

EWH Project: Liquid Medication Delivery System

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Background

- 2.1 million children are affected by HIV
- 15-30% of babies born to HIV+ women will become infected without treatment
- Boehringer Ingelheim developed anti-transmission drug: nevirapine
- Packets of the drug are given to expectant HIV+ mothers
- Pharmacies need a way to accurately dispense the medication into packets

Problem Statement

- Liquid medication bottle-top dispenser
- Sterilely deliver fixed doses of liquid nevirapine into foil packages

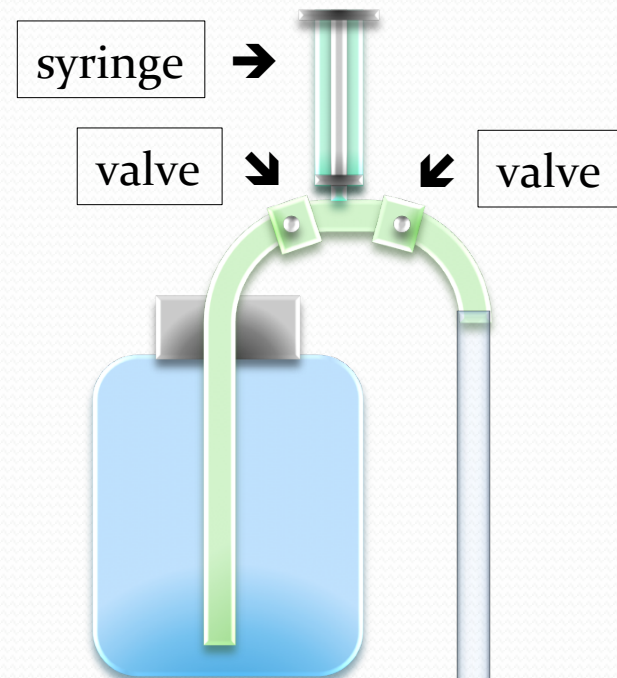


Design Specifications

- Dispense 0.6mL (\pm 0.05mL) of medicine
- Accurately deliver 400 doses; operable for 6 months
- Seal medicine bottle and prevent contamination
- Cost less than \$2.00

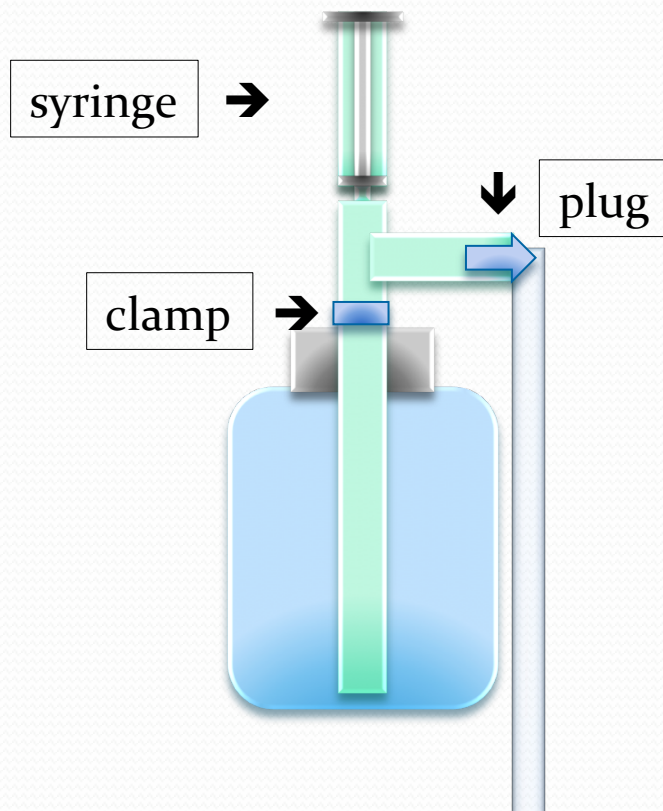
Design 1: Two One-way Valves

- Pros
 - Easy to use
- Cons
 - Valves may be expensive
 - Expensive to manufacture
 - Backflow causes inaccuracy



Cost (out of 35)	Accuracy (out of 25)	Reliability (out of 25)	Ease of Use (out of 15)	Total (out of 100)
20	20	18	15	73

Design 2: Clamp/ Plug Design

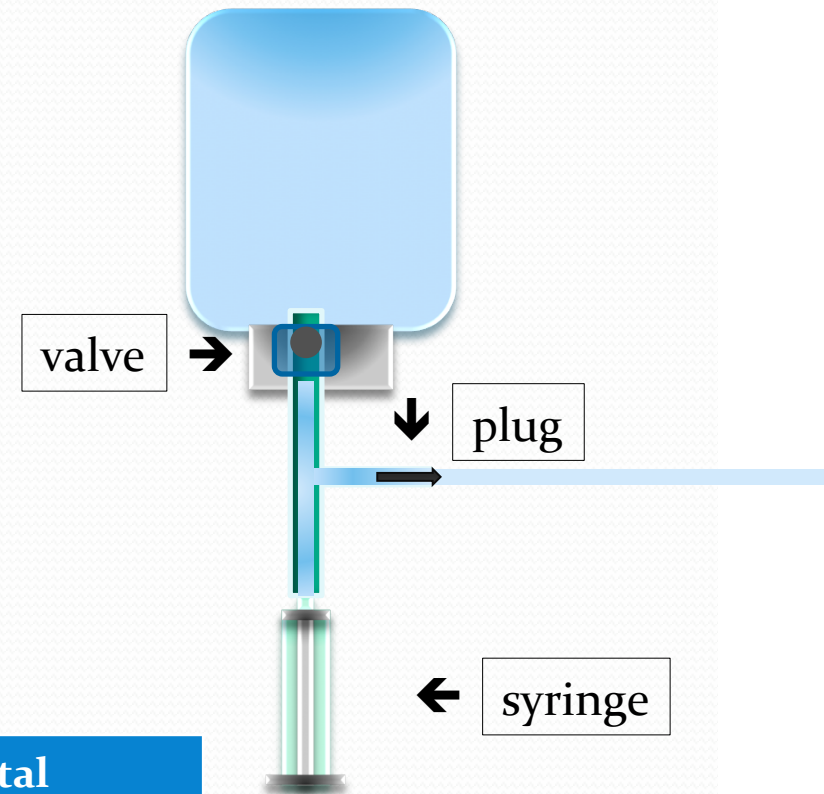


- Pros
 - Simple to manufacture
 - Independent of viscosity
 - Can be made into kit for manufacture
- Cons
 - Clamp and plug harder to use

Cost (out of 35)	Accuracy (out of 25)	Reliability (out of 25)	Ease of Use (out of 15)	Total (out of 100)
28	22	22	10	82

Design 3: Inverted Valve/Plug Design

- Pros
 - Inexpensive
- Cons
 - Not 'user-friendly'
 - Requires Stand



Cost (out of 35)	Accuracy (out of 25)	Reliability (out of 25)	Ease of Use (out of 15)	Total (out of 100)
25	21	20	7	73

Design Matrix

Design	Cost (out of 35)	Accuracy (out of 25)	Reliability (out of 25)	Ease of Use (out of 15)	Total (out of 100)
Two One-way Valves Design	20	20	18	15	73
Clamp/Plug Design	28	22	22	10	82
Inverted Valve/Plug Design	25	21	20	7	73



Manufacturing Options

- Local manufacture
 - In developing countries, using locally available materials
 - Issue with availability of device components
- Traditional manufacture
 - In the US, then shipped to developing countries
 - Need capital to keep project running → grants
- EWH Kits program
 - Parts distributed as a kit to EWH volunteers to assemble
 - Quantity limited by the number of interested EWH Kits customers



Future Work

- Purchase materials and construct improved prototype
- Assess suitability of EWH Kits program for manufacturing
- Obtain foil packets used to contain dispensed medicine
- Synthesize appropriate medication analog for testing
- Test device for accuracy and reliability
- Address drip and air bubble formation issues

Drip and Air Bubble Issues

- Drips
 - Bigger with bigger surface area opening
 - Bigger with larger outer diameter tubing
- Air bubbles
 - Form if air backflow expands in tubing
 - Less of a problem with more viscous fluid
- Solution
 - Narrow opening
 - Long thin tubing



Acknowledgements

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Questions?

References

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