

**NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR**

**Department of Biomedical Engineering**

**Telemedicine**

*Submitted By:*

**Ashish Yadav**

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Roll no : 14111002

*Guided By:*

**Dr. Sourabh Gupta**

## **Question1. Reliable power for medical devices?**

**Ans:**

Wireless power can drive tiny electronic devices in the GI tract.

Using mid-field wireless powering, investigators can transfer power from outside the body to electronics in the gastrointestinal tract. Imagers, gastric pacemakers and other diagnostic and therapeutic tools could someday transform the way diseases of the gastrointestinal tract are measured and treated. But in order for these electronic devices to work, they need a power source.

This is an artistic interpretation of how an electronic device in the stomach could be powered wirelessly. Traditional power sources, such as batteries, can be incompatible with the mucosal lining of the gastrointestinal tract and have a limited lifespan within the body. A more promising possibility is to power electronic devices from outside the body.

In a new study published in *Scientific Reports*, investigators from Brigham and Women's Hospital, Massachusetts Institute of Technology and The Charles Stark Draper Laboratory report that an ingestible electronic capsule, complete with a capsule-sized antenna capable of receiving a radio signal wirelessly, can safely power a device in the gastrointestinal tract in preclinical models. The new work makes wireless medical electronics for treating the gastrointestinal tract one step closer to reality.

"Electronic devices that can be placed in the gastrointestinal tract for prolonged periods of time have the potential to transform how we evaluate and treat patients.

Other medical devices – such as cochlear implants or neural probes - use a well-established technique known as near-field coupling to deliver power wirelessly. But ingestible devices must be small enough to be swallowed and, moreover, lie a significant distance from the surface of the body, making this technique unattainable for most gastrointestinal electronics. A new technique known as mid-field coupling provides an alternative way to deliver power to deeply implanted devices. Mid-field coupling operates at higher frequencies to deliver power two to three times more efficiently.

To test whether mid-field coupling could help deliver power from outside the body into the gastrointestinal tract, the research team designed antennas capable of operating efficiently in tissue. They then placed one antenna outside of the body and the other in the esophagus, stomach and colon of a swine model. They were able to transmit power levels of 37.5 uW, 123 uW and 173 uW, respectively, all of which are sufficient to wirelessly power a range of medical devices from outside of the body.

## **Question2.Diarrhea prevention?**

**Ans:**

When diarrhea strikes, it can have you running to the bathroom every hour or more. Diarrhea can cause painful abdominal cramping, discomfort, and even dehydration. Chronic

diarrhea can last for days or weeks and may be caused by another health condition like irritable bowel syndrome (IBS). However, since most cases of acute diarrhea last for a day or two and are caused by either a bacterial or viral infection, you can do a lot to help prevent diarrhea.

#### Preventing Diarrhea: Good Hygiene, Good Health

If you touch someone's hand, a doorknob, a light switch, a copy machine, or pretty much anything else that has been in contact with a person who has diarrhea, microscopic bugs can get on your hands. And once you touch your face or your lunch, bacteria and viruses make their way inside your body to your digestive tract, and cause diarrhea. The best way to prevent diarrhea caused by an infection is to keep your hands clean and stay away from people who are sick. Good overall hygiene and reducing exposure to potential infection are key ways to maintain your digestive health and prevent diarrhea.

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- Drink only bottled water, even for tooth brushing.
- Avoid eating food from street vendors.
- Avoid ice made with tap water.
- Eat only those fruits or vegetables that are cooked or can be peeled.
- Be sure that all foods you eat are thoroughly cooked and served steaming hot.
- Never eat raw or undercooked meat or seafood.
- Obtain a hepatitis A vaccination prior to travel, if indicated for that region.

#### Q3. Availability of medical gases in remote areas?

Ans:

- Compressed medical gases (CMG or medical gases) include gaseous and liquid (cryogenic) forms stored in high-pressure cylinders that are administered as a gas. Types of compressed medical gases include, but are not limited to, oxygen, carbon dioxide, helium, nitrogen, nitrous oxide, medical air, and combinations of these gases.

Centralised medical gas pipeline system is a vital and integral part of a modern hospital, with emphasis on safety, reliability and purity of the gases. The central piped medical gas system is one of the newer types of hospital plumbing system introduced into the delivery of direct patient care. Medical gas piping is needed for oxygen, nitrous oxide, medical air, nitrogen, carbon dioxide, vacuum and anesthesia waste exhaust.

Piping gas from the central location directly to outlet at the points of use provides high level of safety unheard of in the past. These pipe system provide easier quality control and pressure regulation.

- Transportation of medical gases through closely packed cylinders in which no leakage is there.

Oxygen: for treatment or prevention of hypoxemia or hypoxia. Nitrogen: for use in hypoxic challenge testing. Nitrous Oxide: for analgesia. Carbon Dioxide: for use in extracorporeal membrane oxygenation therapy or respiratory stimulation. Helium: for treatment of upper airway obstruction or increased airway resistance. Medical Air: to reduce the risk of hyperoxia. Carbon Monoxide: for use in lung diffusion testing.

#### **Q4.Long waiting time at primary health care?**

**Ans:**

##### **Understanding the Balance Between Supply and Demand**

"If we can get a balance between the demand for appointments and the supply of appointments if we can get, understand, and measure that balance then we can eliminate waiting times," says Murray. "That involves basically doing todays work today, rather than using the old paradigm of stratifying urgent and non-urgent work. This does not prevent us from being able to see those patients with urgencies; changing the way that we see priority allows us to do the work that needs to be done today, as well as the work that could be done today. But hardly anyone is doing things that way. "We just dont see it that way in health care," says Murray. Working in systems that are always behind or late, "there is a strong imperative to take care of those patients who are sick," he says. "So what we do is find mechanisms to get those patients who cant wait in immediately. So, instead of thinking about how the whole system works dynamically, we only try to solve one part of the equation, which is, how do I take care of those patients with so-called urgent care needs?" What results is a fairly even flow of work, but three months late.

One way to change that is to consider how external demand and internal demand contribute to the whole picture. Primary care physicians dont have much control over external demand, says Murray when patients decide they are sick or need to be seen. Internal demand, however, is far more controllable; it is created by doctors who bring patients back for repeat visits or checkups. "You use the internal demand to load-level," he says. "You bring patients back at times during the day when demand is predictably lower early mornings or late in the week."

The second way is to measure the supply and "recognize that its the supply variation that causes the waiting times," Murray says. The number of doctors working any particular day should fit the demand as well as possible "making sure we have enough supply each day, each half-day, each hour, each minute," he says.

##### **Recalibrating the System**

"Once we understand the balance between demand and supply and we understand the systems dynamics, the second step is to recalibrate our system," says Murray.

That means getting rid of the backlog like "draining a lake or emptying a warehouse." Theres nothing magical about clearing out the warehouse; practices need to figure out how much work is coming in each day, and "do more stuff for a period of time to catch up."

### **Applying Queuing Theory**

Health care providers must apply queuing theory to appointment scheduling. "If we can reduce the number of queues or lines, we can actually reduce the time it takes in total wait time inside the system," says Murray.

Compare a grocery store and a bank, he says. At a grocery store, you pick a particular line. There are multiple lines, each with a specific clerk, and each with a short or long wait time. At a bank, however, one line feeds any one of a number of universal tellers. Theres less waiting time at a bank, says Murray, and the reason is that youre "load-leveling."

In health care, practices tend to have several different appointment types some for Pap smears, some for physical exams, and some for procedures. Where the increased waiting times occur is when theres an open slot for a physical exam, but no one is using it. "Thats where we end up creating variation," says Murray, and that means longer waits. Reducing the number of appointment types which frees appointment clerks and receptionists from trying to figure out what patients want or putting them into a particular pigeonhole is probably one of the more dramatic ways to reduce demand." Its not always possible to do it completely variables such as needing a particular room for a sigmoidoscopy or accommodating a patients choice of clinician can make it difficult but most of the time it can be done.

**Creating Contingency Plans** This is where systems can accommodate the variations inherent in health care delivery. "Theres demand variation and theres supply variation, and the contingency plans deal with or address, how do we manage those predicted variations in a predetermined manner? Were prepared to deal with the variation rather than react to it."

Practices should ask, "What are we going to do when theres variation in supply or variation in demand?" says Murray. Despite what many doctors think, seasonal demand involving the flu, for example, is the result of not only some increase in demand, but is just as likely due to a decrease in supply, he notes. The January and February flu season follows the holiday season, during which many doctors take vacations. That means theyre catching up on work from the holiday as well as handling increased demand; both must be taken into account when creating a contingency plan.

### **Influencing the Demand**

"In primary care, the best way that we can influence demand is to cement that doctor- or clinician-patient relationship and to make sure that patients get to see

their own providers every time and that providers get their patients every time," says Murray.

When patients see their own providers, there are less visits and there is less time with each visit, explains Murray. "That relationship results in not only reduced visits, but better clinical outcomes and lower system costs," he says. "So continuity is really the key." Specialists already have continuity, Murray notes. "On the other hand, when we look at the specialists in terms of the constraints in the system [see below], what we often see is specialists are asked to do work that actually could be done by somebody else in the system. The development of service agreements between primary care and specialty care is a strong way to reduce the demand for specialty care." Such service agreements define which work is done by each of the entities, and defines the packaging in which the work is sent from one to the other, says Murray. "In addition, the service agreement helps clarify the referral process, both for those patients that are known and those patients that are unknown," he says.

### **Managing the Constraints**

The constraints in a system are the rate-limiting step, Murray explains, and they ought to be the providers. In a private practice, things can only move as fast as the doctor-patient relationship. The trick here is to take the unnecessary work from the constraints, or elevate the care team so that work can be properly allocated to them, he says: "This frees up the providers to do the work they are unique and essential for." That means taking away any work that can be done by someone else.

### **Q5. Assistive technology for Asha worker?**

**Ans:**

Asha worker straddle the large divide between traditional firms of health care delivery and community centre health care. They are backbones of most government health interventions since they are the "Last mile" of most outreach efforts.

Asha worker require assistive technologies for the following activities:

- Monitoring Patients especially pregnant mothers who require routine follow-up.
- Reporting the result of their daily work to functionaries of Government of India.
- Delivering knowledge of better preventive health to patient and their families.
- Increasing compliance to prescribed medication.

Such assistive technologies have to be intuitive, robust and scalable=so that are adopted quickly and effectively by ASHA workers.