

# Why Is It That the Different University Specialties in General and Engineering More Specifically Are Not Mentioned When Talking about Medical Work and Health?

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**Abstract.** How is it possible that when talking about technological developments in surgery and specifically in endovascular surgery no one thinks that without the other sciences: engineers, physicists, ITs etc, we wouldnt have the evolution we have now?

Why is medicine separated from the rest of the campus and the society, when its the only business that affects 100% of the people on this planet? And in addition considering that the economical aspect has more than ever a starring role?

Remember: we are more than twice the population we were 50 years ago on the planet; therefore no one can be invisible in health.

**Keywords:** health, minimally invasive surgery, technology, engineering, evolution.

## 1 Introduction

After more than 30 years dedicated to minimally invasive surgery (MIS), starting with the so-called vascular interventional radiology, and then being able to introduce the endovascular surgery in my country, it has come to my attention that the general public only refers to the physicians when talking about health, but never mentions the other scientific areas of the university campus.

How is it possible that when talking about technological developments in surgery and specifically in endovascular surgery no one thinks that without the other sciences: engineers, physicists, ITs etc, we wouldnt have the evolution we have now?

Why is medicine separated from the rest of the campus and the society, when its the only business that affects 100.

If we are able to operate without big incisions it means we use technological developments, “nanotechnology”, this is minimum in size and minimum in aggression. All this is not only because of the physician but thanks to a team of different professionals.

To work as a physician means to dedicate his/her work to implement the changes and most importantly be beside the patient. Its definitely a human relationship and therefore without the others we would have evolved very little.

With this essay we have the objective to remember that the physician is the health specialist but his work is only excellent using technology which is produced with the participation of the different areas of the university campus. In other words we are all part of health and no one can be invisible in medicine.

We do not claim for the patient to ask the physician about the engineer, but what we want is a total and formal integration of all sciences in health.

Throughout history, perhaps due to tradition, perhaps due to ignorance, health and specifically those responsible in learning to cure, known as physicians, have evolved in their own space without perceiving the importance of other knowledge particularly in relation with technological developments and its better management.

From Hippocrates to the current surgeons where minimally invasive surgery has allowed minimizing entries or even using natural lumen such as the digestive tract, evolution has been a vital part of health.

Even in the Hippocratic Oath it is mentioned that the individual physician cannot know everything or apply it on his own.

When we refer to the surgical field, in other words entering the body to repair, the origin of the specialists is “peculiar”. It was the barbers who with no special clinical knowledge of anatomy but with practice in handling the blades were the first to start a technique which would become a specialty: surgery.

Finally and in addition to the technological evolution our interest is also based on the evolution of technology of communication based on our experience: in 1988 we led the first transmissions of live surgical cases; we create a training unit, for simulation and development: MOTIVA.

## 2 Background

According to Hippocrates (460-370 BC): What cannot be cured with medications is cured by the knife, what the knife cannot cure is cured with the searing iron, and whatever this cannot cure must be considered incurable. And here lies the evolution of surgery

- The pillars of surgery, go back to century XVI.
- Early minor surgery was performed by “barber-surgeons” and included minor procedures.
- Barber-surgeons were looked down upon by recognized physicians of the day and wore short robes, leaving long robes to those physicians who did not soil their hands with the surgical blade.

The present barber pole is a vestige of those times, the colors representing bandages and blood.

Firstly its important to know the basis of medicine: the anatomy. Knowing anatomy means knowing the structures, the base to recognize where we are, what lies next to the treated area: the organs and their diseases.

Secondly, anyone who participates in health must know not only the anatomical basis but also the importance of economic management.

The technology related to the anatomy represents a constant technological development, with the consequent cost in updating and adapting information. Minimal invasion reduces hospitalization times and complications with the consequent impact on the economy.

In this second matter one thing that affects everyone on the planet earth is health, so we are talking about life and evolution that helps, not only in direct technological aspects as in the MIS but also in knowledge. We can be anywhere on earth and thanks to communication those responsible for health will be twice as good and competent. Firstly the physician is able to be by the side of the patient and secondly to receive through communication technology all the needed knowledge through connection with others.

This is where all the non-physicians come into place. How can they work on something that affects so many people without knowing the health structure, its weaknesses and needs?

Lets look at some non physicians related to medicine. Anatomy: Leonardo da Vinci, was an artist. Fluoroscopy, base of all endovascular, endoluminal and diagnostic surgery: Roentgen, a physicist. The microscope in the 1600: Galileo Galilei an astronomer. The mid-seventeenth century, first bacteriologist: a merchant of Dutch origin, Van Leeuwenhoek... and history shows us more.

So we must consider that physicians are not necessarily good and competent by definition, because, as in any area of society, there are good, bad and regular professionals. Perhaps if we consider this, we will discover why communication technology is used little or poorly in medicine?

Finally we would like to emphasize two aspects: technology for communication and for training.

Sharing knowledge is vital and if so, why do we not understand the need for the use of robots to visit the patients in hospitals, or why do we refuse to use video conferencing when our patients clinic is far from our hospital?

The development in the area of simulations allows working in surgical techniques without risking the lives of patients using the simulation, how is it possible that this has not been yet regulated as compulsory the learning of these methods?

### **3 How to Up-Date in Minimally Invasive Surgery**

We cannot go back to the medical school each time we implement a new technology, since the surgical and technological evolution is continuous.



**Fig. 1.** Training surgical techniques with simulation

Although junior physicians will learn the basics during their resident medical program, there will always be physicians who will have to learn as seniors during the continuous evolution of technology.

How can we apply this evolution with the same security as when studying medicine and during residents program? Therefore we should create rules based on [1]:

- We **do not** propose the creation of a new specialty.
- We propose the **regulation and certification** of uniform training on minimally invasive techniques.
- We propose training and certification of **new emerging techniques**.
- We propose **periodic recertification** to insure maintenance of skills and knowledge on minimally invasive techniques.

In this essay we focus mainly on vascular pathology firstly because of its impact on the health of the general population, secondly because its systemic, progressive and incurable, and lastly because the technology has completely changed the nature and approach of vascular pathology: from open surgery to endovascular surgery.

## 4 We Are Not Physicians. What Can We Do?

The goal for those who are no physicians is to understand what their task is and how it should be integrated in health in order to improve its technical use and therefore improve their costs sustainability.

Furthermore there is also a pressing need due to the world population that has doubled to over 6 billion in the past 50 years, as well as the life expectancy that has increased from 60 to 90 in western countries.

We propose some key responsibilities for the non-physicians.

### 4.1 Teaching and Learning

We must know the importance of technology in education and especially in medicine so technology allows the physician the space for the dedication, love

and humanity, meanwhile the technological data can be recorded digitally and the skill can be improved with simulators. Surgery is part of the technology, the more technology we use, the more medical skills we have.

- **Online courses:** Easy access through the network through an online platform which allows communication with expert teachers.
- **Hologram simulators:** Simulators are basic in education, preventing mistakes on actual patients, in other words decreasing the morbidity mortality. If virtual training helps in all fields before reality, in medicine not only the simulators but also a combination with holograms could have a relevant role as it reminds the operator the anatomical area where they are working.
- **Medical apps:** Continuous digital applications for our daily work both as reminders and to evaluate medical interactions and results. Always with us and updated. *We must not study just to forget!* For example, we can create the anatomy by ourselves to which we will add the physiology and we will connect the pathology according to our specialization and how to treat it. Also we can have the possibility to continuously add updates and in addition the social networking such as phones, webs, references, skype, etc.

Remember, the specialists have changed their method to achieve the specialization; understandings of the specific area, dedication, updating and full time commitment make a specialist. Times have changed.

## 4.2 Developing

To recognise those changes that are necessary for an adequate work, for example, the ergonomics. The USA Health system considers back problems related due to lack of ergonomics in angiosuit rooms as a professional disease.

What are ergonomics?. Do we realize the importance in matters that requires a physical effort such as laparoscopy or those who are working with a plumb protection?. That is, something as basic as the monitor placement during surgery can improve ergonomics.

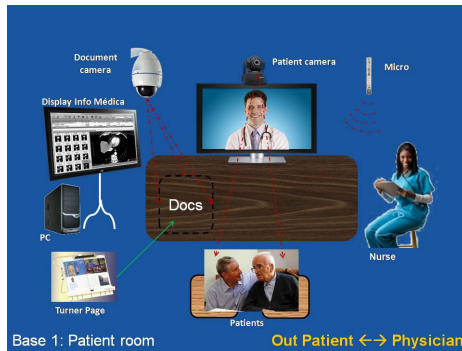
Therefore, engineers could work in developing technologies that can help. To develop technology that is accessible to everybody is also crucial for health and economy, with special focus on the health advantage in home automation, helping elders and disabled persons and in diseases. In these cases, the time to get to the hospital is vital, as stroke and aortic dissections could occur.

## 4.3 Communication

To get closer to patients wherever they are, and to improve communication between physicians.

- (a) Patient to Physician: Using technology we can improve the communication with the patient from our office to his/her room, supported by junior doctors, nursery or other staff.

- (b) Physician to Physician: To have a source of information from experts through video conferencing, with direct inputs of all data or expert opinions directly to the operating room and even using robotic technology.
- (c) Out Patient to Physician: Clinical use of video conferencing for the first consultations and follow-ups since there cannot be specialists in all locations especially for peripheral territories with difficult access and limited hospital service.



**Fig. 2.** Telemedicine Prototype

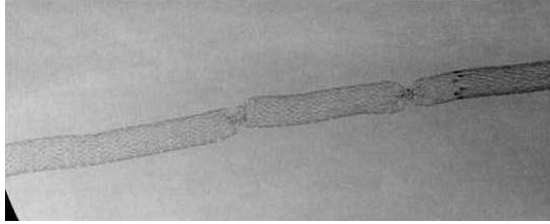
Not all physicians have the same experience and this is why technology makes possible for the patient to choose the physician they prefer. In the future technology will allow the physician to attend the patients especially important for patients who cannot leave their home. This is another aspect of home automation.

#### 4.4 Interconnection

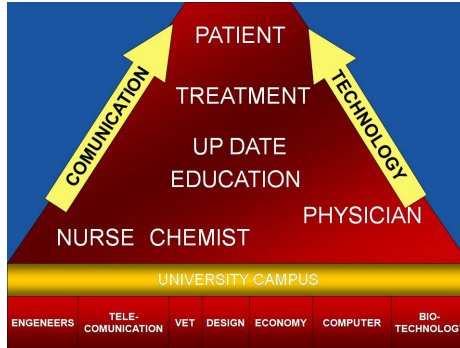
An example of the impact of the lack of information between the different scientific areas is that peripheral intra-arterial stents broke shortly after implantation. Why? Because no one told the engineer that the femoral artery moved and stressed. This has happened recently, in the twenty first century! This is one of the multiple examples where we can appreciate the distance between the physician and the engineer. Incorrect information spoils a good work [2].

And even more: intelligent operating rooms, robotics, endoscopy, computer tomography, ultrasound ... is there any aspect in medicine where the rest of the campus is not necessary?

To be good professionals in medicine is nowadays not because of our large memory or abilities with our hands, for this we have the support of technology. Thanks to the university campus we can increase our clinical/surgical times as information and a constant updating, will always be with us: we develop our own iHealth, a personalized digital data management and communication system.



**Fig. 3.** Stent fracture after implant



**Fig. 4.** University Campus View

A better use of resources delivers a higher distribution capacity. If you, the non physicians have so much capacity to work with the only product that affects 100% of the inhabitants of planet earth why are you invisible?

## 5 What Is MOTIVA?

Motiva is an integration platform for health knowledge, for educational and technological development.

With this philosophy the MOTIVA project was created in our community, Canary Islands, and is currently leading the simulators training and technology education, to study not to forget but to be, with the same or less effort, better professionals.

Through synergy, the collaboration allows more scope objectives, resource optimization and an innovation cooperation model. It can be seen as a high-speed train on the rail of minimally invasive and reconstructive surgery where there are cars carrying different knowledge areas.

In other words, the junior and the experts travel together on the same track to save whatever knowledge there is for sustainable development and without losing any single piece of knowledge for the universal problem: Health.

## 6 Conclusions

I do not know what the future will look like but if we understand the past, we can dream the future. Who is the artist? The one who introduces 4 cm diameter prosthesis through an incision of 8 mm or the one who develops it? It can be said that both, but never only exclusively the physician.

We should create training and education programs for all professionals and specialists who wish to be involved in health area. As others have said before us:

- *Knowing is not enough, we must apply. Being willing is not enough, we must do by Leonardo da Vinci*
- *Science, my lad, is made up of mistakes, but they are mistakes which it is useful to make, because they lead little by little to the truth by Jules Verne*
- *If knowledge can create problems, it is not through ignorance that we can solve them by Isaac Asimov*

Lets recall again what is mentioned in the Hippocratic Oath: “the individual doctor can not know everything or even apply it”.

Surely this is not the time to be invisible and recognize the importance of all members of the university campus, of knowledge in health.

More related literature to understand the importance of teamwork [3] [4] [5] [6]. Remember: we are more than twice the population new were 50 years ago on the planet; therefore no one can be invisible in health.

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