

## Even Engineers can save lives

I am Karttikeya, a senior undergraduate in Electrical Engineering. Last semester, I was at École polytechnique fédérale de Lausanne (EPFL), Switzerland as an exchange student in the Dept. of Computer Science. This incident happened in the first week of February 2018 when I was coming back from Geneva to New Delhi Via Moscow after writing my final end terms exams at EPFL.

My flight was about half full and luckily, the seats adjoining mine were empty. For the first three hours or so, I was enjoying the solitude when I heard an air hostess enquiring whether there is a doctor onboard to deal with a medical emergency that is happening. After a few minutes, I saw a middle aged white russian guy coming from the front part of the plane in a hurry. I realised that he's a doctor and the man in need of medical attention is seated just two rows behind me.

Naturally, I went to the person's seat to help since I was one of his neighbours in the flight. The flight had originated from Moscow and the crew were more fluent in Russian but the person in care of attention spoke only English and Dutch (Later, I learnt that he hailed from Amsterdam, Netherlands). But somehow, the air hostess were able to put together enough English words to understand that the guy needed medical help. Luckily for him, the doctor spoke English and that's why I was also able to understand his situation. His name was Thomas who was about 30 years old. He had Type 1 diabetes since the age of 11 and usually always carried his insulin pump with him. In usual circumstance, he kept the pump attached on his abdomen over his liver and would set the dosage of insulin to take before eating anything through a dial in the pump. However, he was required to take off his pump for security check at Sheremetyevo International Airport, Moscow and forgot to collect his equipment from the deposit tray in a hurry. Now, it has already been 5 hours since he last took insulin and he is feeling that his blood sugar level has risen way beyond normal levels. Being a diabetic for over 19 years, he has learnt to always carry his sugar level checking equipment with him. It showed somewhere around 21 (I can't remember exactly, seems like intense mental pressure has a curious way of blocking details in memory). He went on to explain that it should be around 6 ideally, and he's starting to feel nauseous and feels that he might black out.

The doctor tried to calm him down and explained to the hostess that he needed urgent insulin or he would pass out with possibly multiple organ failures and coma or worse. I personally think it created more panic than helping the situation. Anyway, Thomas already had some cartridges of short-term fast working insulin with him, all he needed was a method to inject them. Fortunately, the doctor himself was a diabetic, but, he used a pen-esque contraption to inject insulin himself. It consisted of a transparent center part where the insulin cartridge loads, a dial on top of it to adjust the dosage and a pen like pushing mechanism that plunges out a small but sharp needle from the pen's front that is then injected into the patient. Fortunately, the doctor had multiple spare needle to replace the one he used with a new one for Thomas but Thomas' insulin cartridges were thinner than the insulin-pen's diameter and so wouldn't fit properly. The russian doctor's insulin cartridges, of course, did

load properly but contained a long-term slow-working insulin; chemically different from what Thomas usually took.

Anyway, seeing no other immediate solution and in the heat of the situation, the duo decided to go ahead with the doctor's insulin. Air hostess escorted them to some private space at the back of the airplane to inject the insulin and I went back to my seat to sleep, thinking that the emergency has been dealt with. *But as the reader could have guessed, that was not the case because otherwise I would not be writing this memoir.*

After about an hour or so, I heard the air hostess announcing that they are planning to land at some airport in the Afghanistan-Kazakhstan region because of a medical emergency. On inquiring further, I came to know that one of the air hostesses while passing through the aisle near Thomas' seat discovered that he had passed out and some kind of white foam forming at the corner of his mouth. Hearing this, I went to his seat, where the doctor was already present and with his opened up his insulin pen. He explained to me that Thomas is unconscious and might have severe life risk if not injected with the effective insulin as soon as possible. He said that over the years Thomas might have developed some chemical resistance to the insulin he had administered and his blood sugar levels have risen to mid 30s from the starting 20s, an hour earlier. On asking what he was trying with the pen, he said that he knows a way to adjust the cartridge holding tube's diameter and he's going to use it to inject Thomas' own insulin. However, when he was finished with this and tried to push the pen's cap so that the needle would come out to inject, the needle wouldn't bulge!

From what I could assess, I think he panicked at this point and asked the air hostess to land immediately lest it would be very difficult to save Thomas. The air hostess said that the land would take at least an hour and a half more and that they have already begun descent from the cruising altitude.

Wondering what went wrong and trying to help, I asked the doctor to give me this insulin pen to check what has changed since it was working just fine an hour ago. Also, I requested the air hostess to let me access the premium Wi-Fi available (only to Business class passengers) in the plane to check on the pen's manual online, *to which she reluctantly agreed*. I looked up the manual and found a large engineering drawing style diagram showing how every part fits with each other. Now, engineering drawing (TA101) was something I loathed in my first year but had practiced enough to score a B and which was also enough to understand this particular drawing. I started to methodically open the pen all the while counting the parts that I have accessed while doing so. I realised that somehow there were only 12 parts in it now while the diagram clearly showed 13 different parts. On cross-checking I realised that it was missing a spring that coiled before the cartridge and was essential to transfer the push motion from the back to the needle in front. To troubleshoot this, I searched around Thomas' seat and in the aisle area nearby to find the spring but in vain. All the while the plane was descending and the doctor had just vanished somewhere whom I couldn't find.

Keeping a cool head, I instructed the air hostess to ask the passengers for ball point pens, which usually have a spring in them. In a few minutes, I got 4-5 pens from the anxious

passenger who I believe were themselves terrified at the thought of landing in that terror-stricken region. Luckily, on trying out a few I found one that perfectly fits the other parts. Quickly, I reassembled the pen and gave it back to the doctor who by then had re-materialized back nearby. He adjusted the dose, changed the needle and injected the proper dosage of Thomas' own insulin. In about another 15 minutes, his blood sugar levels stopped rising and then started coming down, the doctor reported. Also, he informed the air hostess that there is not need to land now as Thomas would regain consciousness in due time. The air hostess seemed very relieved to hear this and asked us to help her to transfer Thomas to the business class so he could lie down. Also, she transferred my seat to the business class as some sort of 'caretaker'. Later on, nearing the end of the flight, Thomas regained consciousness and I narrated the whole incident to him.

Since, he was on the verge of passing out and was alone and completely new to India, I assisted him to the Medanta hospital for a checkup and also to get a new insulin pump. On the stretcher in the ambulance, he thanked me a lot and told me to come visit him in Amsterdam where he owns his own restaurant and brewery and where I supposedly would receive as much free food and beer as I want when I come! He had come to Delhi for travelling around India and see the Taj Mahal. This incident has made me realise the importance of the basic engineering skills we are taught in our freshman year here. I think saving a man's life is more than what anyone could ever imagine to achieve from the basic engineering knowledge endowed in that year. I am grateful to IITK for making me this capable to actually matter in such a critical situation :)

-Karttikeya Mangalam  
February 10, 2018.