

RoboDocs

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RoboDoc

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Dedication

To my son Eric, the doctor,
whose quest inspired this book.

Preface

The author graduated from medical school in 1977, and his son finished medical school 41 years later in 2018. Over those four decades, Americans have witnessed striking advances in the drugs, tools and technology used to diagnosis and treat disease. They have also seen drastic changes in the way our healthcare system is financed. But there has been very little change in our medical education system, except for an increasing reliance on smart machines and a declining emphasis on the caring part of health care. After spending 8 or more years in medical school and residency, many physicians still feel like they are just cogs in a giant healthcare machine.

My goal is not to criticize American medical schools or disparage the American healthcare system; by many measures both are the best in the world. But doctors are scrambling to keep up with an avalanche of new drugs, cybernetic devices and artificial intelligence applications. Dramatic advances in telemedicine are occurring daily, and many fear that remote doctor visits will further dehumanize medical care. Patients and physicians still have misgivings about robots delivering medical care, even though robots are already being used in hospitals to assist in surgery, perform laboratory tests, dispense medicines, transport supplies, and more.

This story is fictional, but the challenges faced by medical students, physicians and patients are very real. These are the doctors in your future.

Contents

1. If I Was a Doctor	1
2. High School	7

1. IF I WAS A DOCTOR

“Finish your plate, Hal. We don’t waste food in this family,” his mother said. “You know there are thousands of starving children in Africa.”

His mother didn’t just say that to make her two sons eat their vegetables. She had actually been to Africa in a UNICEF-sponsored program one summer in college. She had seen starving children in Africa, so Hal always cleaned his plate.

“You know I saw children your age there who were so malnourished they couldn’t walk. When they got sick, their parents had to carry them in their arms for miles to reach the nearest hospital. Well, they called it a hospital, but those places had no doctors and no antibiotics, so most of the kids died anyway. It broke my heart.”

“If I was a doctor, I’d go to Africa and save those children,” Hal said as he finished his plate.

“You’re a smart boy, Hal. You could become a doctor if you wanted to. I would be proud to have a son who could help those poor children. When Jesus said ‘*Suffer the little children to come unto me,*’ he didn’t mean let them die so they can go to heaven quicker.”

It wasn’t that unusual for Hal’s father to miss dinner. His job involved a lot of driving, and traffic was unpredictable. But when the phone rang during dinner that night, his mother knew something was wrong. She was clearing the table when she answered the videophone, and she dropped a plate when she saw who was calling. The policeman said her husband had been in a motor vehicle accident and had been taken by ambulance to the nearest hospital.

RoboDocs

“Mom, let the vacubot clean up the broken dish,” Hal said.

“OK, but check your phone and see how fast we can get a ride-share car out here.”

“Um, looks like at least 45 minutes,” said Hal.

“That won’t do. We’ll have to borrow the neighbor’s car.”

“Our self-driving car is at work picking up my husband,” said her neighbor. “But you can borrow our old truck.”

Hal hadn’t seen a manual-drive truck in a long time. “I didn’t know you could drive, Mom.”

“I can do anything I need to for my family, Hal. We’ll just have to get there the old-fashioned way.”

She left Hal’s little brother with the neighbor and took Hal with her. He was only thirteen, but people said he was mature beyond his years, and he could look up the fastest way to the hospital on his phone.

“Don’t worry, Mom. Dad always rents a smart car. I know they aren’t perfect, but they’re really safe.”

Hal also believed doctors and hospitals could fix any injury, so he figured Dad would be home in a few days. But his mother heard something in the policeman’s tone of voice that told her otherwise.

“Turn left here, Mom,” Hal said. “Emergency parking is right over there.”

Hal helped his mother out of the truck, and led her into the waiting area. The anguish seemed to last forever, but it was probably only half an hour they sat huddled there in suspense. Finally, a middle-aged doctor emerged from the treatment room. He was clean-cut and wore a white coat over his scrubs, but he looked somber and his sleeves had some blood stains on them.

“Are you Mrs. Phillips?” he asked. “My name is Dr. Thomas. I’m sorry to have to tell you this, but your husband, Mike, did not survive the accident.”

Hal’s mother collapsed into the chair beside her and started to cry.

After a few minutes of consoling her, the doctor continued. “The paramedics did a great job of keeping him alive in the ambulance. But there was no way he would have survived all the way to the trauma center in Clark City, so they brought him here. Your husband put up a good fight, but he had broken ribs and internal bleeding. His injuries were just too severe to be treated here. We don’t even have a surgeon on duty at night, and I’m just a family doctor. I can take out an appendix in an emergency, so I did an exploratory laparotomy and tried to stop the bleeding. But even a trauma surgeon would have needed more staff and equipment to deal with a case like this. We simply can’t handle serious accidents here in Carville.”

“Then why did the ambulance bring him here?” Hal asked. He was trying to make some sense of a world that had suddenly been turned upside down. This wasn’t right, this wasn’t fair! Dad couldn’t leave him like this! But he could feel the tears welling up.

His Mom hugged him. “Honey, the paramedics knew he was losing blood. The nearest trauma center is fifty miles away, and he would never have made it that far.”

The doctor waited patiently for her to console her son and stop crying herself. When his mother was finally able to speak again, she asked “Can we see him?”

The doctor nodded. “Yes, just give the nurses a few minutes to take out all the tubes. I know you want to hold his hand one last time.” Speaking aside to her he added, “But are you sure you want your son to see him? Your husband has cuts and bruises all over his face.”

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“Yes, Hal wants to become a doctor, so he’s not afraid of cuts and bruises. Besides, he’s thirteen years old and he’s going to remember this day for the rest of his life. He needs to say goodbye to his father in person.”

Looking at Hal, Dr. Thomas saw a little of himself in the boy. He was once a youngster with dreams of becoming a doctor. He still believed there was no greater calling than saving lives. “So you want to be a doctor, too?”

Hal nodded and wiped away a tear. “I want to go to Africa and save the children there.”

“Well, son, you don’t have to go to Africa to find people in need. There are millions of under-served and uninsured Americans suffering needlessly right here in Colorado. We need young people like you who really care about people to go to medical school. Maybe girls and boys who grow up in small towns will understand how unfair and one-sided our medical system is. Somehow our healthcare system isn’t about helping people any more – it’s just another business making money. Instead of building new hospitals and clinics to serve the people in need, they are closing all the small-town hospitals that aren’t profitable. And young doctors don’t set up their practice where they are really needed - now they end up pushing pills at a ‘Doc-in-a-Box’ booth in the mall.”

Dr. Thomas caught himself when he noticed the shocked and confused look on Hal’s face. “Excuse me, Hal. The last thing you need to hear right now is a lecture on health economics. First you need to see your father and begin dealing with your terrible loss. But remember, Hal, if there is anything I can do to help you achieve your dream, just come and talk to me.”

He turned to Mrs. Phillips, “I really mean that. Just have him call me if he has questions or concerns about a medical career. But now it’s time for you to say goodbye to your husband. Take as much time as you need.”

Dr. Thomas’ words echoed in his mind as Hal sat there looking at his dad on the gurney. Despite the cuts and bruises, Dad

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didn't look like he was worried or in pain. Hal thought he had the expression of someone who wanted to say, "Son, don't worry about me. I'm just sorry I won't get to see you grow up. I would have been so proud to see you graduate from high school, college and medical school. I know you can do it... But right now I want you to take care of your mother and your brother... I'm tired... Let me rest."

2. HIGH SCHOOL

Money was tight growing up. Hal's mother got a job as a nurse's aide working nights at the same hospital where her husband died. And she managed to raise two boys by herself. Sure, her Dad had been a family doctor down in Texas, but he was never rich and he was retired now. In any case, she was too proud and independent to ask him for money.

Still, they weren't starving by any means. Hal's mother always found a way to give something to the Save the Children Foundation. And she had high hopes for her sons. She taught her boys by example; about moral character, self-motivation and self-discipline. As a result, Hal was getting straight A's in high school, and it looked like he might get a scholarship for college; maybe even medical school. Well, a mother can dream, can't she?

Hal still dreamed of becoming a doctor too. He kept in touch with Dr. Thomas, who always encouraged him. "You're just the kind of person we need in medicine," he said. "You obviously study hard, and I can see you care about people and your community because of all the volunteer work you do. You will make a great doctor."

When Hal was sixteen, he jumped at the opportunity to spend the summer with his grandparents down in Texas. It was his mother's idea: "If you don't have plans for this summer, why don't you spend a couple of months with my parents. Your grandma would love to see you all grown up. And my dad could tell you what it was like being the only doctor in town."

So in June Hal got on an autobus headed for Austin, Texas. Sixteen hours and twelve stops later, he had developed a new appreciation for just how many small towns were just like his

own. He spent most of the trip studying U.S. geography on his tablet computer. He discovered that rural areas cover 97% of the nation's land, but only 20% of the population lives there. Small towns dot the countryside, separated by vast expanses of ranch and farm land.

At every bus stop, he saw the poor forgotten people who work the land to feed the cities. Hal didn't think they looked sick or unhappy, but most of the people who boarded the bus had the faraway look of folk who have accepted their fate.

Hal's grandfather met him at the bus station in Dry Falls with a hug. "It's good to see you, Hal. I almost didn't recognize you, you've grown so much."

"It's good to see you too, Gramps." His grandfather wasn't wearing jeans and a T-shirt like everybody else. Instead, he had on pressed slacks and a white shirt. "You didn't have to dress up to meet me," Hal said.

His grandfather laughed. "I got used to wearing these clothes when I was in practice. So I always dress up in public. You've heard of Hippocrates, the old Greek we call the Father of Medicine? He is famous for saying 'First, do no harm.' But he also made a point of telling young doctors to have a 'clean appearance, and wear good clothes' because when patients see that you take good care of yourself they feel more comfortable trusting your advice. You see, what patients expect from their doctor hasn't really changed that much in the last 2000 years. They still want a knowledgeable, respectful, caring person they can trust."

"Well, I didn't bring any nice clothes." Hal picked up his suitcase.

"I don't think your grandmother will mind," said Gramps. "Are you hungry? She made apple pie."

That summer was hot, but there were plenty of chores to keep Hal busy. He mowed the lawn, tended the garden, and cleaned

out the chicken coop. But in the evenings, Hal spent a lot of time on the back porch drinking iced tea and talking to his grandfather.

One night Hal brought up Hippocrates again. “Gramps, what did Hippocrates mean when he said ‘First, do no harm’?”

“Did you look up Hippocrates on the web?” Gramps asked.

“Yes, I learned that every doctor in the world pledges to avoid harming patients when they take the Hippocratic Oath. But no one actually explained how to do that.”

“Well, think about it, how can a doctor harm a patient?” Gramps replied.

“They could make a mistake like giving the patient the wrong medicine, or accidentally nicking an artery during surgery.”

“Those are good examples, and clearly a doctor should try to avoid mistakes like that. But doctors are human, so sometimes they do make mistakes that harm their patients. Knowing that can happen is a burden every doctor must learn to accept. But I don’t think Hippocrates was talking about accidental mistakes. I think he was talking about the things you do on purpose.”

“But a doctor would never hurt a patient on purpose!”

“Not if he *knew* it would hurt the patient,” said Gramps. “But what if he chooses a treatment that has a *small chance* of causing harm? You see, Hippocrates realized that almost every decision a doctor makes involves weighing the risks and benefits of several courses of action. So I believe he was telling us: ‘When you have a choice, always choose the safest treatment available.’ For example, if there are two drugs available to treat a disease, choose the one with fewer dangerous side effects. And if it is likely that the patient could recover without any drug or surgery, then encourage them to rest and get well on their own.”

Hal was confused. “You mean there are times when the best medicine is no medicine at all?”

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“Exactly,” Gramps answered. “Even the tests that doctors perform to find out what is causing your illness carry risks. Take amniocentesis, for example. It is done to find out if the baby is healthy or not. Putting a needle into a woman’s womb during pregnancy is risky for both the mother and the baby, but doctors do this procedure when they believe the benefit outweighs the risk. Cardiac catheterization is another common example. Inserting a tube into the coronary arteries and studying live x-rays of your heart carries a small risk of causing an arrhythmia or even a heart attack. But sometimes doctors need to study your heart before they can recommend the best medicine or surgery. So, for each patient, they need to weigh the risk of the procedure against the possible benefit.”

Hal scratched his head. “So, ‘First, do no harm’ really means estimate the chances for bad results before you do anything to the patient. Then choose a course of action that has a good chance of helping that person get better, and a small chance of making them worse.”

“Well said,” answered Gramps. “It means doctors should neither overestimate their capacity to heal, nor underestimate their capacity to cause harm. And since every patient is a different, their chances for good and bad outcomes are unique, so your advice and treatments should be individualized as much as possible.”

It was sounding like being a doctor was going to be lot harder than Hal had thought. Obviously, a good doctor had to know how to treat disease and repair damaged bodies. And his mother said the best doctors were compassionate, always putting the patient’s welfare above personal gain. But Gramps seemed to think it was hard to tell if you chose the right treatment, much less why you chose it.

“So there is no single best treatment for any disease?”

“No, there isn’t. And to complicate matters, doctors also have a responsibility to society as well as their own patients. That means that sometimes they need to consider the costs and

benefits to society as a whole. For example, when a doctor gives polio vaccine to a child, there is a one in a million chance the child will have a serious reaction to the vaccine. That small chance of harming one child must be weighed against the larger chance that thousands of children would be paralyzed if we did not vaccinate every child against polio.”

Hal made a mental note to ask his mother to double-check his vaccination record.

One day on a trip to the grocery store, Hal realized he hadn't seen a hospital all summer. “Where's the hospital where you used to work, Gramps?” he asked.

“We don't have a hospital here in Dry Falls. The nearest hospital is forty miles away.”

“Then where did you work?”

“I'll show you my old office. I still haven't rented out the space, so you can see what a country doctor's office looked like in the old days.”

They drove to a run-down part of town, where a small building still had “Doctor's Office” printed on the window, but a “Closed” sign was on the door.

“You know,” explained Gramps, “I was the only doctor in this town for twenty years. In those days being a family doctor meant taking care of the whole family. I took care of pregnant mothers, gave their babies vaccinations, talked to their troubled teenagers, put casts on their husbands when they broke a bone, and treated the old folks for everything from diabetes to cancer. I did a lot of minor surgery here in the office too.”

Gramps opened the door to a small reception area with a supply closet in the back. “Here was where my secretary worked. Suzy took care of appointments, cleaning and keeping track of patients' charts. She even ran the autoclave to sterilize surgical instruments. Suzy knew every one of my patients on

sight; their name, their job and their family history. When she left to go live with her daughter in Dallas, I decided it was time for me to retire, too.”

Next Gramps showed Hal his old desk with an ancient telephone and a stack of old medical journals on it. Behind it was a bookshelf full of medical textbooks that covered one whole wall. In the corner were a microscope and a centrifuge. “You didn’t have a computer?” asked Hal.

“No, that was the other reason I retired. They made it so you couldn’t get paid unless you used their new-fangled electronic billing system. Suzy didn’t know how to do that, and I certainly didn’t have time to learn, so we were still sending out paper bills in the mail.”

He opened a third door. “This is where I talked to patients, did physical exams, and treated patients. I even did some emergency surgery in this room.”

Hal was astonished at how bare the room was. It contained an examination table with an overhead light, two chairs, and a cabinet that contained iodine, some bandages and ointments. Next to that were the gloves, needles, tubing and supplies necessary to draw blood and start an IV. An eye chart, otoscope, blood pressure cuff, and oxygen mask were hanging on the wall. Another tray on wheels held a portable EKG machine and a defibrillator. There was also a locked drug cabinet, but it only contained a few bottles of pills and some surgical instruments now.

“You delivered babies here, too?”

“Yes, if the mother couldn’t make it to the hospital in Stryker. I delivered babies here without any fancy fetal ultrasound, Doppler, or even an incubator. There’s a midwife in town who I called if there was time, but I delivered several babies by myself - you do what you have to do.”

Hal thought about his father’s death in an auto accident, and all the doctors, nurses, and emergency facilities it would have

taken to save his life. “But what happened when someone had a bad accident? You couldn’t save those people, could you?”

Gramps frowned. He knew what Hal was thinking, so he took his time before answering. “No, there were people I couldn’t save, but I always did the best I possibly could. People who live in small towns don’t have an emergency room close by when they have a heart attack or an accident. But many times I was able to keep them alive long enough to make it to a hospital.”

“How did you do that?”

“Well, let me tell you about a man I treated just a few years before I retired. I was about to finish up for the day when Suzy rushed into my office and told me there was a bleeding man who just collapsed in our waiting room. We carried him into the treatment room, and it was obvious he had mangled his right arm in some kind of machinery. His forearm had almost been amputated; both bones were broken and his radial artery was spurting blood all over. So I put a tourniquet just above the torn artery and Suzy helped me clean and splint his arm. The man woke up and started screaming in pain as we worked on his arm, so I gave him a shot of morphine. Suzy called 911 while I started an IV, but we only have one ambulance that serves Dry Falls and they were out on another emergency. I knew the man would probably lose his arm if that tourniquet stayed on more than a few hours, so I told Suzy to take my car keys and bring the Buick around to the front door. I grabbed my medical bag, and climbed into the back seat with the patient. Suzy drove us all the way to the emergency room in Stryker while I monitored his blood pressure and kept the IV going.”

“Wow, did you save his arm?”

“Well, the man came back to my office two months later to say thanks. It turned out he was a migrant worker who got hurt working on a tractor mower. He had actually walked half a mile to my office applying pressure to his bleeding arm with

his left hand! But to answer your question: Yes, the orthopedic and vascular surgeons in Stryker were able to save his arm. They told him that without my emergency care he not only would have lost the arm, he almost certainly would have died.”

Gramps looked at Hal with a smile. “When it’s all said and done, those are the cases you remember. Those are the cases that make you glad you became a doctor.”

Hal thought about that story a lot that summer. He was proud of his Grandpa, but he wasn’t sure he could ever work in a town that didn’t have a hospital. He could understand why they needed family doctors in small towns, but he wanted to become an emergency physician, or maybe a trauma surgeon – someone who saved lives.

Hal wasn’t very popular in high school because he wasn’t athletic. Not only did he excel in school work, but he developed a musical talent as well. His baritone voice was easy on the ears, and he enjoyed singing in the choir.

To avoid being called a nerd he joined the Scouts, and spent most weekends on campouts or working for the troop. When he attained the rank of Eagle Scout his scoutmaster declared that he exemplified all twelve points of the Scout Law. He was “Trustworthy, Loyal, Helpful, Friendly, Courteous, Kind, Obedient, Cheerful, Thrifty, Brave, Clean and Reverent.” He told Hal those traits not only made him a good Scout; they would make him a good doctor, too.

He finished high school with all kinds of academic honors and graduated valedictorian of his small high school class. His academic record and scouting achievements together were enough to earn him a partial scholarship to attend the University of Colorado.

In his graduation speech he made a stirring call to his classmates. “Anything is possible if you are willing to work

RoboDocs

hard, develop leadership skills, and care about the people in your community.”

He spent his last summer before college volunteering at the local hospital. Dr. Thomas told everyone he was going to become a great doctor, and Hal started to believe it could happen, too.