

DP-1 – GI Joe Ostomy Modification

The Osto-box

Written Proposal

Team Number 18

William Ward, Taha Tahan, Stiv Berberi,
Luka Mircetic

10/30/18



Figure 1

Source: [1]

Signed Academic Integrity Statement:

The student is responsible for performing the required work in an honest manner, without plagiarism and cheating. Submitting this work with my name and student number is a statement and understanding that this work is my own and adheres to the Academic Integrity Policy of McMaster University.

Submitted by: Stiv Berberi, 400212350

Signature:



The student is responsible for performing the required work in an honest manner, without plagiarism and cheating. Submitting this work with my name and student number is a statement and understanding that this work is my own and adheres to the Academic Integrity Policy of McMaster University.

Submitted by: Taha Tahan, 400200740

Signature:



The student is responsible for performing the required work in an honest manner, without plagiarism and cheating. Submitting this work with my name and student number is a statement and understanding that this work is my own and adheres to the Academic Integrity Policy of McMaster University.

Submitted by William Ward, 400170514:



Signature:

The student is responsible for performing the required work in an honest manner, without plagiarism and cheating. Submitting this work with my name and student number is a statement and understanding that this work is my own and adheres to the Academic Integrity Policy of McMaster University.

Submitted by: Luka Mircetic, 400196057

Signature: 

Statement of The Problem:

Our patient has considerable restrictions when it comes to modification of her device. She is a high-output ostomy patient, who eats primarily before bed, and has issues with gas and waste filling up her ostomy device (i.e. bloating). She has found that she needs to wake up multiple times during the night in order to empty her ostomy bag, roughly every 1-2 hours. Our solution is designed to minimize her need to wake up during the night to prevent her bag from filling and bloating. Our patient requires a low-cost option that will work on smaller ostomy bags, without constant or extensive modification of her device. The solution we developed is designed to increase output storage for patients who are worried about leaks during the night. It is not specifically designed for patients who eat or work later at night. However, the solution addresses concerns for both of these populations because of the achieved objectives of the solution. The original design is just meant to address irregular sleep schedule concerns, but in development it can address other lifestyle limitations.

Design Objectives:

The direct objective of this project is to minimize the need for our patient to interrupt her sleep during the night to empty her device (ostomy bag). Our solution is designed to be used as an at-home device with minimal movement. It is designed to work as a direct attachment device with no device modifications, so our patient does not need to do any extensive modifications to her preferred ostomy bag. Our solution is designed such that it can attach successfully to any style or brand of ostomy bag, as it attaches to the terminal end of the bag. In other words, the project is intended to deliver an attachment that is compatible with the user's preferred style of ostomy bag. This attachment serves as an extra collection device to minimize the need to empty the ostomy bag frequently. High-output patients who have trouble sleeping for long periods will also benefit from this proposed solution. In development, we discovered that there is also a larger population of patients that will benefit from this solution to Salwa's issue. Not only will high-output patients benefit, but patients who are worried about bloating, leaks or comfort during the night. Additionally, users that would like to keep their ostomy bag private, or prefer a small, more discreet bag for social, career or recreational reasons now have that flexibility with our proposed solution. Previously, the population of ostomy users identified above would have to purchase twice the amount of bags, and switch the bags more often. Ostomy bags are relatively expensive, and switching the bag often can be slightly uncomfortable. Our solution solves problems for this population as well, as it is a one

time, long term, simple yet effective investment that gives ostomy users flexibility for night-time and at-home ostomy use.

Description of the Proposed Solution:

The original objectives for the project include the following: prevent leakage, prevent gaseous buildup, and increase output storage during the night. These objectives are achieved through an extension that attaches to the terminal end of any pre-existing ostomy bag. The terminal end of the ostomy bag is where the user empties the bag initially. This end includes a “lock’n’roll” closure system designed by Hollister. This system utilizes multiple folds of the end and seals the bag with a material that is similar to Velcro. This Velcro-like material is also designed by Hollister. Our solution takes advantage of this pre-existing closure system, so minimal effort is required for potentially non-technical ostomy users. In our design, the terminal end of the ostomy bag stays open, after minimal cleaning from the user, and our attachment slips over the outside of the terminal end. There is an inner and outer portion of our attachment. The outer portion has the same Velcro material that is used on the ostomy bag and connects on both sides of the outside of the terminal end of the ostomy using this Velcro material. The inner portion of our attachment goes inside of the terminal end of the ostomy bag. There is a flexible ring that fits inside the terminal end, to which the user must apply compression when fitting inside the terminal end of the bag. The ring expands once the user releases the attachment piece and creates a seal on the inside of the terminal end of the bag, effectively creating a pathway for fecal matter and liquid to flow into a tube. This tube is coated on the inside with SLIPS (Slippery Liquid-Infused Porous Surfaces) to allow the waste to easily travel through the tube into the separate collection container. SLIPS (Slippery Liquid-Infused Porous Surfaces) is a development from The Wyss Institute at Harvard University, that is a “Non-stick, ultra-repellent, self-healing, surface coating for industrial and medical materials [2]”. This material will allow fecal matter to flow easily into the larger containment box, even if it is slightly solid. However, Salwa has high amount of liquid output, so the tube size is not of immense importance as liquid will flow easily. The connection piece inner lining is made of the same liquid-repellent waterproof material that forms the inside of pre-existing ostomy bags. The matter goes into a larger collection container that will allow for much more build-up before emptying is required. The inside portion of the attachment has a sealed connection to the outer portion of the attachment, so no fecal matter or liquid can escape from the inner portion of the attachment. The tube is connected to the separate collection box with an effective sealing attachment junction (see figure b). The tube needs to be forced onto the outside of this attachment piece, and there is a flange, and threaded material inside the box that allows for a tight seal both with the box and with the collection tube. Additionally, the box has a very-user friendly drainage valve (see figure d). This drainage

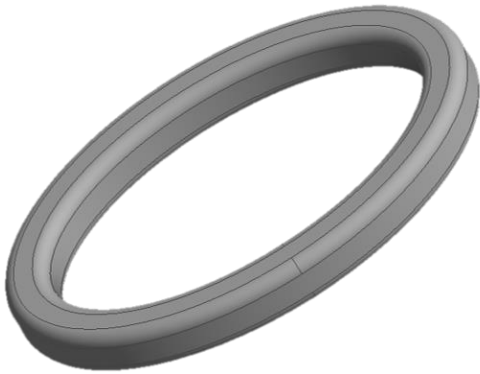
valve allows the user to simply empty the box in the morning, once they disconnect their ostomy bag from the attachment piece. No extensive device modifications are necessary to use this product. However, the user must interact with the device to attach the joining piece between the ostomy bag and separate collection container. The user must squeeze the ring, insert it into the terminal end of the bag, and use the Velcro material to attach the outer portion of the attachment piece. Each piece of the whole device can be taken apart and cleaned, although it is not necessary to clean very frequently due to the SLIPS coating. The tube can be take of off the box, and the drainage valve can be easily cleared as well.

Justification of Proposed Solution:

This attachment device will dramatically increase comfort for many ostomy patients who have issues with high-output, gaseous output, or other lifestyle limiting factors. The device is not expensive to manufacture, as it is a simple design that primarily uses the same materials used in Hollister ostomy bags. The flexible ring would be made from a stiff rubber. The inner and outer portions of the bag will be manufactured using materials similar to those of a Hollister ostomy bag. The inner portion will be the same waterproof plastic that forms the inner layer of Hollister ostomy bags. The outer portion will have the same material but will also include the same fabric material as the outside of a Hollister ostomy bag. The justification behind our design is that it allows for the user to continue using their own ostomy bags in whatever manner suits them. As their main problem comes from not having enough storage at night, the proposed external storage container with an easily attachable tube will solve this problem. The container can be easily cleaned and maintained, allowing for a one-time purchase. Our proposed materials and manufacturing process also takes into account the existing materials used in Hollister ostomy bags, making manufacturing of this extension easily accessible for Hollister. In turn, this could reduce the costs of this extension. Overall user interaction with the device is minimal at night, allowing for an easy system of attaching the extension before bed without having to worry about it all night. Because of this, it solves the user's problems of waking up during the night due to excessive output or gas buildup. Overall, the proposed design is an effective solution for excessive output buildup overnight because of its ease of use with existing ostomy bags and minimal impact on lifestyle. Furthermore, it has very minimal financial impact, requiring only one purchase to be made over its lifetime. Additionally, the manufacturing process will be relatively simple and cost-effective. The manufacturing process is not difficult because our device uses many similar or identical materials already used in ostomy bag assembly, and each piece can easily be manufactured separately. Each piece can be manufactured separately because the user assembles the tube-to-box assembly. It is designed to be taken apart by the user with minimal effort for cleaning and mobility purposes, thus translating into a simpler manufacturing process. Our proposed solution is a

simple, effective, long-term investment for patients with irregular sleep schedules derived from issues with their choice of ostomy bag.

Appendices and Supporting Documentation:



(a)Flexible ring:

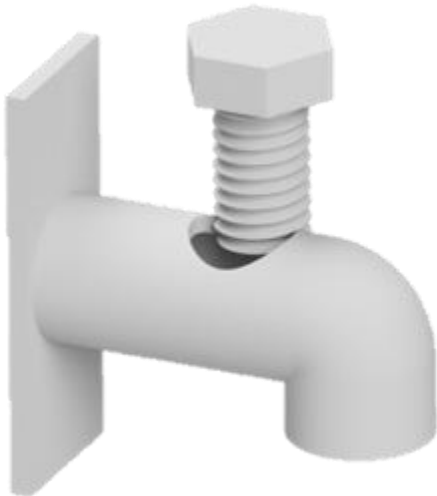
(b)Tube-to-Box Attachment + Flange:



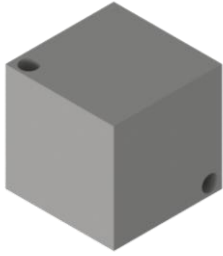
(c)2nd Sealing Ring:



(d)Box Drainage Valve:



(e)Seperate containment box:



(f) Lock and Roll connection:



(g) Tube Assembly:

References:

- [1] WikiHow, *How to change a Colostomy bag*. 2018.
- [2] Wyss Institute, *SLIPS (Slippery Liquid-Infused Porous Surface)*, Harvard Wyss Institute, 2016
- [Online] Available at: <https://www.wyss.harvard.edu/technology/slips-slippery-liquid-infused-porous-surfaces/>
- [Accessed: 29-Oct-2018]

