

ANESTHESIA IN 2050

“Strength and growth comes through continuous effort and struggle – Napoleon Hill”

Medical knowledge has been increasing exponentially over time. Healthcare constitutes one of the current megatrends which has led to an overall increase in life expectancy. People expect more with a minimal to nil margin of error. Hence safety with perfection is the need of the hour.

“It’s tough to make predictions, especially about the future. – Yogi Berra, baseball player philosopher”

Similarly it is difficult to predict how advanced anaesthesia will be in clinical monitoring and clinical practice technology and in PACU in 2050. There have been notable advances in the same but certain lacuna persists. A predicted patient journey for anaesthesia in 2050 as I envision it:

Every individual will fill a health related questionnaire online on a day-to-day basis to keep a track on the social or physical or emotional or environmental changes which might have a long term cumulative effect on the person’s general wellbeing. There will be a comment section where the individual can note any significant events which can have any impact on his or her persona. An artificial intelligence supported chatbot will keep track on a person’s daily routine and activities. This will be collated with all other information provided by every person to create an exhaustive database which can be accessed when deemed necessary.

If a person feels the need for a health check-up, he can access the health check-up kiosks kept at every 500 metres. This includes a cubicle with an inbuilt camera to get a real-time and computerised 3D image of the patient with electronic stethoscope which can amplify the breath sounds and heart sounds and via sensors record the same into audio clippings which will be compared by artificial intelligence to a pre-recorded audio files classified as both normal and abnormal. In case of any discrepancy from the pre-recorded files due to which a diagnosis is difficult, the patient will be referred to a medical specialist. The patient can choose a doctor from a list of designated specialists. In addition there will be wireless ambulatory ECG and lung function assessing cubicles, full body scanners, which combines positron emission tomography, X – Ray computed tomography and the investigation booth where blood, urine, stool or any other samples will be collected as per requirements. Based on all the above investigations a preliminary diagnosis will be made. This will be correlated with the existing database of the patient which will be analysed by a panel of health specialists and a diagnosis will be made (biotelemetry) . Meanwhile the patient will be directed to a waiting area with a token no allotted and as per the number, he or she will be called to a kiosk where the diagnosis will be revealed. Based on the gravity of the diagnosis, medicines will be dispensed or the individual will be directed to a specialist. In the scenario where the patient wishes to be seen by a specialist of their choice, he or she can opt for the same as per choice and an appointment will be made as per availability. For a patient who has been given a surgical diagnosis, an option for surgical intervention will be offered. If the patient opts for the same, additional retinal scan, fingerprints, facial recognition scan and signature will be registered, a date and time will be allotted and a surgical and anaesthetist team will be assigned. If the patient opts for a team, they are given the choice, as per availability, videoconferencing would be arranged and the electronic medical records will be made accessible to the team.

The patient will be called in a day prior to the surgery and will be provided accommodation along with other patients planned for surgical interventions. Various interactive group sessions and individual counselling sessions will be organised to clear doubts related to the surgery, provide moral support by others having similar experiences, alleviate anxiety . Personal pampering outlets like, spas, meditation centres, relaxation

exercises and music therapy will be other ways to alleviate fears and relax. Patients who cannot be managed by the same will be provided sedative pharmacotherapy or hypnotherapy.

They will retire wearing a bodice with a pneumatic compression device for the extremities into a bed kept in a patient coded open portable transparent capsule. They will be provided with 3D or 4D virtual reality experience to provide a more pleasant journey into the sleep realm. Once they enter stage 1 non-REM sleep the capsule will be closed and natural aromatic or chemical agents will be emanated into the capsule which increases the duration of stage 3 non-REM sleep. The patient will be kept in this state till the surgery. Patients with obstructive sleep apnea symptoms will be provided by cell operated nose (CPAP) continuous positive airway pressure.

On the day of the surgery, the patient will be identified by facial recognition, fingerprints, retinal scan and capsule code. The capsule will be transported with the patient inside, thermoregulated and in suspended animation, to the operation theatre. Capsule will ensure less theatre pollution, easy scavenging and less theatre space requirement. The anaesthetic machine is run by artificial intelligence which does self-checks every 15 minutes which one can manually override if required. Intravenous access will be established using IV guns which can locate, trace and insert IV access with utmost precision – both central and peripheral access. Depending on the surgical grade, the anaesthesia will be administered. In case of regional anaesthesia, the anaesthetist will be assisted by an “RA expro device” which combines ultrasound with nerve pattern tracing and needle GPS in a portable handy form. In case of spinal or epidural anaesthesia or analgesia, the patient will be strapped and the gurney with the patient will be rotated into right lateral or left lateral position inside the capsule. A scanner will locate the spinal or epidural space of choice – the panels on the gurney will move to expose the area. Based on loss of resistance, the drug will be administered and if required a permanent connection will be established with workstation to administer drugs till the end of surgery. For postoperative epidural analgesia, a mini encapsulated form of local anaesthetic which is remotely controlled can be injected into the epidural space which will self decimate in a week’s time. The drug level can be noted by a transcutaneous sensor which will help to micromanage the drug levels remotely.

Once the IV access and analgesic modalities are established and blood is sent for cross match. The airway patency is secured via remote fibreoptic intubation through ports in the capsule at the cranial end. In addition, the capsule has a glove box system for head manipulation for introducing the airway or if the surgery has to be performed by hand in an emergency situation. Once the airway is secured, the patient is connected via breathing circuits to the ventilator which self adjusts the mode based on a balance between the patient’s efforts and the anaesthetist’s judgement based on the stage of surgery and the hemodynamic parameters of the patient. In case of surgeries requiring a particular patient position, the capsule will be removed, and a workspace system based on the principal of random positioning along multiple axes will position the patient onto a hydraulic bed with sensors which provide a note of the pressure applied on different body parts and the blood supply in the extremities. The patient is enclosed in different encapsulated environments based on the final position.

The surgery commences. Majority of the surgeries will be robotic or remote surgeries. This will provide better asepsis and better wound healing. For further asepsis, the surgery will be done under antibiotic mist pumped into the capsule prior to the start of the surgery.

Prior to start of surgery, the surgeons and the anaesthetist will station themselves in the cockpit – the area from where the operation is controlled. For the anaesthetist there is a myriad of monitors – the Electrocardiogram, blood pressure monitors – both invasive and non invasive, pulse oximeter, the capnography, PPV monitoring, the bispectral index monitoring, CVP monitoring, AEDs, transesophageal echocardiogram in case of cardiac surgeries. The drug delivery is regulated via computer controlled infusion

devices as per the stage of the surgery and the requirement of the patient. Drugs and infusions will be started as per intermittent assembly line system used in factory which can be manually controlled as per need of the hour. Fluids and blood will be administered as per the fluid requirement calculated by the computer based on the blood loss and maintenance fluid requirement which is cross checked by the anaesthetist and adjusted if required. At the end of the surgery, the wound is sutured and is coated with antibiotic gel or extract from marine alga like *Dunaliella primolecta* which can promote healing. All patients post-surgery are kept in a postoperative fugue or trance based on the grade of surgery and postoperative pain relief is provided with electronic acupuncture therapy. The IV access and the regional anaesthesia accesses are detached once the patient is deemed fit and is extubated. The patient is gradually awakened through multiple levels of awakening – false awakening, pre-lucid dream, lucid dream and then fully awake. Once the patient attains full sensorium and is pain free, all accesses which are potential portals for infection are removed and sealed off with antibiotic gel. The patient is rehabilitated and discharged once deemed fit.

Patients who require prolonged monitoring due to hemodynamic instability or airway related issues or any other cause of morbidity will be transferred to an intensive care setup in the capsule to ensure thermoregulation, reduced environmental losses and to enhance healing. In addition a chest compression device will be attached to the capsule of the critical patients, in the event of a cardiac arrest. All the monitors and IV infusions will be in place and these patients will be under 24 x 7 monitoring. The progress in their vital trends will be noted and drugs will be adjusted accordingly by artificial intelligence overseen by anaesthetists. Once the patient shows improvement, he or she will be downgraded to multiple levels of less intensive care till deemed fit for discharge.

This is how I see 2050. But one point to always note is the following.

“Technology will not replace teachers but technology in the hands of great teachers can be transformational – George Couros”

It does not matter what technology is available, if it falls into the wrong hands it will cause more harm than good. As anaesthetist it is our duty to provide the most amicable operating environment for the surgeons which is also in the best interest of the patient. This will provide the most favourable outcome for all the teams and parties involved. Remember:

“Coming together is beginning. Keeping together is progress. Working together is success.”

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