Problem statement:

Our objective is to design an alternative method of drug delivery that is disposable, small, light, and inexpensive pump that is comfortable and discrete while in use. The product should utilize micro-fluidics to deliver a constant flow rate between ten and fifty micro liters per hour with minimal error or fluctuation for no less than eight consecutive hours.

Client Requirements:

- Small, light drug pump-no larger than a pager
- Inexpensive
- Disposable
- Comfortable for patient during long term use
- Constant flow rate
- Minimum eight hour use
- Doesn’t require adjustable flow rates
- Safe range of potential delivery error

Design Requirements:

1. Physical and Operational Characteristics

   a. Performance requirements: The product will be used continually throughout the day. Each individual pump should work for no less than eight hours at a time. The product must provide a known constant delivery rate throughout the tenure of its use.

   b. Safety: Because the pump is delivering insulin to diabetics it is imperative that the flow rate is known by the user and delivered with minimal error. Also the product may use certain gels or chemical reactions that must be biocompatible. The system must be sterile for daily use. Also, needles must be covered while not in use.

   c. Accuracy and Reliability: It is extremely important that the pump delivers insulin within an acceptable range of error.

   d. Life in Service: The product must work for no less than eight hours but is disposable after one use.
e. **Shelf Life**: The shelf life of the product should be limited by the shelf life of insulin, which is three months if refrigerated. Any chemicals or gels used in the micro fluidic delivery system must not compromise the shelf life of the product.

f. **Operating Environment**: The product will be attached to the user’s torso. It must be air tight and capable of withstanding the wear and tear of everyday human interaction in a range of all livable temperatures and conditions.

g. **Ergonomics**: It should remain tightly attached to the user’s torso.

h. **Size**: It should be extremely small, ideally the size of a quarter.

i. **Weight**: No specific weight requirements, but it should be as light as possible.

j. **Materials**: Biocompatible with skin contact as well as capable of containing insulin, and any other chemicals or gels used in the system.

k. **Aesthetics, Appearance, and Finish**: The product should be unobtrusive and unnoticeable while worn.

2. **Production Characteristics**

   a. **Quantity**: It will be mass produced; however, our goal is one working prototype.

   b. **Target Product Cost**: The product should be as cheap as possible; no more expensive than $35.

3. **Miscellaneous**

   a. **Standards and Specifications**: No government regulations exist on a delivery system during testing; however, FDA approval must be gained before commercial use.

   b. **Customer**: Diabetics are currently our customer of focus, though it could be expanded to any human that needs a constant delivery of any drug throughout the day.

   c. **Patient-related concerns**: If the device malfunctions the repercussions could be severe to fatal. *Delivering too much or too little insulin could induce a coma or even death.*
d. *Competition*: Because our device will utilize a new method of drug delivery than other systems on the market, we have no competition. There are no cheap, disposable, micro fluidic drug pumps currently on the market.