OPTIMIZING PREMATURE INFANT GLUCOSE BALANCE
via Continuous Glucose Monitoring and Control

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Low blood sugar (Hypoglycemia) is a dangerous condition in neonatal infants. A control loop using a continuous glucose monitor (CGM), Raspberry Pi, Arduino microcontroller, and syringe pump is proposed to automatically add additional glucose when low blood sugar is detected. This system will assist staff by relaying real time information to doctors and nurses allowing for on the spot medical decisions.

ISSUES & OPPORTUNITY
Current glucose control methods require manual monitoring and treatment by a nurse. This allows for larger error to accumulate as there is time delay in treatment. An automated system will allow for real-time information relay and tighter control as glucose can be titrated in real-time.

ANATOMY AND PHYSIOLOGY
• In utero blood glucose is regulated by the mother; preterm infant physiology is not prepared to regulate glucose.
• Hypoglycemia (infant serum glucose level below 40 mg/dL) affects 5 to 15% of healthy babies and can cause seizures, brain damage, or death.
• Hypoglycemia (infant serum glucose level above 150 mg/dL) can cause nerve damage, kidney failure, and death. It is usually a result of glucose infusions given to counter hypoglycemia.

Normal processed Glucose in the Body. The glucose is processed in the Pancreas and then is regulated using glucagon and insulin.

FUTURE WORK
• Finish wiring the circuit to the stepper motor.
• Work with Dexcom to connect the Continuous Glucose Monitor (CGM) to the Arduino.
• Write program in to port CGM data to control Arduino
• Develop Graphical User Interface (GUI) hosted on Raspberry Pi (similar to figure below).

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