

RSA Design Directions 2007/08  
Including You: Diabetes

# Statement of Creative Strategy and Research Journal

# Statement of Creative Strategy

**C-Lite is a watch with an integrated continuous blood glucose monitoring and signal system for people with diabetes. The concept came directly from my research which highlighted the difficulty in identifying low blood sugar and the problem of blood glucose testing. C-Lite is attractive and user friendly blood glucose monitor that tests painlessly and discreetly. It alerts the user when glucose levels go too high or low, therefore preventing hypoglycaemic attacks as well as lowering the risk of complications.. This reduces the cost of paramedics being called out and hospitalisation. C-Lite enables the user to maintain good control of blood glucose levels and therefore helps them take ownership of managing their diabetes.**

## Who is it for?

All people with diabetes must test blood glucose regularly but this is especially useful for insulin-dependant people as they must test several times a day. It is also extremely useful for children, newly diagnosed people, those prone to hypoglycaemic episodes, gestational diabetes, and those who have difficulty controlling glucose levels.

## How does it test?

C-Lite is non-invasive; it is painless and doesn't puncture the skin. It is different from previously tried non-invasive monitors such as the Gluowatch because it uses a different technology that doesn't cause skin irritation. There are no expensive pads to replace and it is not bulky to wear like the Gluowatch. The technology used was developed and patented by Orsense and uses occlusion spectroscopy to measure the variation in light responses in the blood to calculate the glucose concentration.

## When does it test?

There are different test modes that are programmed on the watch by the user. There is a spot check mode that is used to test before injecting, after eating, before going to bed, when you are ill, etc. There are also activity modes, such as sport, driving and sleeping. For example, sleeping mode tests every 30 mins.

## How is the user alerted?

C-Lite has glowing colours, a vibration motor and an alarm to alert the user when levels become too high or low. The user can see an accurate reading by looking at the digital display or they can get an idea of glucose levels from the glowing light on the sides of the watch. Using the most recent reading taken the lights glow accordingly: green means levels are in the desired range; orange means levels are rising or dropping and the user should

act by either take insulin or eat something sugary. When levels reach danger point a red light flashes. For night time and for those with sight or hearing difficulties, there is also an alarm and vibration motor.

## C-Nite

For night time there is also a bedside clock, the C-Nite. It acts as a signal system in the same way as the watch but can be placed in a different room. This is particularly useful for young children with diabetes, as the mother can have the C-Nite clock by her bed, which tells her when the child's sugar levels are dropping. If the alarm goes off she gets up to attend the child. A signal is sent from the watch to the clock using radio frequency. The mother can also send a signal to the watch to tell it to do a spot test. If a person lives alone and they don't turn off the alarm within 15 minutes, the emergency services or neighbour or friend is alerted. This means the risk having a hypo while sleeping is less worrying.

## Visualising results

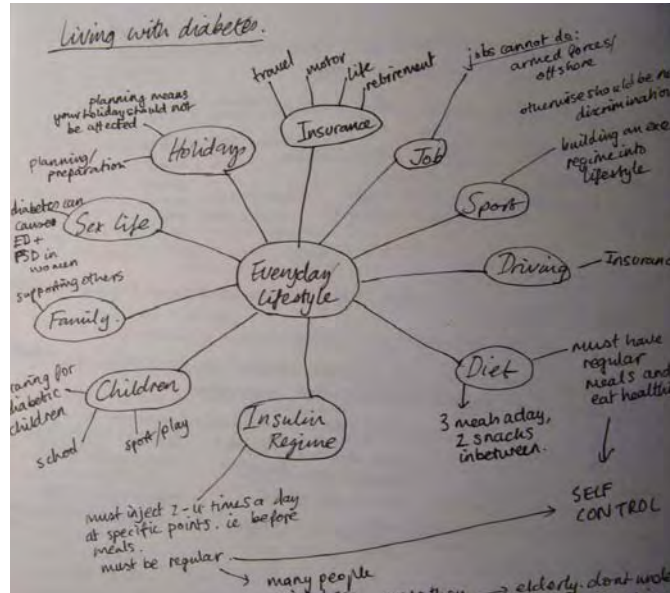
A Bluetooth chip enables readings to be transferred and stored on a mobile phone or computer. The user can see changes in glucose levels over a certain time period, such as 4 hrs, 12 hrs, 24 hrs, and one week. This helps track changes in routine and ultimately helps better management of the condition.



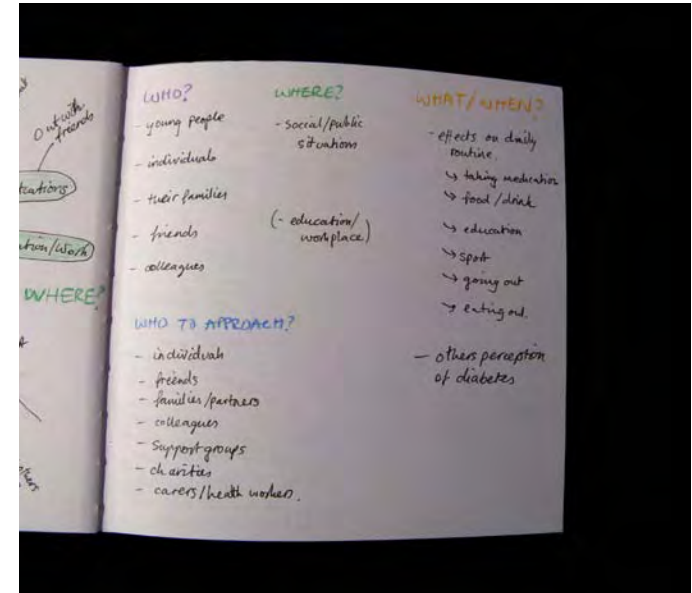
# Why diabetes?

I chose to look at diabetes because I knew very little about it and wanted learn more. I learnt about what it is like to live with diabetes using a variety of research methods to understand what diabetes is and how it affects people's lives and relationships with others. This journal shows the research methods employed and how it leads to the proposal for C-Lite, a blood glucose monitor and signal system.

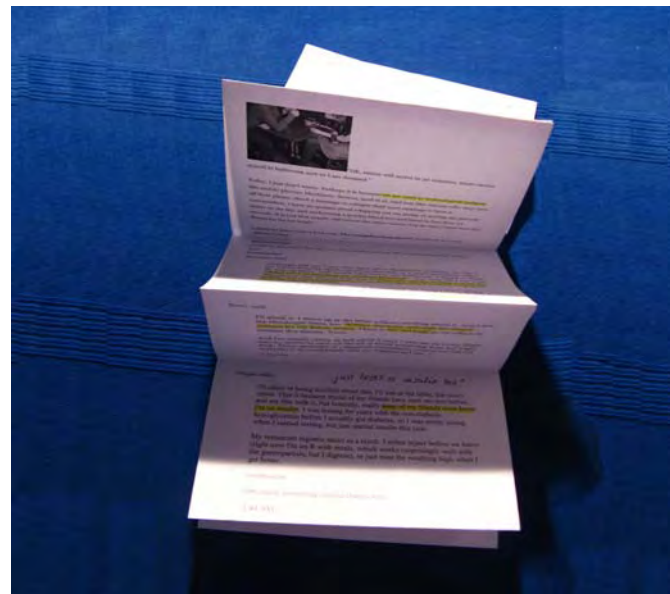
initial research in sketchbook



what? who? when?



Read book at the Mitchell reference library  
 Contacted Diabetes UK Scotland  
 Read Diabetes UK magazines  
 Looked at formal and informal websites and blogs  
 Mapped out issues raised in initial research: Diabetes - What? Who? Where?



articles from blogs

**young people?**  
 I think insulin pumps were new to most people. It was the first time for many of the people attending to actually see a pump and to understand how it actually works - mechanically and day-to-day. Also many people did not know about different styles of insulin management - such as DAFNE. Young people, and people in general like choice. With choice comes information and education and most importantly feeling in control of your life and your health.

**What could be done to improve the way organisations support young people?**  
 When you are young there are more important things to worry about than diabetes - new jobs, moving...

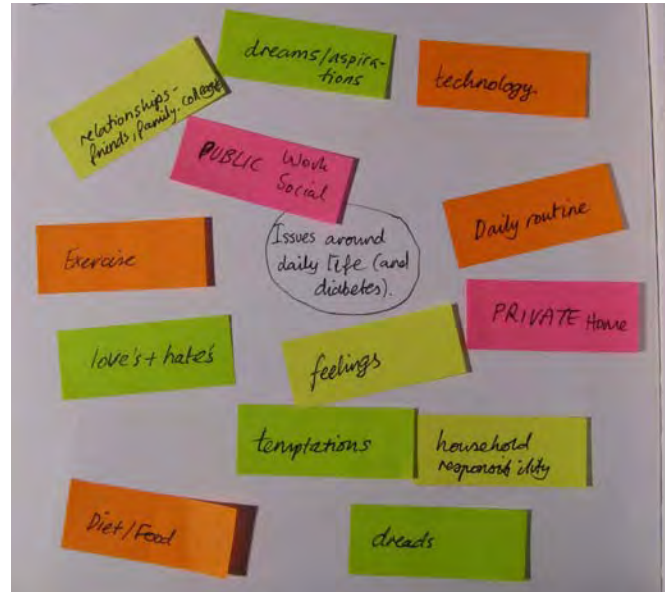
Diabetes UK Scotland newsletter



## Planning the probe kits

One of the most valuable research methods I used was cultural probes kits. Questions and tasks were deliberately kept quite open and only two asked specifically about diabetes. This was in an attempt to find out people's thoughts, feelings, loves, hates, hopes, fears and temptations. After doing a test kit, 11 others were sent out to people with diabetes or people with a family member with diabetes.

issues to find out about



love or loath?



Example tasks and questions:

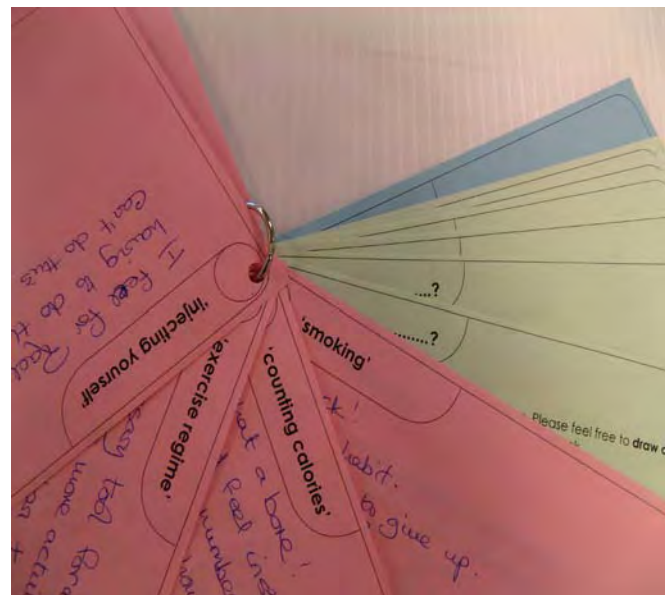
Put the pictures in either the love or loath envelope. Explain why you love or loath this...

Draw or write down the immediate thought or image that comes into your head from these simple phrases...

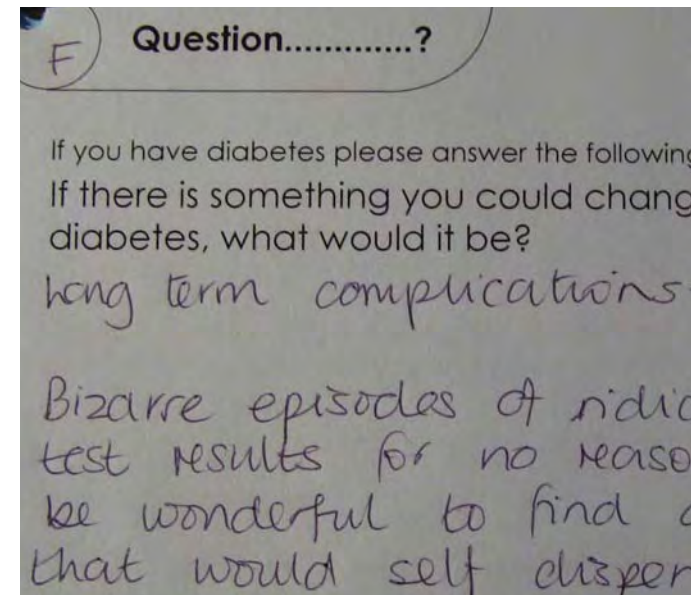
What is your biggest temptation?

Is there something your work/ school colleagues don't know about you?

If there was one thing you could change about diabetes, what would it be?



what image comes to mind?

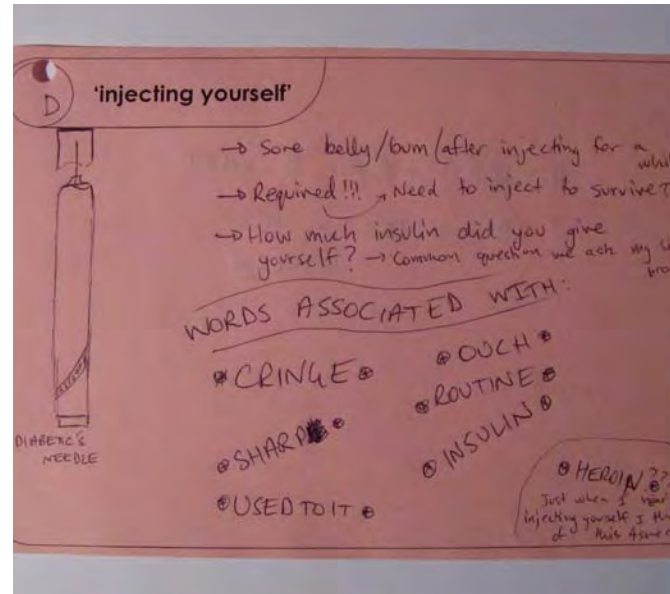


hopes, fears....

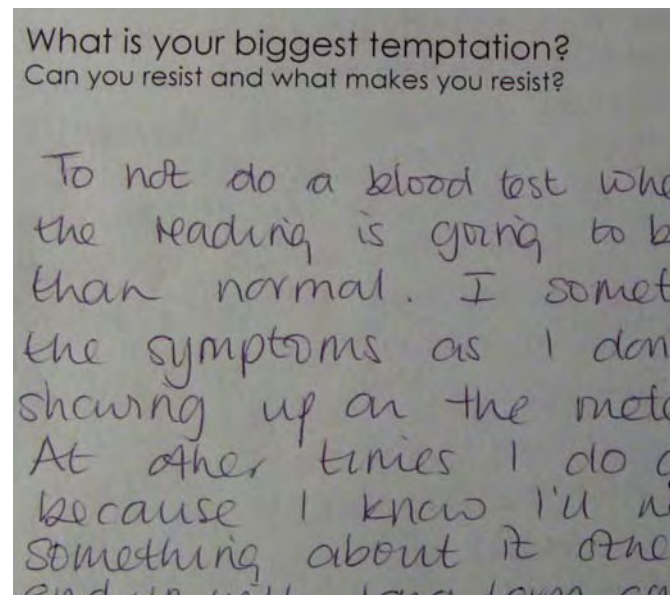
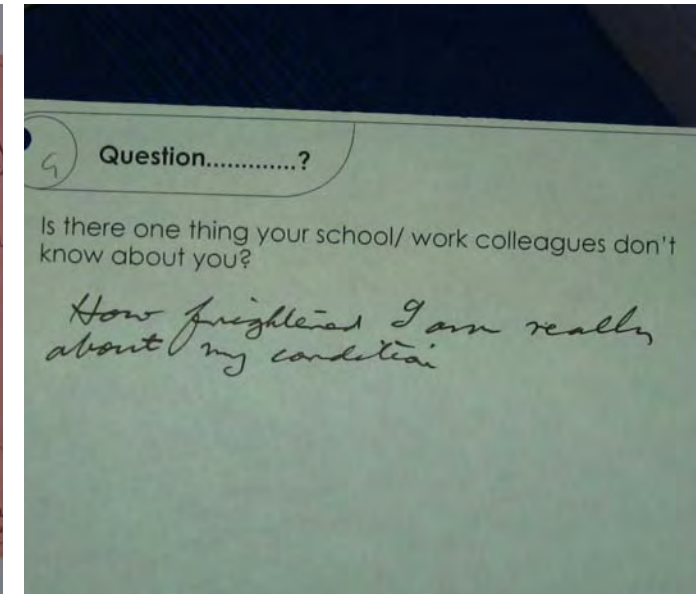
## Cultural probe kits results

Some comments referred to diabetes while others didn't. This gave me an overall perspective about what it is like to live with diabetes, from the diabetic's point of view as well as family and friends.

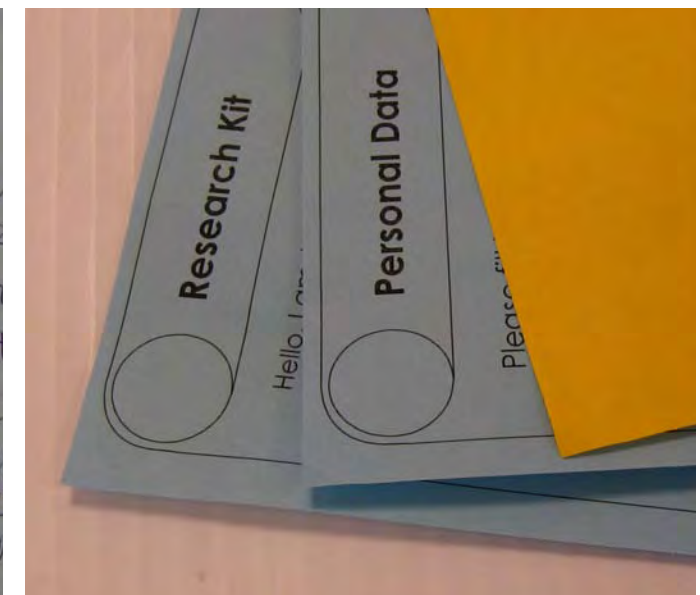
this person was thinking of his diabetic brother



love or loath?



tempted not to do a blood glucose test



explaining the project

- Contacted friends to find diabetics
- Learnt about ethical research considerations
- Designed cultural probes kits and handed out
- Identified possible research opportunities



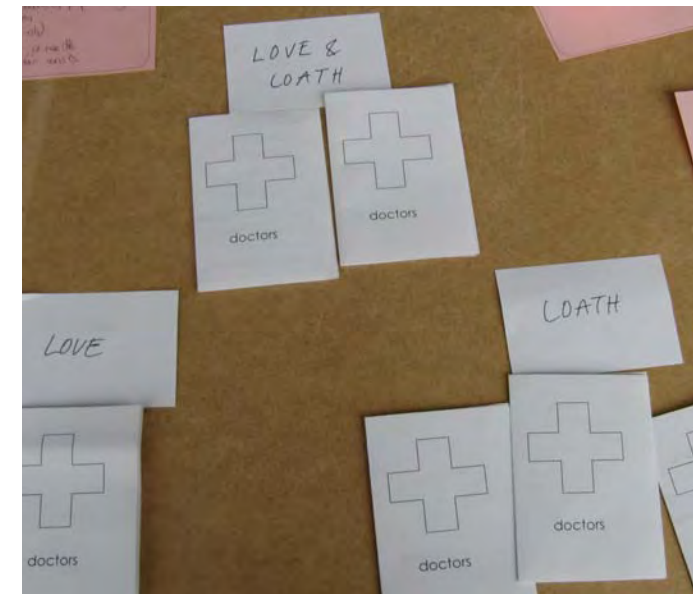
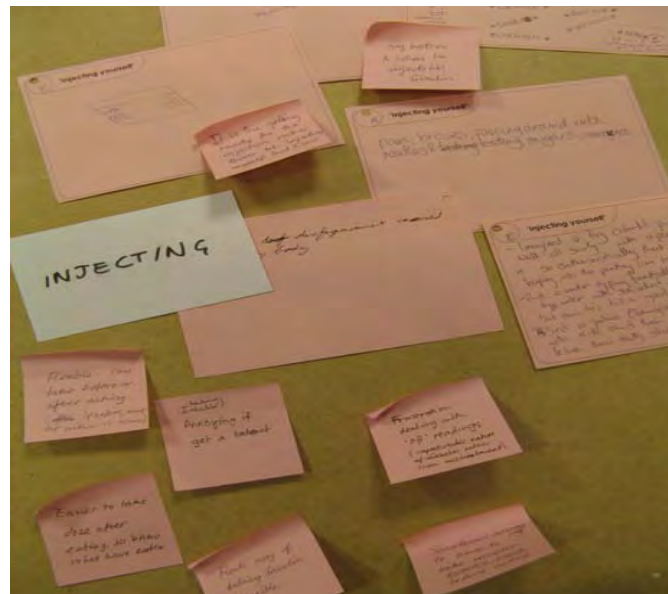
## Categorising findings

Once the probe kits were handed out I continued to research through internet sites and blogs. Blogs and discussion forums were particularly personal and gave me a real insight into people's experiences and how diabetes affects their lives. With the probes kits back and the other information I had I started to play around with the quotes and arrange them in various ways to see were the most important issues.

identifying different stages



various ways people adapted to diabetes



Probes kits returned  
Categorised findings and highlighted most important issues  
Interview with a newly diagnosed type I diabetic

grouping issues

sorting into love or love

## Interviews

I identified various stages that someone with diabetes may go through, such as recognising, adapting, accepting, coping, informing others and ignoring or denying. I was particularly interested in what kind of support and information a newly diagnosed diabetic receives. In interviews I focussed on how people give and receive information and about the issue of identification. A reoccurring issue seemed to be the problem of recognising low blood sugar and going into a hypo.

Went to Gartnavel Hospital Diabetes Support group meeting, Glasgow

Interview with type II diabetic and chairman of the Dundee University Diabetes Research Campaign

Email correspondence with person with type II diabetes

Interview with type I diabetic and chairman of Gartnavel Diabetes support group, Glasgow

Keeping track of carbohydrates

**Eating.** Calculate carbohydrates. **Has little book with everything written in** to keep me straight when I forget, eg, how many carbs in portion of pasta. How about knowing size of portion? Sandwiches good – says on it. When jar of pasta sauce, just have to calculate/ guess. **I'm good at knowing what's not got carbo in.** So if to-

**I get frustrated when straightforward events seem to generate unnecessary complications – life insurance, flights, deciding if you are disabled, using sun beds, etc.**

*It is the getting ready for the injection rather than me injecting myself that I see.*

daily life with diabetes

I showed this person different reactions to being diagnosed

***First diagnosed 17 yrs ago and got gradually worse – peeing too much, went to doctor, recognised immediately. 'shattering'. Didn't know what was. Things couldn't eat but didn't know was were. Stopped buying diabetic choc after first time. First quote most relevant. – I was confused and took a while to get to grips with it.***

when first diagnosed, she was really ill and pretty much on **border line** – if it had gone on any longer without being diagnosed, she **would have gone into coma.** Nurses said this to her (2 weeks later) and this was the **least helpful thing they ever said.** But still **feeling vulnerable** at this stage so not helpful to say this. Nurses at

unhelpful information

## Personas

As a way of illustrating different types of people who have diabetes and their diverse lifestyles and ways of coping with the condition, I made four personas. There is Anita, mother of Hanna who has diabetes. They are finding it very hard to predict blood glucose levels and give the correct insulin dose.

Malcolm didn't find out he had type II diabetes until he got quite ill. He is finding it hard to make lifestyle changes.

Rosemary explains how she has to calculate carbohydrates when buying and cooking food.

Dave talks about how inconvenient it is to have to test and take insulin in public and about how he doesn't always do it.

Created personas to illustrate the affect of diabetes

My daughter Hanna has had diabetes for one year now and since being diagnosed it has taken over her life. It is a constant battle to control Hanna's blood sugar levels. It has been a struggle to get the doses right and to predict how much insulin Hanna has to take, as sometimes I don't know how exercise will affect her, for example.

Also I sometimes have to force Hanna to eat when she is not hungry, just to keep the blood sugar levels up. I hate having to do this.

We are waiting to get an insulin pump and hoping that this will give Hanna much more flexibility. The pump is attached to your body and means that you don't have to inject insulin several times a day.



Anita, mother of 8 yr old Hanna

With the pump you still have to use the blood sugar monitor to test your levels and then work out and set the dose on the pump. However it means that it is much easier to control the blood sugar levels, especially over night time.

Scientists are working on a device that will automatically detect your blood sugar levels and give you a dose of insulin automatically, meaning that you effectively have an artificial pancreas. It will be a few years yet until it happens, but in the meantime the pump will offer Hanna much more flexibility in her daily life as well as much tighter control of her sugar levels.

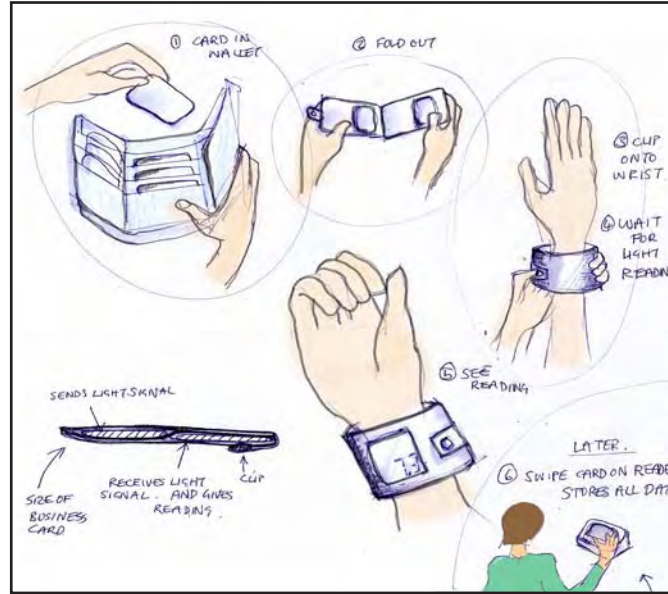
This means she will have much less chance of developing some of the long term complications that come from diabetes, such as a greater risk of heart disease, kidney disease, going blind and having to have limbs amputated. This is one of the things I fear most for my daughter.



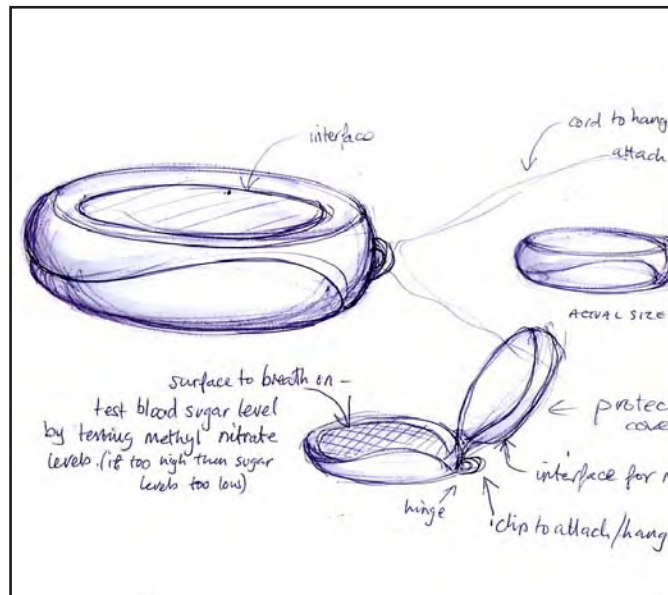
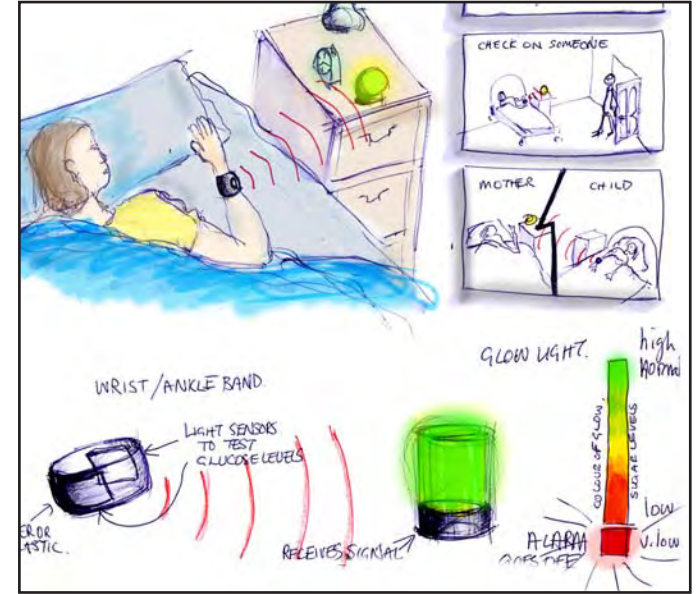
# Identifying opportunities for design

I identified blood glucose testing as a problem as many people don't test as they should or at all. This is because it is painful (more than the insulin injection itself). Pricking your fingers often causes numbness and bruising. It is something you have to do in public that makes you different. Also many people fear the results being abnormal and don't want it recorded by the meter. Lastly, people often don't do anything with the results even if they are abnormal; as they are only reviewed every 6 for type I and 12 months for type II.

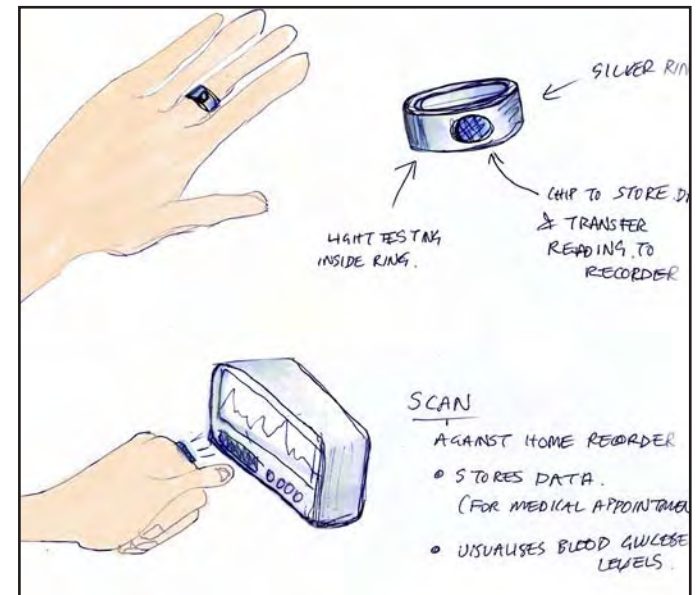
business card monitor



alarm at night



pendant



ring and keyring

Identify blood glucose testing as problem

## Developing design concepts

I started to sketch concepts for a painless and friendlier way of testing blood glucose levels. The concept had to be easy to use, wear or carry. The design had to communicate to the user and others around them when glucose levels were too low or high. Also the concept had to test continuously at night and be able to alert the user if levels were dangerous. The concept had to enable the user to visually see the results.

issues to find out about



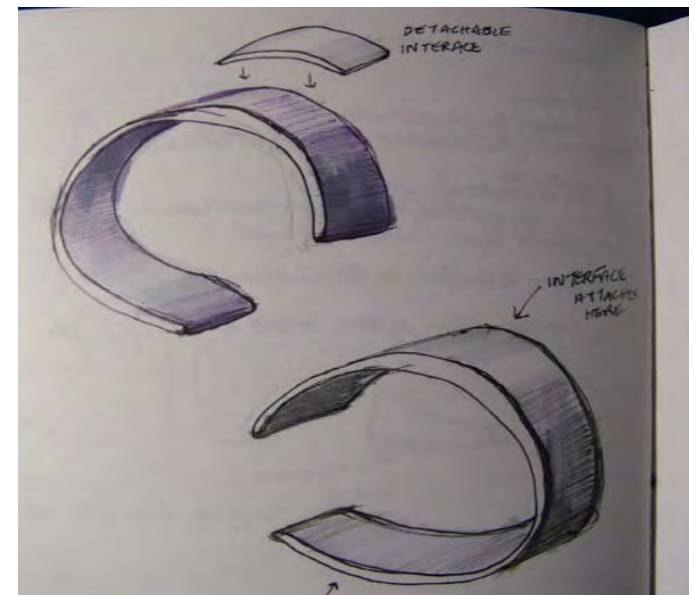
issues to find out about



Set criteria for design

Interview with diabetic nurse to show concept and hear her opinion on proposals

issues to find out about



issues to find out about

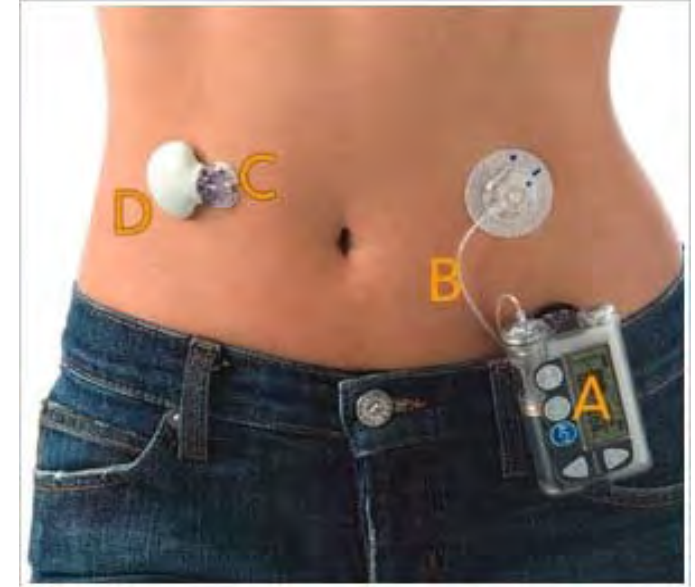
## Technology

One thing people said in the probes kits was, "If only there was a way of calculating an insulin dose and giving it to you automatically". There are insulin pumps which do this but I decided not to focus on them is because I wanted to find a non-invasive way of testing blood glucose that doesn't involve having sensors under you skin and wearing a pump all the time.

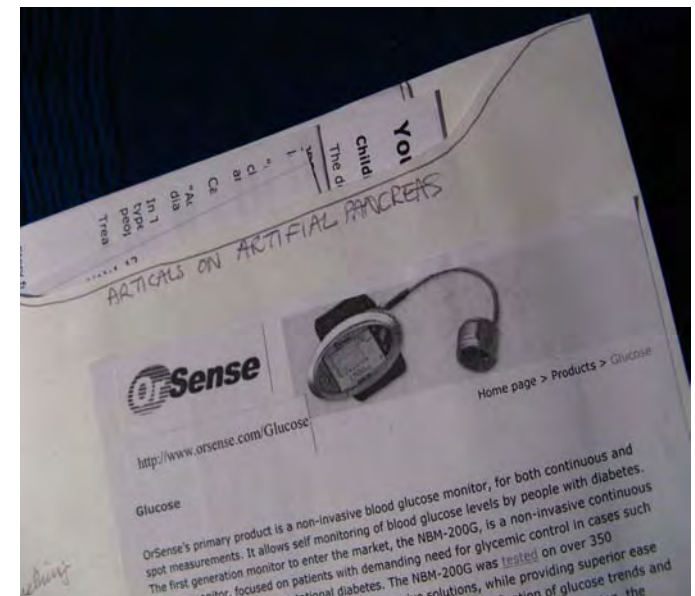
Gluowatch



insulin pump



Orsense non-invasive monitoring technology



Orsense

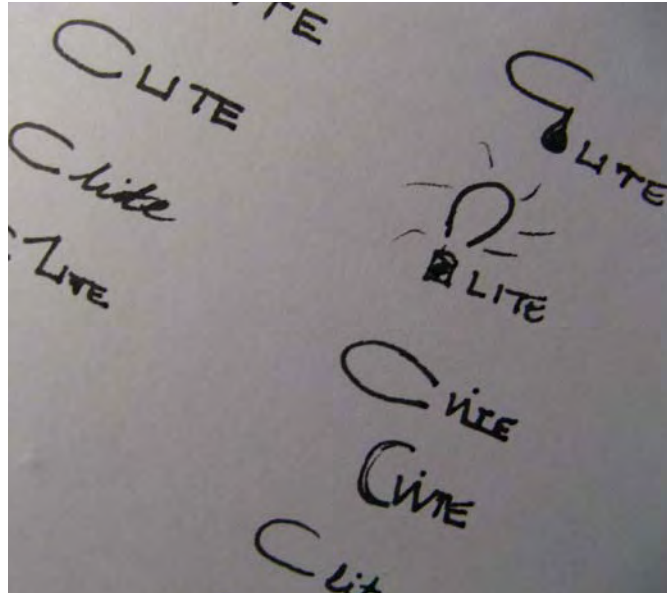
Investigated non-invasive technology



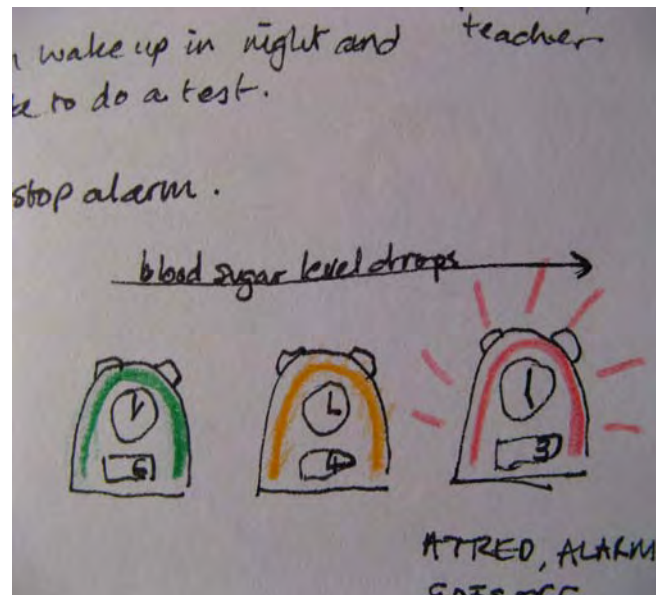
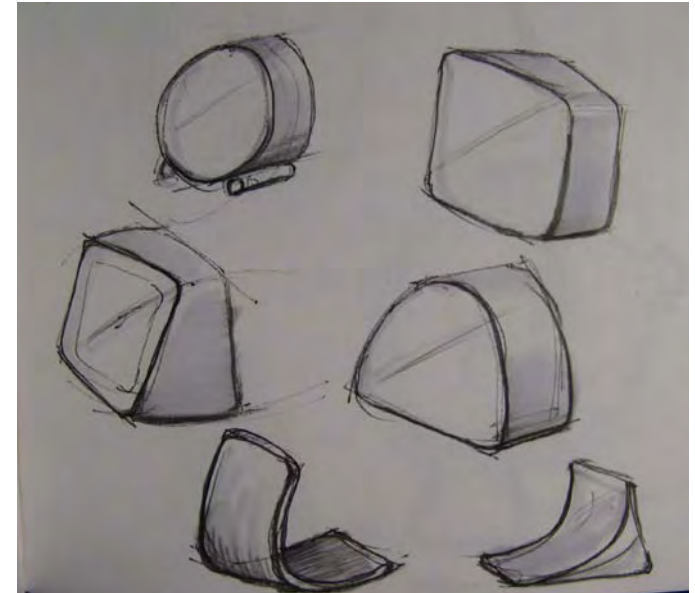
## Development sketches

I identified various stages that someone with diabetes may go through, such as recognising, adapting, accepting, coping, informing others and ignoring or denying. I was particularly interested in what kind of support and information a newly diagnosed diabetic receives. In interviews I focussed on how people give and receive information and about the issue of identification. A reoccurring issue seemed to be the problem of recognising low blood sugar and going into a hypo.

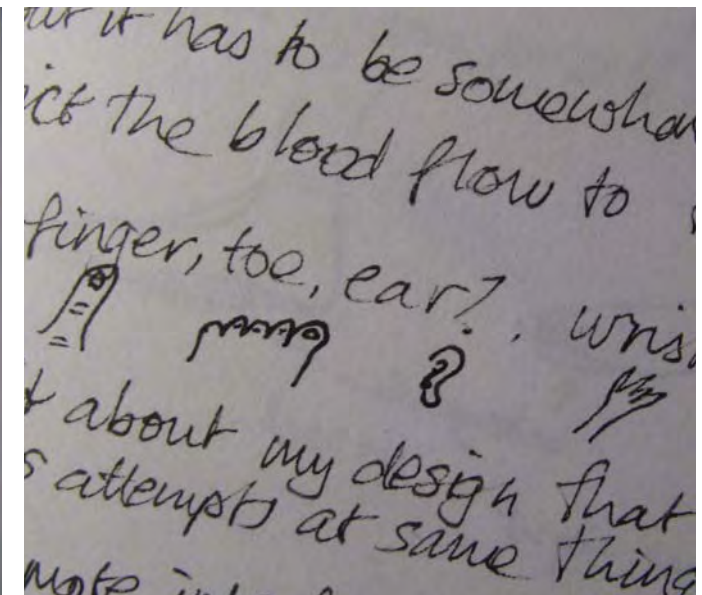
logo



C-Nite form development



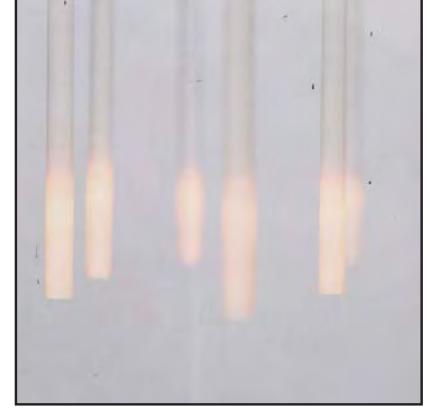
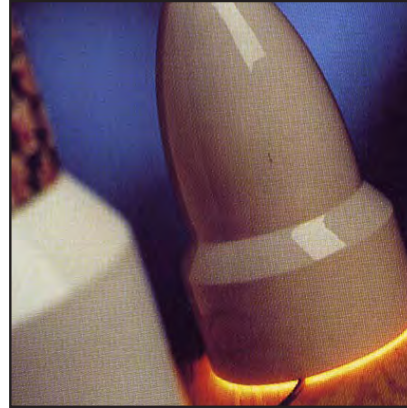
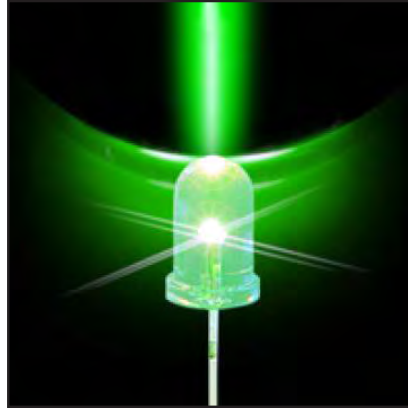
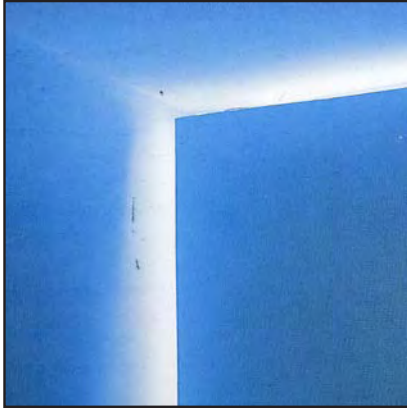
colour and sounds alarm system



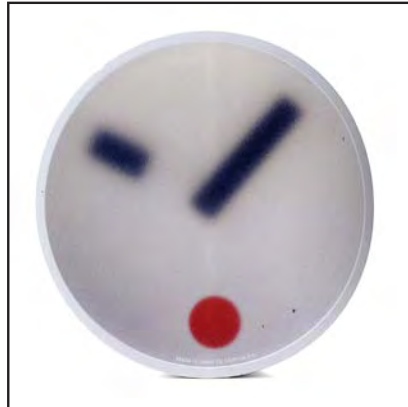
thinking about how technology works

# Inspirations

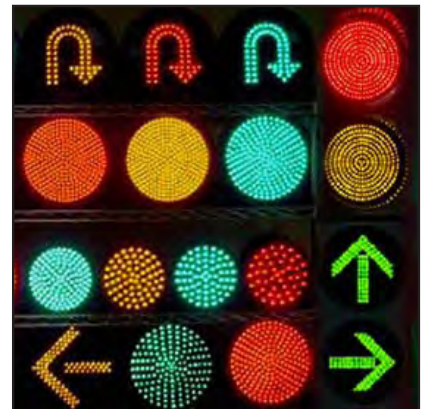
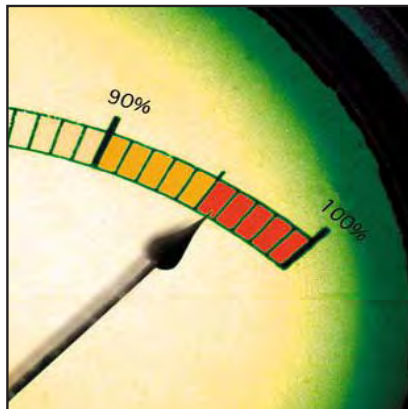
glowing



form and materials



signals



# Final design

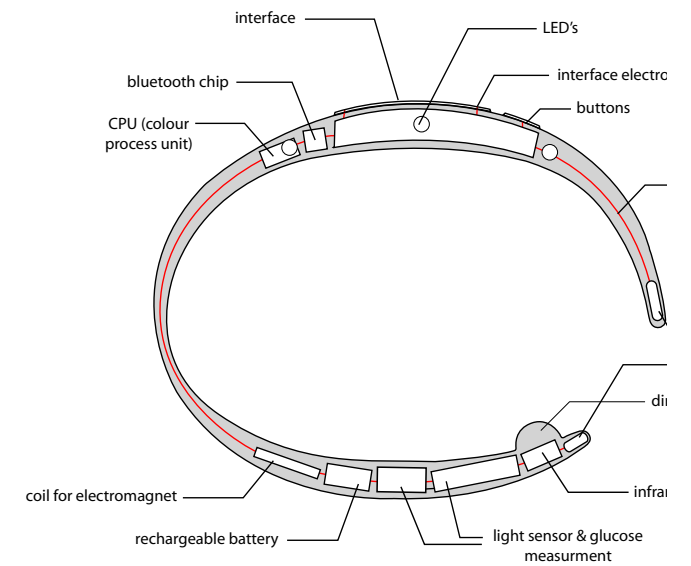
C-Lite comes in a colour range



the C-Nite remote glucose alarm



display interface and buttons



electrical components