

SECTION 1

IDENTIFICATION & EXPLORATION OF THE NEED, WANT AND OPPORTUNITIES

BACKGROUND

As an asthma sufferer myself I am all too aware of the impact asthma can have on day to day activities and in particular on the ability to engage in physical activities for leisure or sport. Having participated in water sports such as swimming and surfing, I have personally had asthma triggered by pool chemicals or the exertion of the activity itself. This has led to a feeling of anxiety for both myself and my parents.

When considering potential projects, the issue of asthma and its potential to inhibit physical activity amongst a broad section of the community became an area of interest. To establish context some preliminary research was undertaken. It revealed:

- The cost to Australia of each asthmatic is \$11,740 per year
- In 2017-2018 there were 38,792 hospitalisations where asthma was the main diagnosis
- 70% of asthmatics don't listen to the full instructions given by their doctors
- 'The lower level of activity among children with asthma reflected a climate of fear among parents and teachers about what was safe and possible for the child.'

After considering these statistics, several potential design solutions that could be developed emerged.

1. A **reusable inhaler case** to reduce the high costs asthmatic people have to spend on an inhaler each year
2. A wearable electronic device that **assesses** the user's symptoms, reducing the inherent waste by indicating how many puffs to take and how to correctly use the inhaler through an app connected to their specific diagnostics/treatment plan, to address the gap in user's adherence to doctors instructions
3. A **wearable** device that users can wear in the pool or surf, allowing them to efficiently access the medication when required, despite the presence of water. This concept would assist in combating fear from carers allowing them to feel **confident** when their student or child is **engaging in water sports**.



From these 3 options, the concept that has the potential to positively impact the 2.7 million Australians with asthma is a wearable device that would allow the delivery of medication whilst engaging in water sports. As a country surrounded by water and one in which swimming and surfing dominate as both leisure and sporting pursuits, this has the potential to positively impact the ability of asthmatics to engage in these activities. Aquatic sports are also an area where the fear of an attack has led to parents, care givers or the individual themselves preventing child participation due to the perceived higher risks of the activity.

To determine the specific needs, wants and opportunities of the concept further research through primary and secondary mechanisms is needed to demonstrate the validity of the design project. To do so I will be engaging in the following methodologies:

- Primary research - Interview with asthma sufferers
- Secondary research - Analysis of existing designs
- Each methodology will help to reveal the deeper implications and specific user requirements needed to promote a successful outcome should the concept be well received and/or identified as a distinct need.

METHODOLOGY 1 - INTERVIEW KEY STAKEHOLDERS/PARENTS/ASTHMATICS

AIM - To determine the extent to which parents or asthma sufferers themselves limit or prevent participation in water sports or water-based activities due to suffering from asthma.

METHOD - Interviewed Joe Porter on 26/10/2019 who suffers from asthma - Getting insights into how he responds with the condition and his personal thoughts and feelings associated with reduced participation in sports in particular. As an asthmatic myself my pre-existing knowledge gave me a clear insight into the conditions impacting not only the ability to participate, but the overall mental health and behavioural implications.

RESULTS -

What sports do you play?

Footy, Cricket and swimming

Do any of these sports trigger your asthma?

Swimming and footy

Has there ever been a situation where you had to sit out of sport due to having asthma?

Yes, I used to surf when I was little but had to stop due to my asthma. I then picked up swimming as this was something I could enjoy instead of surfing and it was known to help with asthma. The other advantage of swimming in a public pool is that it is supervised, and I feel less at risk with regard to a potential asthma attack

Regularly, footy games trigger my asthma, but this is easily managed by having the inhaler with me on the field.

Would you feel more comfortable swimming if you had your inhaler with you while engaging in the particular sport?

Yeh definitely, it would make it easier and I would be able to go back to surfing knowing That I am safe out in the water.

The discussion with Joe broadly analysed the impact of the condition on his ability to participate in water sports. From this analysis I have identified the following:

PRODUCT/TARGET MARKET NEEDS -

- In an ocean you are exposed to **limited supervision** leading to increased fear, therefore my wearable could expand opportunities for asthmatics.
- A waterproof casing that enables delivery of Ventolin or flexotide in an aquatic environment would reduce frustration amongst people with asthma, empowering them to engage or **re-engage** in water sporting activities.
- Easy access to the medicine for worst case scenarios such as an asthma attack in any water conditions, would reduce the amount of stress and concern created by the parents and teachers of students with asthma, effectively supporting the 2.7 million asthma sufferers to **safely engage** in water sports, whilst reducing stress for carers, a key impediment to participation.

OPPORTUNITIES -

- To allow the user to **feel comfortable** and able to engage in sports they had to limit or not participate in at all. This will lead to positive effects towards their social and mental health, **improving their overall lifestyle**.
- Design a device that not only can assist in water activities but potentially find application on land or out of water sports such as cricket or footy. A **wearable delivery system** would create ease of access and flexibility of use relevant to a range of sporting pursuits.

CONCLUSION/EVALUATION-

I have concluded, from the from the initial qualitative data gathered it is clear that users do modify their activity choices due to the impacts of asthma, both physical and mental. Whilst many asthmatics are engaging in physical activity (as part of a doctor developed health plan) such as swimming in an attempt to improve their asthma, it was identified that this can still trigger an episode due to the chemicals in the chlorine, leading to negative outcomes or non-participation. Therefore, this is clear from this research that a wearable device suited to use in water creates a distinct and important opportunity to open up access to sporting activities for asthma sufferers.

METHODOLOGY 2 - ANALYSIS OF EXISTING DESIGN - STANDARD VENTOLIN UNIT

AIM - To determine what strengths and weaknesses the traditional medication delivery device has and identify where adaptation can/could enhance the effectiveness and applicability to a broader range of activities and specifically water sports.

METHOD - Secondary research, is possible to create applicability to water sports activities

SOURCES - <https://asthma.org.au/about-asthma/medicines-and-devices/relievers/>

RESULTS -

The primary medication in Australia is 'Ventolin', a portable, disposable pack that has the compressed medication cylinder in a disposable case.

Strengths

- **Fast to act on triggers** and relieve and reduce asthma symptoms quickly
- Simple canister to hold the medicine tank stable and secure
- Practical cover to **limit germs** or bacteria from entering the mouthpiece
- Ergonomically considered to suit **any age** person and provide them with the medicine needed to reduce these symptoms and can also be attached to a spacer
- Low cost of approximately **\$7-\$12 per unit**

Weaknesses

- All **hard surfaces** so little consideration of comfort for the user.
- The canister is made from plastic and places a negative impact towards the environment when the user has finished using the product particularly as it is a one-use item that is consumed in high volume quantities
- The product is **not waterproof**, therefore not making it a suitable design for my concept, and limiting it to a narrow 'dry' use only scenario.
- **Aesthetics are poor**, it is driven by its functionality and high turnover use scenario.

Opportunities

- Use the simple canister and medicine connector in the design concept, which is wearable for the user This will give the opportunity for users to simply take out the medicine tank from the traditional design and **simply insert** it into the new **waterproof or water applicable** device. Creating a re-usable delivering pack would also **limit the environmental impacts** and negate the issue of single use plastics



Traditional current inhaler design

CONCLUSION/EVALUATION -

I have concluded that the traditional design incorporates a few concepts that can be used in my design project and some that will need to be improved or altered.

- The canister to medicine connective method is something that I could incorporate in the final design project, this standardisation will allow the current, popular systems to be readily transferable, lowering cost to consumers.
- As this design is not waterproof and is inconvenient for the user, I will need to look into how I could improve both these aspects to allow the design to be fully functional to the needs and wants of the user, specifically those in water activities.
- Use of the canister would likely create a repetition of 'known' operation steps, therefore making new users comfortable, creating efficiency and efficacy
- Using the canister module creates lower costs for users as they already purchase them
- Use of the canister creates standardisation in product components, therefore allows for greater accessibility

METHODOLOGY 3 - ANALYSIS OF EXISTING DESIGN - COMPARABLE PRODUCTS

AIM - To determine whether similar concepts have been marketed before or whether a distinct gap in the market exists for a wearable asthma medication delivery unit.

METHOD - Secondary research, investigation into a variety of similar concepts associated with asthma casing and waterproof bands

SOURCES - <https://www.behance.net/search>

RESULTS - In the research conducted there were delivery devices including the Aer inhaler that improved on the aesthetics and function of the disposable device: however, no products, that specifically targeted water sports/activities were identified. The research identified the plus, a device which provided 3 medicines with a sleek aesthetic look that provides convenience for the user.

Strengths

- Includes 3 inhalers; reliever inhaler, preventer inhaler, and an extra small emergency inhaler. This gives the user 3 types medicine types to use in different situations when dealing with asthma.
- **Sleek, aesthetic** look which reduces bulk of the product. This makes it more convenient for the user as they can simply place the product in their pocket, wallet or small bag.

Weaknesses

- Casing is **not waterproof** as it has Bluetooth connectivity inside. Therefore, the gap for water usage still exists
- Due to small sleek aesthetics the inhaler could easily be lost or misplaced

Opportunities

- The articulation (**swivelling mouthpiece**) could be a way to capture the sleek aesthetics whilst creating a seal or waterproof valve
- Sleek look may make asthma sufferers feel more **comfortable and confident** using the device, therefore allowing them to use the medicine as soon as triggers are evident.
- The ability to replace medication canisters in the main body or housing reduces the waste incurred by a 1 use plastic housing



Aer design concept

CONCLUSIONS -

I have concluded that the design will need to be a sleek aesthetic that provides a highly functional product for the user, and importantly impacts a higher level of quality than its disposable predecessors.

- This will allow for a convenient use and storage for the medicine.
- There is a distinctive gap in the market, that has been identified, with no specific water activity devices readily available. This creates a clear opportunity to create a device that enables the 2.7 million Australians that have asthma to feel confident, comfortable and empowered when undertaking water sports and potentially any sport.
- As there is no water-based delivery system, this emphasises to the need and opportunity to develop or innovate a system, targeting this distinct gap in the market.

SUMMARY OF KEY CONCLUSIONS

Through the preliminary research conducted via both primary and secondary sources, I have been able to determine the following demands for any product developed:

NEEDS

- Any design must respond to the **identified fear amongst parents** and carers about children (asthmatic) engaging in water activities. Research has revealed the need to overcome this significant concern, with regard to asthma, any solution needs to be a device that is visible and this creates/**promotes confidence** in the ability to manage risk for the user.
- As shown through research, the strenuous nature of water-based activity is a known trigger for many asthma sufferers. Looking at this information it highlights the need to create a waterproof asthma casing that will benefit the user by opening access to, and **enhancing safety**, when engaging in water sports.
- The design must be **easily accessible** for the user in 'case' they are placed into an emergency situation. The use of the design should be intuitive and easy, enabling rapid, effective delivery of the correct dose.
- The cost of the product needs to be reduced to prevent exorbitant additional costs to those Sufferers already spend on inhalers/medication per year. The ethical goal is to create efficiency and efficacy not additional expenditure, therefore the design must avoid a single use container/delivery system.

WANTS

- After looking into statistics, it is shown that 'Young users often hid their inhalers, often leading to poor routine.' This was due to them feeling insecure about having the condition therefore leading them to hide the medicine to avoid comments made by others. As a result, I want my design to be **discrete** allowing the user to feel more comfortable when having the product on their bodies in water sports or activities.
- Existing inhalers were shown to be too bulky and often inconvenient to carry during exercise. This highlights the need for a design that is **sleek** and handy for the user, so the design needs to involve the least disruption to normal physical activity in order to be readily adopted by customers. It suggests a wearable device could have a positive impact on users in a broad range of physical activities
- As the current inhaler casing is made from plastic in a single use device, this has a negative impact towards the environment. For my design I would like to **reduce this impact** on the environment where-ever by incorporating sustainable design principles and materials. A primary goal will be to avoid the single use plastics typical of the current Ventolin model.

OPPORTUNITIES

- To design a **portable wearable asthmatic** device that allows asthmatics to feel **empowered** and comfortable swimming and engaging in water sports and activities
- Having this device will open doors to the 1 in 13 people who are asthmatics and allow them to engage in the activities, they once were restricted from participating in particular application to a range of water sports is critical.

- Sleek aesthetic look may allow asthma sufferers to feel more **comfortable** and confident using the device, therefore allowing them to use the medicine as soon as triggers are evident.

PROJECT PROPOSAL

To design and develop a wearable asthma medication delivery device suitable for use in a variety of water sports from swimming to surfing. The design will target the **2.7 million Australians** who suffer from the condition and its often-debilitating effects. The impact of asthma has been shown to limit the ability of individuals to participate in or pursue a variety of sporting activities. The effect of this on the psyche of the individual and their immediate family can often be negative. Therefore, this product has the potential to empower the individual, including parents, teachers and children to **feel comfortable** in water conditions and engage and participate in water activities.

MOTIVATION/PURPOSE

The motivation behind this design is to effectively reduce the significant gap in the market, in which there are currently no specific water activity devices readily available. As an asthmatic myself, I have a deep understanding of the impact on an individual's feelings and emotions associated with inability to confidently and safely participate in strenuous physical activities such as water sports. I can recall moments in my life where I have had to reduce the amount of water sports, or worse, to not participate in school water activities due to having asthma. As a teenager this issue still exists and **affects my social life** as well as my health and overall well-being. The **inability** to participate in swimming, a key pastime in my beach side suburb can leave myself and all asthmatics isolated from their peers. For the reasons outlined I propose to produce a product that successfully provides medicine when triggers arise. The design goal is to improve the situation of people like myself by designing a sleek comfortable, wearable, product that reduces the **anxiety experienced** by the individual and their loved ones. Ultimately the goal is to reduce the severity of attacks and the hospitalisations that occur if rapid treatment is not administered. Through this device I plan to improve the lives of all asthmatics by giving them greater control over the disease and its debilitating effects.

TARGET MARKET

Within Australia, as a nation that loves water sports, this device has the potential to positively impact on the lives of the 1 in 13 people who live with the debilitating effects of asthma but more broadly has the capacity to impact the lives of **334 million people with asthma globally**.

This design project will be aimed specifically at asthmatics, as well as parents with children suffering from this common condition. Parents will be a significant influence in the market for this product as they are the ones who buy children medication. This evidently means that the product marketing must attract this market and make them feel confident and comfortable with their children using this product. This design has the potential to positively impact on multiple stakeholders, the user by creating a **wearable** that enables previously dangerous activity to be managed and the family of asthmatics by providing confidence that lifesaving medication is accessible.

SLK design concept - a sleek, minimal designed inhaler



PARAMETERS, LIMITATIONS AND CONSIDERATIONS

PARAMETER	EXPLANATION + JUSTIFICATION
Time	This project must be completed by week 6 in Term 3, which is equivalent to 36 school weeks. As this time is quite limited to produce a product, I must work effectively and manage my time well to be able to complete all tasks by this date. To do so, I will form a time management plan and estimate when I would like each task to be completed by, this way I will feel organised and use my lessons efficiently.
Cost	As this project will need to be fully functional there comes a cost that will help to assist in collecting the correct materials suited for the design concept. My personal budget for this project will be \$500 . This may be put towards these quality materials to design the most functional final project. More broadly, the inhaler must be affordable for the users, who already feel the financial strain of being an asthmatic, with each inhaler costing around \$7-\$12 and spending approx. \$11,740 each year .
Material, tools, Machinery	For this design I would like to choose materials that are affordable for the user/buyer as this is a factor that needs to be improved with the traditional design. As well this, I must pick a material that has minimal effect towards the environment, either through durability or reliability but still provides the standard quality the user needs and wants. To fulfil safety requirements on and off the school premises I must ensure that trained supervision is on hand when working with tools and machinery.
Safety	To comply to work health and safety laws , my project design must not be harmful to the user in any way. For example, the asthma band must not be too tight on the body, and the asthma casing must not have any sharp edges which could cut or injure the user. As well as this, in the production of the product, correct safety procedures must be followed in all stages of production and use cycles reducing the risk for injury to occur. Occupation Health and Safety training also must be completed to allow for safe use of tools and equipment.
Target Market	The design concept must appeal to the specific target market of asthmatics and provide them with a functional aesthetic design that appeals to their needs and wants (sleek design that does not obstruct with water sports activities) that were identified in research.
Technical Requirements	In this project, new technical skills may be required to design and develop the final asthmatic casing and waterproof wearable. Due to the limited time given to complete this project, it is preferable to utilise past knowledge and skills learnt from previous projects to assist with this production.
Environment impacts	Due to the rising awareness of the modern consumers increasing their interest in environmentally conscious design, my design should look into maintaining an environmentally ethical design criteria to the greatest extent possible. This may include environmentally sustainable materials, for example using the 3D printer which has reduced affects to the environment due to additive manufacture creating no waste.