Closed-Loop Insulin Delivery in Prenatal Care: Evidence for Noninferiority Compared with Multiple Daily Injections

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Abstract:

Closed-loop insulin delivery systems (automated insulin delivery [AID]) are increasingly used in pregnancy for individuals with pregestational diabetes, where strict glycemic control is essential to reduce congenital anomalies, fetal overgrowth, hypertensive disorders, neonatal hypoglycemia, and stillbirth. Professional societies, including the American College of Obstetricians and Gynecologists and the American Diabetes Association, recommend intensive insulin therapy to achieve trimester-specific glucose targets. Traditionally managed with multiple daily injections (MDI), patients are now candidates for closed-loop systems that automate basal insulin delivery in response to continuous glucose monitoring. Contemporary randomized trials and cohort studies in pregnant individuals with type 1 diabetes demonstrate that closed-loop therapy is noninferior to MDI in achieving hemoglobin A1c targets while improving time in range (63–140 mg/dL) and reducing glycemic variability without increasing severe hypoglycemia or diabetic ketoacidosis. Perinatal outcomes—including rates of large for gestational age infants, preterm birth, and neonatal hypoglycemia—are comparable between modalities. By improving time in range, a key determinant of fetal hyperinsulinemia and macrosomia, closed-loop systems provide an evidence-based, patient-centered approach to diabetes management in prenatal care.