# HUB5031S FINAL REPORT

## NOAH ADHERENCE DESIGN CHALLENGE

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MPhil. Health Innovation 1st year

Division of Biomedical Engineering

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# Contents

Introduction

In the course of the year, the HID class of 2018 has been on a design journey that has served as a learning point as to how design thinking can be used within the healthcare sector to help solve problems in innovative out of the box ways. To do this, different individuals from different backgrounds work together to understand a problem, contextualize it, come up with ideas, test and refine them and finally look to implement them. This process is iterative meaning that it is not uncommon to go back and redo some steps all with the aim of getting the best form of the idea. The first semester mostly focused on understanding of the problem and ideating around it. The second semester has been one that has seen the team focus on the fourth prototyping phase and fifth testing phase with the occasional redefining and ideation.

The first part of the write up will begin by introducing the context within which the challenge took place followed by a description of the activities and insights gained. The second section will be a reflection of the experience of learning how to use design thinking as we worked together to design for the elderly.

# 1. Section 1

This section will focus on some of the insights gained. These will be presented in a format that will start with a description of information from literature that was used to understand the residents and the concept of adherence.

## 1.1. Background

The population of South Africa is currently estimated to be at fifty seven million (SA, 2018). Of this population nine percent of the total population estimated to be over sixty years of age (WHO, 2015). It is in this population group that there has been sustained increase in the prevalence of non-communicable diseases (Day & Gray, 2017). The rates of such conditions like hypertension have been on the rise in the last few years. As at 2015, the prevalence of hypertension in the Western Cape was 73.9 per 1000 among females and 75.1 per 1000 among the male population (Day & Gray, 2017). The prevalence of diabetes among all ages covered by all medical schemes in South Africa also increased from 16.0 per 1000 in 2008 to 48.3 per 1000 in 2015 (Day & Gray, 2017). There has also been a recorded increase in the prevalence of other non-communicable diseases like hyperlipidemia (27.7 per 1000 in 2008 to 70.6 per 1000 in 2015), asthma and mental disorders. This has contributed to increased costs of treatment and morbidity and mortality from these conditions in the same period of time as the government decreases the spending per capita (Blecher et al., 2017). Among these conditions, stroke (6.5%), diabetes Mellitus (5.7%), ischemic heart diseases (4.8%), hypertensive heart disease (2.7%) accounted for four of the top ten causes of death in South Africa (Day & Gray, 2017).

## 1.2. Adherence and NOAH

In order to increase the quality and duration of life of the elderly proper management of their health conditions is key; a feat that requires a concerted effort between the patients and the medical practitioners (Sabaté, 2003). It usually entails lifestyle modification measures like cessation of smoking, reducing alcohol consumption of alcohol, eating healthy and increasing exercise. The management of the health of the elderly also usually necessitates the use of pharmacological agents resulting in patients having to be on more than one medication. It is for this reason that the WHO refers to adherence as "the extent to which a person's behavior – taking medication, following a diet, and or executing lifestyle changes – corresponds with the agreed recommendations from a provider" (Sabaté, 2003). This is however not achieved in all patients with rates of non-adherence to medication being estimated to range from as low as ten percent in some papers to as high as sixty percent resulting in adverse clinical outcomes in this group (Anglada-Martinez et al., 2015, Costa et al., 2015). It has been shown that for some conditions that adherence rates as high as 95% still expose the patient to risk of opportunistic infections, virological failure (Sabaté, 2003). This means that as one looks at what approach to take when looking at the adherence of a particular patient, the disease condition under treatment must be considered. This introduces the concept that there are different factors to be considered when discussing adherence or non-adherence. Other determinants identified in literature include; factors related to the patients (their attitudes, social support systems) and the therapy initiated (multiple drugs, duration of therapy amongst others) (Sabaté, 2003).

Social and economic constraints facing the patients, especially with the high cost of treatment also contribute to the rates of non-adherence. Another constraint that was described has to do with the health system ecosystem within which the elderly patients seek care (Costa et al., 2015). Within the Western Cape organizations like the Neighborhood Old Age Homes (NOAH), many are working to try and tackle this problem. They estimate that the average pensioner in South Africa has to survive on 120 dollars per month for all their needs including the cost of treatment. They provide housing and a social community where they are able to provide monthly doctor reviews while sourcing their medications from the government funded Central Dispensing Unit at no cost to the patients (NOAH, 2018). This is an innovative solution for this constraint. Despite such measures, there are still reports of non-adherence among the population being served by such organizations. It is for this reason that the design thinking class of 2018 has been working with the residents and staff at NOAH staff to build on the current innovation in place.

## 1.3. MedCal

We decided to build on this innovation because measures that have shown increased effectiveness are those that incorporate different approaches to adherence (Costa et al., 2015).

One such category is self-management methods. This refers to measures that empower the individual with the assistance of their social support systems to manage their own chronic conditions (Wilkinson & Whitehead, 2009). They combine different areas of focus like patient education, self-care monitoring and behavioral interventions. Other interventions that have shown effectiveness in controlling adherence is reminder packaging (Costa et al., 2015). This measure seeks to improve adherence by combining patient education with behavior interventions by reminding patients what medications to take while reminding them when to take their medication (Ibid). At the start of the second semester, we had two projects. One leveraged on the social network to motivate residents to be adherent. The other, MedCal is a type of a reminder intervention, a category that has been shown to have a positive effect on adherence (Costa et al., 2015). The main limitation to most of the interventions that have shown effectiveness has been the increased cost associated with such measures (Ibid). This is usually associated with the cost of coordinating services between different stakeholders, the high cost of technology and times the complexity of the ideas (Costa et al., 2015). For this current project, we also had a similar problem. The number of students participating in the challenge had reduced by more than 50%. This meant that the remaining team members would have to take on a lot more work to move both projects forward in terms of simplifying the idea, redefining the prototypes and testing it among the residents. From our interaction with NOAH staff in the first semester, we were aware that NOAH also did not have sufficient staff to implement and sustain both projects concurrently.  This human resource deficit on both sides and the complexity of the ideas meant that we had to find a way to make the design challenge leaner.

To address this challenge we went back to the drawing board to see how we could modify the project to make it feasible within our constraints. We used the concept of live prototyping. This refers to a prototyping technique that seeks to make the concept being discussed realistic. It involved asking, "Moving forward, what would the combined idea look like?"

 The team had been previously working on a different project for the previous eight weeks of the challenge it was necessary to do a mind wash to see what they understood the other team's project was and what they thought the pros and cons for each project was. A review of the ethics approval obtained to carry out the project was undertaken. Several points were drawn up and used to guide the next iteration round. This included the following

- To move away from the "Adherence Heroes" idea and to focus on the "MedCal" idea. The main reason for this was a way to save on the human resource capital required to carry out the process.
- To develop a detailed description of how the final idea will work. The team went back to the prototype step to attempt to create a roadmap of what is to come. See figure 1 for the results of this phase.

The next step was to go and interact with the staff at NOAH. The teams prepared questions to shed light on the medication distribution system, the expectations of NOAH staff and their willingness to carry out the project. After the meeting, the team returned and unpacked by reviewing what our assumptions were, what we had heard from the stakeholders at NOAH and what we needed to do moving forward as shown in figure 2 below. The team was able to achieve the following points

- Identify a suitable point for delivery and collection of MedCal. We were also able to determine a convenient schedule for their distribution.
- The team also settled on focusing on the residents who were at highest risk of being non-adherent. This would not only be a cost cutting approach for NOAH in terms of cost of paper, but this would also reduce the burden on the current staff. Different projects also go around this cost limitation by narrowing their area of focus by targeting those patients who are non-adherent or those who are at the highest risk of non-adherence (van Boven et al., 2014).
- The team also introduced the concept of a Visual management tool. The aim of this was to introduce a tool to help the residents better understand the link between proper utilization of MedCal and their own vital signs.



## Way forward

- **What do we need NOAH to do and at what points?**
- How do we make this seemless and reduce administrative burden?
- What would a tool look like that would reduce this burden? What does it need to do?
- **We need to map out medication delivery system, i.e how does medication get from the main box to the person and how does the right calendar get there?**
- We probably need another interview with the doctor about how to "implement" PCP?
- Could go to Khayelitsha with prototype to test there. Would be valuable insights to see how it could work outside of context initially designed for.
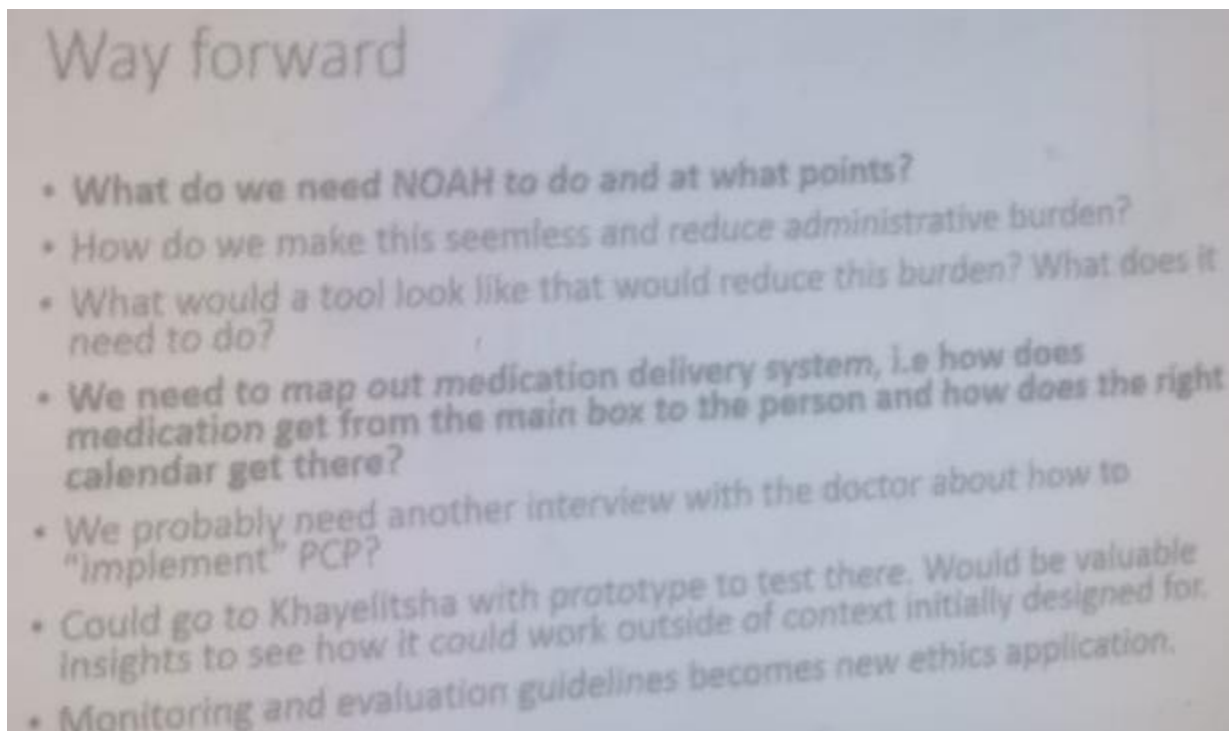- Monitoring and evaluation guidelines becomes new ethics application.

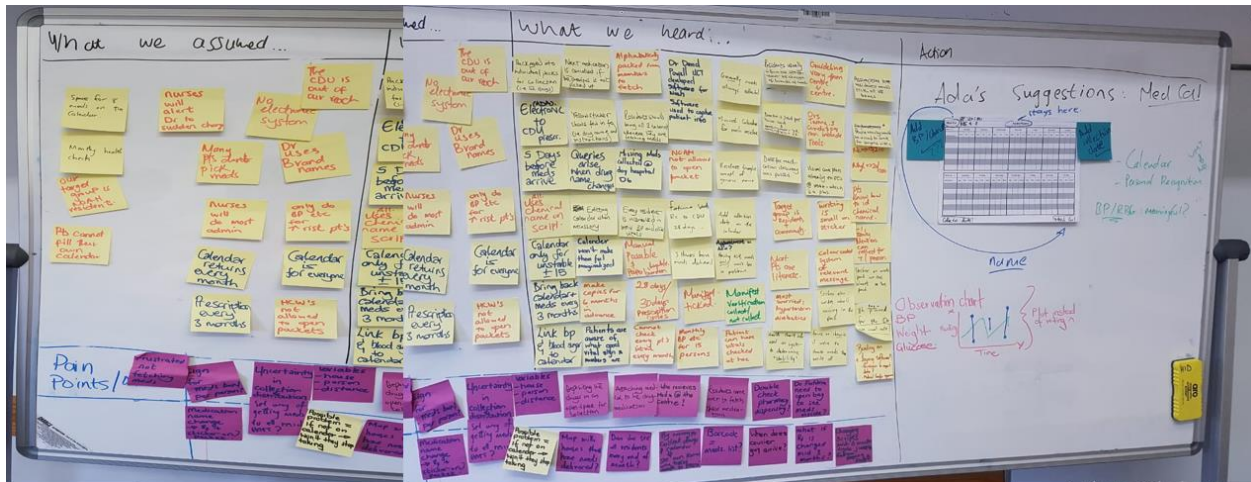*Figure 1: way forward after prototype phase*

*Figure 2: Post Test with Aida and Fatima, unpacking session held on 20/08/2018*

The team began to ideate around the concept of the VMT with an aim of improving it. A suggestion to use a simplified method to track vitals similar to the one used in hospitals was taken up (figure 3).
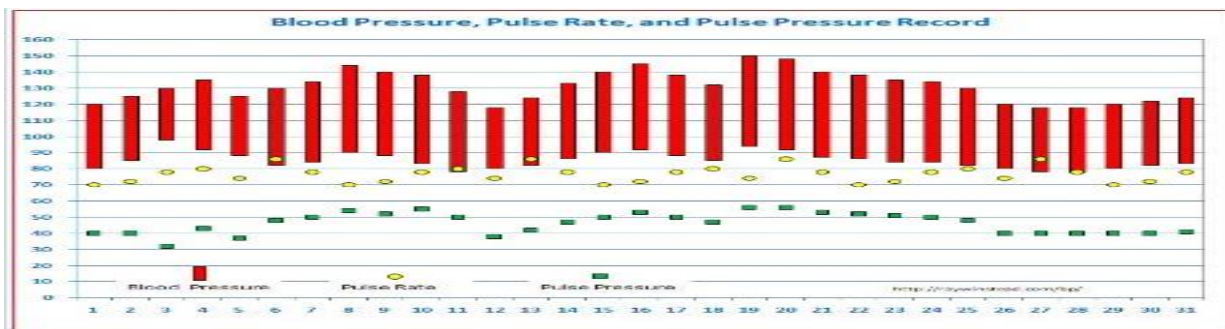


*Figure 3: an example of a monthly vitals-tracking system (Ray, 2011).*

Testing was done concurrently with MedCal as it was presented to residents and staff at the Khayelitsha NOAH residents. This testing phase was done in three sessions. The first session involved framing the challenge as a how might we question to guide the ideation around the best way to present the idea to this new population as well as how to in cooperate the VMT tool so that it is valuable to the patients. In the second session, three members of the team had a conversation with the nurse. In the third session and final presentation, the prototype was presented to the residents. During the post-Khayelitsha unpacking session, the team brainstormed using a 2 by 2 chart as shown in figure 4 to identify new solutions to overcome the problems encountered. The take away points were as follows:

- The nurse who manages the clinic there, Sister Lulu, gave a positive review about the idea. She expressed enthusiasm for MedCal. She explained that she had a few patients who were ready and willing to test MedCal. She also gave feedback that she would not have

objections to the Visual management tool and its proposed format of representation of the vitals. She did not view the tool as an added burden, but as a change in method of recording the vitals. She believed it would increase her ability to explain to her patients what was going on with their condition thus helping improve their adherence. She seemed to have viewed the VMT as a combination between an educational and risk communication intervention. Educational interventions seek to increase the level of knowledge of the patient with regard to their own conditions (Costa et al., 2015). Risk communication interventions are those interventions that attempt to encourage increased adherence behaviors by altering the perception of the patient to the risk and benefits of the treatment to the patient before and after initiating the therapy (O'Connor et al., 2009).



*Figure 4: Unpacking Khayelitsha test using 2*2 matrix tool*

- There was a language barrier when it came to the second session. The presentation of the idea was done in both English and Xhosa. The Xhosa speaking team member then went around all the residents obtaining their feedback. It was determined that moving forward more contact would be needed with the Khayelitsha NOAH residents and new methods

that are more efficient at overcoming the language barrier when presenting MedCal should be adopted by the team.

- It was reported that many of the residents complained that their vision was wanting and would therefore not be able to see MedCal. A systematic review of adherence solutions highlighted that many new tools were not tested on the very elderly, therefore leaving out of the scope of assistance (Costa et al., 2015). One suggestion is to include the caregivers in the ideation and implementation of MedCal. This is in line with current literature that seeks to include older adults in the development of new interventions (Trivedi et al., 2012). In the NOAH Woodstock dependent residence there is a system where a caregiver takes care of such needs for those residents who could not cater fully for their own needs. Such a system can be conceptualized and implemented in NOAH Khayelitsha to solve this problem. The design teams can also include this group early in the design phase to assure that there is no alienation by age as they develop the point of view.

Several of the residents also had reservations about MedCal, citing that it would increase the amount of work associated with taking their medications. This introduced the concerns around how might we get residents to start using MedCal. The first step was to ensure that the caregivers were on board. The Idea was presented to Ada and Fatima and a few suggestions were given that guide the final representation of Medcal. The team went back and resolved to institute the changes shown in figure 5 below.



*Figure 5 showing suggestions received from Ada*

The team also looked at ways to introduce MedCal to the residents in such a way that it did not interfere with their schedules too much to reduce the amount of effort a resident would have to put in to use MedCal.  To do this the team developed a road map that describes the whole journey from booking the visit to see the doctor to receiving your medications from Sister
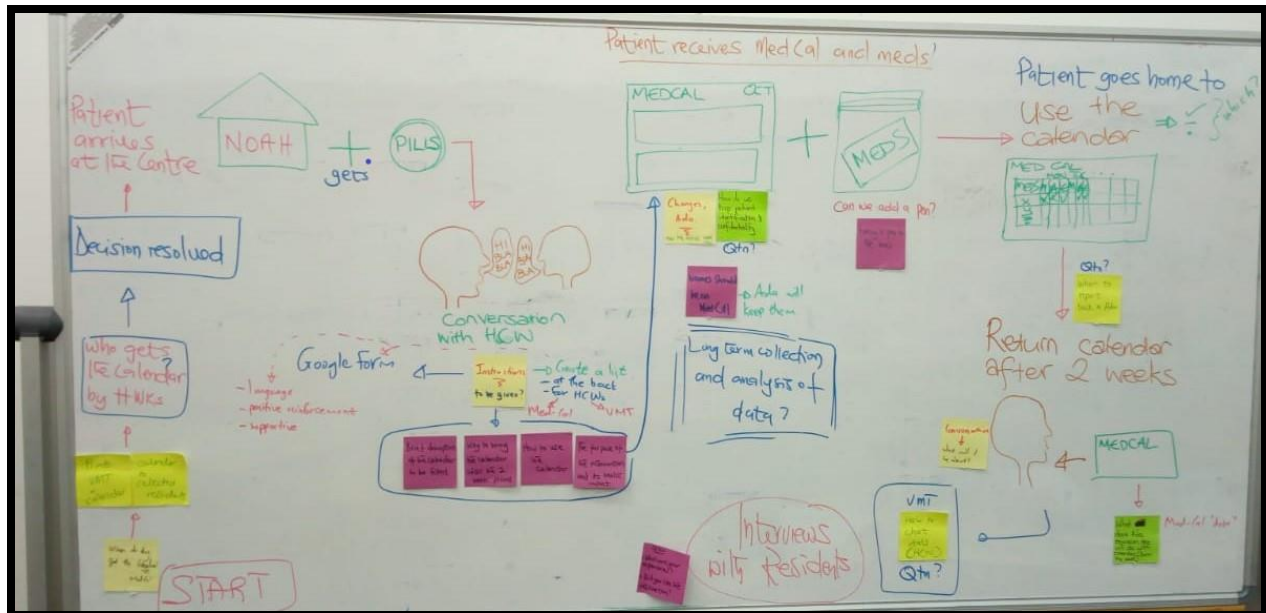
Fatima.



*Figure 6 showing the patient road map*

It was after this that the team handed over MedCal to Ada. She had expressed a desire to test it herself on some residents at NOAH Woodstock. We then subsequently received feedback from her that many of the residents did not want to use it partly because they were intimidated and fearful of filling it in wrongly. To better understand this complaint the team undertook a one week use your own prototype challenge. The team members picked several things they wanted to follow up on in their own lives and were to use MedCal for that week. The main finding that was carried forward was that mobility of MedCal is important. The team therefore came up with an idea to develop a pouch that could be carried around and a beaded bracelet that can be used to show that one had taken their drugs at a particular time so that when they got home they could just fill out MedCal appropriately. This was subsequently presented to Ada and the residents during the next test and final presentation. The response was mixed. Ada explained that they usually discourage the residents to move around with their medications and therefore leaned more towards the beads. Some of the residents showed interest in both ideas during the final presentation of the work done so far. Subsequent tests also showed the team that targeting the adherent residents may be used as a means to convince the ones who were non adherent to use MedCal as well.

The team had a final presentation with the residents at NOAH Woodstock as a way to do a final debrief to commemorate the end of the design challenge for the year.  The team sought to explain to the residents the outcome of the yearlong interaction as well as thanking them for the part the residents played during the design period.

# 2. Section 2- My learning reflections

## 2.1. Introduction

This second part of the write up is a reflective look at the incredible learning experience this process has been. Adoption of an idea is something a team should be cognizant of from the start. Part of putting the users at the center of the design thinking process, is acknowledging that the complete buy-in into the process by your team has an effect on how the end users will perceive the idea. In this write up, I therefore will focus on my personal lessons around understanding and how it affects buy in and subsequently adoption of an innovation.

## 2.2. Team buy-in

The end of the first semester had two different ideas. One group had developed an idea that would leverage the social capital within Neighborhood Old Age Homes (NOAH). The idea was named Adherence Heroes. The second team had come up with an idea that was going to function as a reminder system by using a tool named MedCal to remind patients to take their medications and by extension increase their adherence level. The second semester saw the master's students from Biomedical engineering class leave the health innovation and design module. This meant that the team had to do several things.

The first was to find a way to combine both projects into one. The team quickly settled on MedCal. This is the first idea adoption challenge that the team faced. Out of the seven participants, four of them, plus Dr. Nailah who coordinates the group, had been working on adherence heroes previously with only three working on MedCal.

*Table 1: Table showing the newly constituted group members and their previous project*

| Participant | Medcal | Adherence heroes |
|---|---|---|
| Jaydon Farao | No | Yes |
| Kagiso Dikomo | Yes | No |
| Kedebone Oliver | Yes | No |
| Lyanne Mapani | Yes | No |
| Maatje Wessels | No | Yes |
| Nyotu Gitau | No | Yes |
| Humphrey Kwaku | No | Yes |

The feeling that was initially created by the change in projects was a sense of apathy that the effort and thought put in in the previous twelve weeks was to not be used again. Interestingly, this reaction was present despite everyone including myself acknowledging that adherence

heroes had very many limitations. One such limitation was that in addition to being very complicated, it relied completely on buy-in by everyone and would be very difficult to sustain moving forward. This knowledge did not however have the effect of automatically increasing buy-in into MedCal. This personal difficulty in buying into the new idea, created a negative attitude of focusing more on why the idea would not work as well. This cast doubts about the next phase of the challenge thereby creating a skeptical attitude towards the work. This created a challenge to motivate myself as much as I did in the previous sessions. This was a negative reaction that I should have anticipated and dealt with early on as it led to energy attrition and less enthusiasm among other group members as can be evidenced by the attendance and class participation.

This lack of awareness of my own negative attitude actually ended up being a disadvantage. I am usually a very aggressive networker who looks for the smallest opportunity to create new bonds. The lack of awareness put me in a situation where I missed out on true opportunities to network and grow the idea. This was highlighted by the fact that a section of the team attended a digital health conference but none of the team members present, including myself, took the opportunity to network or ask questions about adherence despite having spent a significant amount of time on the topic. When it came up in class it made me realize that this may have been because I had not bought into the idea as a project that can really be implemented in the real world.

This is of concern since the ideas are really good. One of the thoughts that has been with me all through the program has been how to adapt the entire innovation capturing all aspects including the NOAH logistics system, MedCal's reminder system and adherence heroes' social capital leveraging to attempt to improve the lives of the elderly in more resource poor settings like the East Africa region.

This insight has enabled me to learn that even after the first phase of understanding is over, I shouldn't stop trying to understand what is affecting my participation and therefore the team. By being keen one would not automatically assume buy-in from team members simply because we are working together as part of a team. Such a point of view would also allow me to let go of previous lines of thought and projects quickly so as to efficiently continue with the next.

## 2.3. Client buy-in

The issue of adoption was not just a problem faced by the team but also by the staff at NOAH. This presented a very confusing situation through-out the course of the project. The confusion was with regard to the role of the client with respect to the target sample population. Ada was the main person we interacted with at NOAH. In the course of the design challenge the team is meant to go through the five steps of Empathy, Define, Ideate, Prototype and Test.

My confusion was clearest during testing of the prototypes. Most prototypes were targeted at the residents and nursing staff who had provided information to the team during the early define and empathy phases. Most of the tests though had to go through Ada where she played the role of both a potential user and a development partner. This meant that before we could test on users like NOAH staff and residents, Ada had to be happy with the idea. This gave me a sense of frustration especially because it increased the number of redefinitions and iterations the ideas and prototypes underwent while reducing the number of times the prototypes were actually tested on the target users. She became the client and user concurrently. This provided real restrictions with the team not having direct access to the doctor, nurses nor residents.

Through this I learnt that in the early phases of "understanding" I was too focused on understanding NOAH and the residents that I overlooked that it is just as important that the client also understands what we are trying to do. I learnt the importance of bringing in Ada (the client) into the design phase to avoid them being an extra test step before we could test on the residents. In my next design project, I will take time to think and learn and map out which stakeholders are present at the start, what their expectations are and what role they will play as we move forward so as to provide a clear distinction between the role played by the client and the target users in the course of the design project.

## 2.4. User-buy-in

Design thinking puts the user at the center of the innovation development process. In our project, the users were the elderly residents at NOAH. Towards the end of the semester we faced issues to do with poor uptake amongst the elderly individuals currently relying on the NOAH system.

I got to see firsthand how empathetic understanding can change the way one approaches a challenge. To understand the reason for the poor uptake of MedCal, the team decided to do a 'one week use our own prototype' followed by an ideation session and then a test with the residents scheduled after this. We did this in order to gain empathy about adoption and utilization of MedCal. This was a very important lesson as it allowed me to see MedCal from the point of view of Ada and also from the point of view of the patient. I had not considered that many residents actually already have preexisting self-taught techniques that are guided by experiences from their own lives that help them stick to their prescribed treatments. I learnt that part of the adoption process would include acknowledging those behaviors, understanding them and finally leveraging them. Ultimately the plan to foster adoption is to encourage those residents who are adherent to use MedCal to encourage others who may need it more to pick it up.

## 2.5. Conclusion

I noticed I had compartmentalized the stages after thinking about design thinking from a theoretical point of view. I viewed understanding as the main tenet that guided the first two steps in the design thinking process and less important once the idea was at the ideation phase for example. From the reflections of practice from above I have come to see that the process is not only iterative in terms of the phases, but also in terms of the thought process employed all through. I now see that through proper and a constant desire to understand I can be part of those who find a way to bring in the other team members, the supporting institutions and the hiring client as well without losing focus on the true users.

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