Direction | | | Blood Glucose  Change  Range |
| Adjustment in insulin infusion |
| **⇩** | **DECLINING** | If **DECLINES**  in **1 HOUR** by | 0-2.7 mmol/L/hour | Increase rate by 20% |
| 2.8-4.2 mmol/L/hour | No change in insulin drip |
| >4.3 mmol/L/hour | Hold insulin drip for 15 minutes and then restart at 50% of most recent rate |
| **⇧** | **INCREASING** | If **INCREASES**  in **1 HOUR** by | 0-2.7 mmol/L/hour | Increase infusion rate by 50% |
| >2.8 mmol/L/hour | Bolus 0.05 unit/kg and increase infusion rate by 50% |

1. **When the blood glucose drops to less than 16.6 mmol/L from a previous value of >16.6 mmol/L,** adjust regular insulin infusion to 0.05 unit/kg/hr and, if not done earlier, change IV fluids to a dextrose containing solution per physicians’ orders. The goal is now to maintain blood glucose between 11.1 and 16.6 mmol/L (200-300 mg/dL) until patient is mentally alert. If either current or previous blood glucose remains less than 16.6 mmol/L, follow the adjustment rules below:
   1. If blood glucose decreases in 1 hour by ≥1.6 mmol/L (≥30 mg/dL) since previous level, decrease insulin infusion rate by 50%.
   2. If blood glucose increases in 1 hour by ≥1.6 mmol/L (≥30 mg/dL) since previous level, increase insulin infusion rate by 25%.
2. Stop insulin infusion if blood glucose 3.8 mmol/L (70 mg/dl), notify physician, and initiate hypoglycemia protocol. Restart insulin infusion at half of the last rate when blood glucose is >5.6 mmol/L (>100 mg/dL).
3. Subcutaneous insulin should be started when patient is mentally alert and able to tolerate oral intake: Contact physician for orders.
4. Stop intravenous insulin 60 minutes after injection of a short-acting insulin and 90 minutes after injection of a long-acting insulin.
5. After stopping the insulin infusion, monitor blood glucose 1 hour after stopping and then at frequency ordered by the physician.

**Oversight and Responsibility**

1. Quality and Patient Safety Institute
2. Department of Pharmacy
3. Medical Subspecialties Institute
4. Respiratory and Critical Care Institute
5. Department of Nursing

**Definitions**

1. None

**References**

1. Abbas E. Kitabchi et al. Diabetes Care 2009;32:1335-1343
2. www.UptoDate.com
3. L. Loriaux. Endocrine Emergencies: Recognition and Treatment, Contemporary Endocrinology.

Chapter 2, pages 15-32.

**Institute / Department / Committee Involved in Protocol Development / Revision**

1. Quality and Patient Safety Institute
2. Department of Pharmacy
3. Medical Subspecialties Institute, Endocrinology, Diabetes, and Metabolism
4. Respiratory and Critical Care Institute

**Contact for Questions / Clarifications**

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**Related or Supporting Documents**

1. None