Diabetes Education in Vellore, India

Nirja Desai

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ROCHESTER INSTITUTE OF TECHNOLOGY

A Thesis Submitted to the Faculty of
The College of Health Sciences & Technology
In Candidacy for the Degree of
MASTER OF FINE ARTS
In
Medical Illustration

Diabetes Education in Vellore, India

by
Nirja Desai
February 1, 2021
Diabetes education in Vellore, India

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Acknowledgments

I would like to thank Dr. Meredith Hawkins of Albert Einstein College of Medicine who introduced me to Dr. Nihal Thomas of Christian Medical College (CMC) in Vellore, India. I am grateful for the opportunity I received to visit CMC and see hands-on healthcare professionals working to treat and spread diabetes awareness. I would also like to thank my family and friends who helped me through this project. Last but not least Jim Perkins and Glen Hintz have been very patient with me throughout these years and training me to now be able to work at Science magazine. I am very grateful to you all and the Rochester Institute of Technology.
Abstract

The prevalence of diabetes mellitus has risen dramatically in developing countries over the past two decades, especially in India. There is a lack of awareness about the condition, how to treat it, and the symptoms of diabetes amongst the general population. Regular screening of adults is essential for early detection and care, but inadequate knowledge about type 2 diabetes is preventing the country from fighting a fair battle. Christian Medical College (CMC) in collaboration with Albert Einstein College of Medicine has taken the initiative to educate the general public and re-educate the physicians around the country about diabetes. There is no material available for the lay public to get basic information about diabetes. The textbooks created by the CMC faculty for the physicians lack clear illustrations and simple design. There are a couple of simple solutions that can improve patient education material and health professional education material. An animation could be used to help educate the public using cultural references of Tamil Nadu, India. This animation can be played in a physician’s office for an easy quick summary of the disease and care, it will also be available on the CMC’s YouTube and website. Animations with a spoken message as compared to a written one have been shown to improve recall in patients (Meppelink 2015). A re-design of the textbook for physicians with clear, simple illustrations using the CMC faculty’s medical knowledge can elevate the content of the textbook.
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Introduction

The worldwide prevalence of diabetes mellitus has risen dramatically and is projected to rise to nearly 440 million people by 2030 (Shaw 2010). In India, it is projected to rise to 79.4 million individuals (Wild 2004). There is a lack of awareness about the condition, how to treat it, and the symptoms of diabetes amongst the general population. Regular screening of adults is essential for early detection and care, but the inadequate availability of materials discussing type 2 diabetes is preventing the country from fighting a fair battle. Diabetes mellitus prevalence and knowledge assessment studies have shown that massive education programs are urgently needed both in semi-urban and rural India. Management of diabetes mellitus requires collaboration between physicians and patients to encourage self-care (Funnel 2010). Christian Medical College (CMC) in Vellore, India has been educating their patients and the local community about diabetes for many years. In collaboration with Albert Einstein College of Medicine and CMC, I decided to create an animation that would teach the general public about diabetes mellitus by simplifying the symptoms and taking into account the local culture. Spoken animation has been shown to be the best way to communicate complex health information to people. Narration along with moving elements have a significantly higher impact on learning and retention than print media (Meppelink 2015).

The Department of Endocrinology, Diabetes, and Metabolism at Christian Medical College (CMC) located in Vellore, India is at the forefront of diabetes care and research. Dr. Nihal Thomas, the associate director of the endocrinology department at CMC and their team have also taken the initiative to educate their patients about diabetes care and prevention. In collaboration with the Distance Education Department of CMC, the Department of Endocrinology has established a Distance Education in Diabetes Management for Physicians. My role at CMC was to improve the educational material with
my illustrations, design, and animation. I had the opportunity to travel to India and meet with Dr. Thomas’s team of doctors and nurses who were creating the material for physician continued education and also giving treatment to the patients.

Scientific Background

What is diabetes?

Diabetes mellitus is a disorder that occurs due to hyperglycemia. Hyperglycemia is an excess of glucose, also known as blood sugar, in the bloodstream. The food consumed is converted to glucose and is the body’s main source of energy. Insulin, a hormone made by the pancreas, helps glucose from food get into cells to be used as energy. Hyperglycemia usually results from defects in insulin secretion, meaning the body does not make enough insulin. Sometimes the body does not use enough insulin. Chronic hyperglycemia can cause long-term damage, dysfunction and organ failure. There is no cure for diabetes but it is a manageable disease (National Institute of Diabetes and Digestive and Kidney Diseases 2016).

There are two types of diabetes: type 1 and type 2. Type 1 is usually is diagnosed in young adults and children. In this case, the immune system attacks and destroys the cells in the pancreas that makes insulin. People with type 1 diabetes need to take insulin to manage their diabetes. My project focuses on type 2 diabetes. In type 2 diabetes, the body does not make enough insulin, it is the most common type of diabetes. One can develop this at any age, though it is most common in middle-aged and older people. One is likely to develop this type of diabetes if one is age 45 or older, has a family history of diabetes, and is overweight. Physical inactivity, race, and certain health problems such as high blood pressure also affect the chance of developing diabetes. Over time, high blood glucose levels can lead to many health issues, such as heart disease, stroke, kidney disease, vision problems, nerve damage, and foot problems.
Diabetes in India

Diabetes has reached an astonishing level globally. The World Health Organization (2016) states it affects 170 million people worldwide with a predicted increase to 366 million by the year 2030, 10 times the number affected by HIV/AIDS. Of that 366 million, more than 298 million will live in developing countries. India is one of many developing nations combatting this epidemic. There is a lack of awareness by the general population, a lack of knowledge by healthcare providers on how to treat the disease, and no coordinated healthcare infrastructure to support chronic and acute treatment. Type 2 diabetes has always been considered the disease of the affluent, a disease of the first world. The reality is that in the poor regions of many developing countries, people now have access to cheap food with empty calories. Along with a sedentary lifestyle, these factors are the primary cause of the rise in Type 2 diabetes (Diamond 2011). Another challenge in India is overcoming cultural beliefs that being overweight is a sign of prosperity, beauty, and health.

Christian Medical College’s Endocrinology Department has developed a comprehensive, two-year diabetes training program and has successfully trained staff from 99 hospitals around India to provide high-quality diabetes care. This training takes place on location and remotely. The training includes videos, PowerPoint slides with illustrations, brochures with illustrations, and animations. Some of this material is available to the public domain and needs updated illustrations. One of the main goals of my project is to create new material for the training program to educate the clinicians. The secondary goal is to create material for patient education that is culturally relevant in two different languages: Tamil (if time permits), a regional language of Vellore, and English.
**Body of work:**

**Textbook:**

The distance education department at CMC designed 4 textbooks that are used in the program of Distance Education Management for Physicians. The textbooks are used by physicians all over India to teach themselves about managing diabetes in their respective local areas. The books are a crucial part of the program along with frequent communication with the educators based in Vellore. The textbooks were designed many years ago by doctors without any illustration or design background. My goal was to redesign the textbooks and recreate the illustrations. Many of the illustrations used in their version of the textbook were outdated, blurry, and sometimes created in PowerPoint. There was little consistency in the font choice, character style, or color palette. In Figure 1, you can see the old cover of the textbook and the newly redesigned cover in Figure 2. My goal was to bring in all the elements of Diabetes and display them in a dynamic form. I used Adobe Photoshop to make the pancreas and the foot and Adobe Illustrator to create the rest of the illustration, it was laid out in Adobe InDesign. I referenced the *Atlas of Human Anatomy* by Frank Netter to create an accurate illustration of the pancreas. In the original (Figure 1), the color yellow was too distracting, the background caught too much attention. The color yellow tends to signify intensity and warmth, but when the entire background is warm, our brain has a hard time focusing (Dzulkifli 2013). On the new cover (Figure 2) my goal was to bring in all the elements of Diabetes, pancreas, blood, ulcered foot, and display them in a dynamic form. I chose to use yellow only on the pancreas to bring focus to the anatomy. The background was a cool green color with focus brought to the pancreas with yellow. People find green color associated with a feeling of peace and hope (Dzulkifli 2013). I chose to use green as the main color on the textbook cover as it represents calmness. It is the right mood for students before they open the textbook to review material. Visual
hierarchy in color and contrast is a very useful technique, it is used to bring the reader’s attention to the most important subject of the content and it has shown to improve memory (Dzulkifli 2013).

Another graphic design principal I focused on was visual hierarchy in typography. Along with typographic choice, the weight of the typography has the power to guide the reader from more important subject matter to less important (Boss 2017). Bigger and bolder text was used in the updated version to show importance. Titles and subheads received the bold treatment whereas the rest of the body text was in regular weight. I used Helvetica Neue for the sans serif type and Garamond pro for the serif type. Organizing the text is just as important as organizing the illustrations.

Negative space does a similar job of drawing attention to a specific piece of content. In Figure 5 I used this technique to leave breathing room around the illustration. The color around the graphic was removed to improve legibility. The updated version is shown in Figure 6.
Figure 1: Original cover
Figure 2: Redesigned cover
Distance Fellowship in Diabetes Management

Outcome:
What to do if the exercise test is positive?
+ Advise to undergo coronary angiography and revascularization procedure
+ Advise to avoid strenuous exercises but they can exercise up to their effort tolerance.
+ The lifestyle modification and the pharmacological therapy should be maximized.

What to do if the exercise test is negative?
If the history is not suggestive of angina, then negative test rules out coronary artery disease as a cause of chest pain.
If the history is suggestive of angina, the negative test suggests that the patient is at low risk for further cardiac events. So he/she may not need angiography, but lifestyle modification and medical therapy should be continued lifelong.

CORONARY ANGIOGRAM (Cardiac catheterization):
A coronary catheterization is a minimally invasive procedure to access the coronary circulation and blood filled chambers of the heart using a catheter.

History: Coronary catheterization was introduced in 1929 when the German physician Dr. Werner Forseman inserted a plastic tube in his cubital vein and guided it to the right chamber of the heart. Since the late 1970s, it has been extended to therapeutic uses.

Indications: It is not an initial screening test. It is performed for both diagnostic and interventional purposes (angioplasty).

Uses: It is a visually interpreted test performed to recognize:
+ Occlusion, stenosis, re-stenosis, thrombosis or aneurysmal enlargement of the coronary artery lumens
+ Heart chamber size
+ Heart muscle contraction performance

Figure 3: Original page about coronary angiogram
Outcome:

**What to do if the exercise test is positive?**
- Advise to undergo coronary angiography and revascularization procedure
- Advise to avoid strenuous exercises but they can exercise up to their effort tolerance.
- The lifestyle modification and the pharmacological therapy should be maximized.

**What to do if the exercise test is negative?**
If the history is not suggestive of angina, then negative test rules out coronary artery disease as a cause of chest pain. If the history is suggestive of angina, the negative test suggests that the patient is at low risk for further cardiac events. So he/she may not need angiography, but lifestyle modification and medical therapy should be continued lifelong.

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- Occlusion, stenosis, re-stenosis, thrombosis or aneurysmal enlargement of the coronary artery lumens
- Heart chamber size
- Heart muscle contraction performance

**Fig 13:** Injection of dye into the coronary arteries
PATHWAY OF ACCELERATED ATHEROSCLEROSIS IN DIABETES:

The increase in cardiovascular morbidity and mortality in diabetes is complex and multi-factorial and is usually related to a combination of both macro vascular and microvascular dysfunction.

**Macrovasculature:**

Dyslipidaemia is common in patients with diabetes (97%)\(^n\). Triglycerides are increased and HDL Cholesterol is decreased. Oxidation and glycation of LDL make it pro-atherogenic. However, glycation of HDL shortens its half-life and renders it less protective against atherosclerosis.

Endothelial dysfunction in diabetes accelerates the process of atherosclerosis. The normal protective mechanisms that make the endothelium vasodilatory, anti-atherogenic, and anti-inflammatory are lost.

**Microvasculature:**

In addition to the retinopathy, nephropathy, and neuropathy that we normally associate the term “microvascular disease” with, small vessels throughout the body are affected by diabetes, including those in the brain, heart, and peripheral vasculature.
Pathway Of Accelerated Atherosclerosis In Diabetes:
The increase in cardiovascular morbidity and mortality in diabetes is complex
and multi-factorial and is usually related to a combination of both macro vascular
and microvascular dysfunction.

- **Macrovasculature:**

  **Dyslipidaemia** is common in patients with diabetes (97%)\(^8\). Triglycerides are
  increased and HDL Cholesterol is decreased. Oxidation and glycation of LDL
  make it pro-atherogenic. However, glycation of HDL shortens its half-life and
  renders it less protective against atherosclerosis. **Endothelial** dysfunction in diabetes accelerates the process of atherosclerosis.
  The normal protective mechanisms that make the endothelium vasodilatory,
  anti-atherogenic, and anti-inflammatory are lost.

  ![Macrovascular Diagram](image)

- **Microvasculature:**

  In addition to the retinopathy, nephropathy, and neuropathy that we normally
  associate the term “microvascular disease” with, small vessels throughout the
  body are affected by diabetes, including those in the brain, heart, and peripheral
CARDIOVASCULAR DISEASE IN DIABETES–PART 1

By Dr. Vijila Isac

Learning Objectives

- Enumerate risk factors for CVD in diabetic patients.
- Explain the pathogenesis of CVD in diabetes.
- Screen diabetic patients appropriately for Cardiovascular disease.
- Explain to patients about exercise testing & coronary angiography.
- Recognise typical and atypical presentations of angina in diabetic patients.
- Educate patients with chronic stable angina and unstable angina appropriately.
- Follow-up drug treatment of diabetic patients with stable angina.
- Stratify the risk of Acute Coronary Syndrome.
- Give immediate care to patients with ACS and refer appropriately when indicated.
In designing and illustrating the textbook, my goal was clear communication. Using a specific type of color, font, and paragraph style I was able to achieve a decent layout that is easy to read. I used Helvetica Neue for the sans serif type and Garamond pro for the serif type. I created a hierarchy using bold text for the heading and serif font for the body text for legibility. The color of the illustrations was also muted with contrast and defined lines. I avoided using multiple colors in the textbook to focus the reader on the important parts of the material. I also used light blue as my main theme color as it is largely associated with the healthcare field and it is a calm color (Dzulkifli 2013). It also helps tie the whole textbook together. There were other challenges I faced in completing the textbook, one of which was that many of the raw InDesign files were missing from the CMC’s database. This meant I had to retype the content.

These redesigned and re-illustrated textbooks can be used for the Distance Fellowship in Diabetes Management program in the coming years. Along with the Distance Fellowship in Diabetes Management program, CMC has many other education programs. Programs that educate nurses, social workers, and patients. I created brochures, designed, and illustrated the cover for their annual research magazine.

**Animation:**

The creation of animation was performed in multiple stages: research, script outline, final script, audio recording, asset creation, animation and post production. First I did research about the content. I used all the references listed at the end of the document to create a script outline. I listed the main ideas we wanted to showcase about diabetes that are relevant to the general public.

**Script outline**
Follow a person throughout the story.

A vegetable vendor is leaving work and notices a blister on his foot. He decides to go see his doctor on his way home. The doctor sits him down and checks it out. The doctor notices that his blister is quite large and the vendor was complaining about the burning sensation in his foot as well.

The doctor suggested to the vendor to get his glucose level checked the next day.

The next day the vegetable vendor finds out at his office that he has diabetes.

The doctors give him an overview of the things below: (The chart that he will be pointing to will be animated, in an infographic manner)

What is diabetes? Types of Diabetes.

- It is a disorder that involves the hormone producing part of the pancreas, leading to a partial or complete deficiency of insulin.
  - Type 1 - total lack of insulin, usually below the age of 30
  - Type 2 - incomplete insulin deficiency to start with and an additional element of ‘insulin resistance’, where the body’s own insulin does not perform its function properly.

Symptoms of Diabetes.

- Thirst
- Excessive passage of urine
- Weight loss
- Excessive hunger
- Non-healing wounds
Diabetes education in Vellore, India

- Weakness
- Burning feet
- Increased propensity of infection

• Management of diabetes

- One needs to undergo significant lifestyle modification to maintain food diabetic control. (Use a tricycle or a Rickshaw as an example, the tricycle or the rickshaw will not work if one of the wheel is missing)
  - Diet
  - Exercise
  - Drugs

- This is very important to protect the heart, kidneys and eyes from damage

• Blood Sugar

- Check regularly

• Symptoms of low blood sugar

• When should one use insulin

• FOOT CARE!!! (very important)

Once the script outline was finalized I moved to the script. As I was writing the script, I wanted to inform the audience about some statistics about the disease before I leaped into the story. The story follows a person who is potentially diabetic to a clinic where he finds out he is diabetic and he also learns about diabetes. The main goal of the animation was to increase awareness and prevention of diabetes mellitus, hence I covered these topics in a simple language. I used storytelling as a tool to
Diabetes education in Vellore, India

inform. It also covers the physiology of organs involved in diabetes, major types of diabetes, symptoms of diabetes, foot care in diabetes, and prevention of type 2 diabetes.

**Script**

The following is the actual script used for the animation:

India has around 65 million diabetics between the age of 20 and 79 years. By 2030 this figure is estimated to go up to 101 million. For every person who is diagnosed as a diabetic, there are 4 more who are pre-diabetic. Some of the symptoms of type 2 diabetes include weakness and non-healing wounds. Raj is walking over to the clinic to get his foot checked out, as the cut in his big toe has not healed in a week. The doctor suggested him to come back the next day to get his glucose level checked out. The next day he found out that the glucose in his blood was high and he has Type 2 Diabetes.

This is how it all works, when we eat our body turns the food into glucose. This glucose is used as energy. The energy that we use to move around, to think, and function every day. But this energy can only be used if insulin can do its job. Insulin is a chemical that is produced in an organ called the pancreas and it enables glucose to be transported from the blood into the body cells so it can be used for energy.

When a person has Type 1 diabetes, there is a total lack of insulin in the body. So there is excess glucose collected in the bloodstream.
When a person has Type 2 diabetes, the liver does not get the signal that there is already enough glucose in the body and keeps pumping out glucose. And there is also a problem in the pancreas, it does not produce enough insulin or the insulin is not being detected and so the cell cannot absorb glucose.

And the cells don’t receive the energy they need, and so you may feel weak and tired all the time. The high blood sugar level is a serious health issue but it can be controlled. Patients with type 2 diabetes may also experience weight loss, excessive hunger, thirst, and urination.

One needs to undergo a significant lifestyle modification to maintain good diabetic control. This involves a crucial triad of Diet, Exercise, and Drugs. Similar to a rickshaw, if one of the wheels is not working properly, the rickshaw will not move any further. If a person with diabetes does not eat a proper diet, exercise regularly, and take medication, the risk of damaging the heart, kidney, and eyes increase. They must also keep their cholesterol and blood pressure in control.

How often should one check blood sugars?
Once you are detected, as diet control is established and the dosage of tablets increased, the physician will recommend monitoring sugar levels frequently.

Sometimes doctors may also prescribe insulin, if blood glucose level is not controlled with the maximum dose of tablets or if there is the eye, kidney, nerves, or heart damage.

Foot care is very important as feet are prone to injury and infection in a diabetic patient for a
number of reasons. Diabetes will often lead to nerve damage and decrease circulation in the feet. These conditions can lead to burning sensations in the feet. The high concentration of glucose in the blood makes it easier for the bacteria and fungus to grow quickly and profusely. These rapid growth may reduce immunity in cuts and other injuries. To avoid injury wear soft footwear with proper fit and sole. Keep the feet clean and dry at all times. Examine the feet daily in between the toes to look for fungal infection. Poor foot care with diabetes can lead to amputation.

So who should be concerned for developing diabetes?
People of any age, with a family history of diabetes who are overweight or have a sedentary lifestyle are at risk. It is important to get your blood glucose level checked now. Walk instead of taking the rickshaw. Walking briefly every day for half an hour can reduce your risk for developing type 2 diabetes by 30%. Exercising your muscles improves their ability to use insulin and absorb glucose. This will also help you lose weight and decrease your chances of developing heart disease. Bake your samosas instead of frying them. Eat plain rice instead of biryani.

The next step was to record the script. My friend Andy O’Donnell was kind enough to narrate the script and we recorded it in RIT’s recording studio. This helped me time the animation. Using the time as a reference along with the text, I started sketching out the storyboard.

**Storyboard**

Using the script I created the storyboard. I used Adobe Photoshop to loosely paint the frames
based on the script, which was used as a visual guide for the animation. The objective of the storyboard was to have every scene ready before I started animating it. This simplified the process of animation. I painted the storyboard in grayscale to focus on the values of each frames. Contrast in values can help a viewer focus on the subject and it saved me time as it is much faster to paint in grayscale than in color. For example in Figure 9 frame 2, you can see the focus is on the medical sign as it is light compared to the background. Another example is Figure 10 frame 1, the background is dark and the report that the doctor is holding is light. This brings our attention to the report. In the beginning of the story I used elements from his everyday life of the vegetable vendor to create the environment. The vegetables that he would be sitting by are shown in Figure 1 frame 2, the small light bulb that he turns off that shows that his day is ending is shown is Figure 1 frame 3. I used the metaphor of a rickshaw as seen in Figure 11 to discuss the three main aspects of type 2 diabetes. Rickshaw is an everyday mode of transportation that everyone uses in India and it has three wheels. Each wheel represents a key aspect of diabetes care, which are diet, exercise and medication.

The storyboard was laid out in InDesign, I added the sketches that were saved as JPGs from Photoshop into InDesign. Then placed the script next to each frame, in some frames I mention the type of action that would be animated. The process of creating the storyboard tremendously saved time when it was time to create the assets for the animation.
Diabetes education in Vellore, India

**Title Page.**

Suggest a better title.

**Narration:** India has around 65 million diabetics between the age of 20 and 79 years. By 2030 this figure is estimated to go up to 101 million.

**Action:** Vegetable vendor is at his shop, almost closing his shop.

**Narration:** For every person who is diagnosed as a diabetic, there are 4 more who are pre-diabetic.

**Action:** The vegetable vendor is turning off the lights in his shop.

**Action:** Vegetable vendor is walking home in the dark.

**Narration:** Some of the symptoms of type 2 diabetes include weakness and non-healing wounds.

**Action:** Zooming in on the wound of the vendor, to show detail.

---

**Figure 8: Storyboard Page 1**
### Figure 9: Storyboard Page 2

<table>
<thead>
<tr>
<th>Frame</th>
<th>Action/Discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Action:</strong> the vendor notices that his wound is out of control, he decides to stop by at an emergency clinic</td>
</tr>
<tr>
<td>2</td>
<td><strong>Narration:</strong> In these situations it is highly recommended that you visit your healthcare professional. <strong>Action:</strong> Zoom in on the doctor's office.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Action:</strong> Person is sitting at the doctor's office</td>
</tr>
<tr>
<td>4</td>
<td><strong>Narration:</strong> It takes up to 24 hours for the results of blood glucose tests. <strong>Action:</strong> Zoom in on the doctor's office</td>
</tr>
<tr>
<td>5</td>
<td><strong>Action:</strong> The clock's arms around the clock to show 24 hours time has passed.</td>
</tr>
</tbody>
</table>

**AFTER 24 HOURS**
**Narration:** What does it mean to have Type 1 or Type 2 diabetes?

**Action:** The doctor is showing the test result.

**Action:** The doctor is now pointing to the teaching board to educate the patient about diabetes.

**Narration:** One of our primary sources of energy is from sugar such as glucose.

**Action:**

**Narration:** So that we are not constantly eating to preserve our metabolic needs our bodies can store energy.

**Action:** Glucose turning into energy.

**Narration:**

**Action:** In
Diabetes education in Vellore, India

**Figure 11:** Sample Storyboard Pages
Assets for the animation

After the storyboard was completed, I started creating the assets in Adobe Illustrator. I chose to create them in a vector software to easily transfer the illustrations to Adobe After Effects where I would animate them. I picked a bright color palette for the illustrations along with modern fonts: a sans serif font called Sweet Sans Bold and a serif font Kelvingrove Regular. Some of the typography was done in Adobe Illustrator and part of it was added in Adobe After Effects.

The illustrations were simple yet accurate. Since I had to create a large number of assets for the animation, I kept the style simple and playful. This worked to my advantage as it was meant for a lay audience. Since a typical audience for this animation would be a patient newly diagnosed with type 2 diabetes at the doctor’s office in Tamil Nadu, they would not have an in depth knowledge of science or medicine. This animation would give them a quick summary about the disease and care. The playful colors added to the simple style of the illustrations. Along with creating the animation I collected a few paper textures that would be used in After Effects. I also collected sound bites to be added later to create an environment and found a soundtrack of ambient recording from India on SoundCloud.com. I’ve used it under a Creative Commons license. Immense amount of testing was required in terms of transferring the illustrations from Illustrator to After Effects before I could start animating. The illustrations were all created using the pen and the pencil tool in Illustrator.

Final animation

Once all the assets were imported into Adobe After Effects, it was time to animate. The recorded narration was my underlying guide, it helped me time each sequence. I had clipped each sentence into its own track so I could move it around as animated. I used the puppet tool along with multiple effects such
as wiggle, glow and jitter. Some items like the walk cycle in Figure 41 was drawn frame by frame in Illustrator then brought into After Effects. The animation resembles a cut-paper effect with many textured papers, as this style feels organic and fun.

Many items in the animation have local references, such as the Rickshaw, the vegetable vendor, the food items mentioned in the animation. I played close attention to visual hierarchy in color, values and typography as I was animating. One of the challenging parts of animating with a lot of assets and a huge file, was the time it took to load the software. I had to work in low resolution to save time and prevent my computer from crashing the software. I learned I had to work very methodically to speed up the process. My files in Illustrator had to be very organized when I imported to After Effects. The process would have been even longer if I had chosen to make these illustrations in Photoshop instead of Illustrator as editing a raster image is always more time consuming than editing a vector file.

Once the animation was done, I exported it at 720p in MPEG format. This animation is meant to play on a small TV at the doctor’s office and on their website. For a movie to run fast it must be a small file without compromising the quality of the video. On the exported video, I re-imported the animation into After Effects and added the environment sound of the bazaar. The last step was to export the video and upload it on Dropbox for Dr. Thomas’s team to download.
Diabetes education in Vellore, India

Nirja Desai
Medical Illustration
MFA Dissertation Project

**Figure 12:** Opening frame of the animation

**Figure 13:** Opening stats

2030
101 Million People

For every Diabetic
Figure 14: Vegetable vendor on the street

Figure 15: Vendor travelling to the hospital
Figure 16: Zoom in on vendor’s feet with ulcer

Figure 17: Vendor walking
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Figure 18: Vendor at the hospital

Figure 19: Doctor giving the result

Figure 20: Clock animation to show time
**Figure 21**: Doctor teaching the vendor about diabetes

**Figure 22**: Anatomy of the human body shown by the doctor

**Figure 23**: Simple illustration of how food turns into energy
Figure 24: Animation of insulin function

Figure 26: Insulin in a person’s body

Figure 25: The three key points of diabetes care
**Figure 27: Insulin Function**

**Figure 28: Rickshaw with One Wheel Off**

**Figure 29: Rickshaw Show the Three Main Aspects of Diabetes Care**
Figure 30: Three main points of diabetes care

Figure 31: Two things to check in diabetes

Figure 32: Organs that are affected by diabetes
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**Figure 33:** Blood test to check for blood sugar

**Figure 34:** Syringe

**Figure 35:** Foot with ulcer
Foot Care

**Figure 36: Foot care**

Normal  Diabetic

**Figure 37: What diabetes does to the nerves in the feet**

**Who is at risk?**
- Any Age
- Family history of Diabetes
- Overweight

**Figure 38: People at risk**
Figure 39: Obese people are at risk

Figure 40: Healthy person
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Figure 41: Man running to show exercising

Start EXERCISING

Make Better Diet Choices
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Figure 42: Diet options for diabetics

Stay Lean & Stay Active
Diabetes education in Vellore, India

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Figure 43: Closing Remarks

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Figure 44: End of the Animation

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Conclusion

The goal of this project was to create a redesigned textbook that would help educate health care professionals about diabetes and diabetes care. Another objective was to create an animation with a cohesive design and provide adequate information about diabetes care. The textbook has a hugely improved illustration from the original textbook. The topic for both the textbook and animation is the same but they’re presented to two different audiences. Textbook illustrations are detailed with heavy medical context and the animation is at a simpler level for the lay audience.

There is a huge need for this sort of material in the health awareness world. I learned a great deal in the process of creating this visual and on my trip to India in 2013. My stay at the Christian Medical College in Vellore has taught me a lot about the important work CMC and Dr. Thomas are doing to spread awareness about diabetes.
References


