

## Discharge Summary

Mr. Smith, 29-year-old male, was brought to the ER on 15 September at 00:33, having jumped in front of a metro train at McGill station. Ambulance notes state that witnesses reported that he was struck by the train. Patient was recovered from under the first carriage. At the scene, he was reported unresponsive but breathing spontaneously with a strong pulse; other events surrounding the accident remain unclear.

Trauma team present on patient's arrival. He had an oral airway and a cervical collar. On examination he had good bilateral air entry, with O<sub>2</sub> saturation at 97%; trachea was midline and there was no chest wall crepitus. Heart sounds were normal with no murmur. He had a #18 left brachial intravenous line. He was noted to have an open skull fracture. Right pupil was blown, left pupil sluggish. Glasgow coma scale was 3.

He was intubated at 00:42 with a #8 orotracheal tube, according to trauma protocol; paralyzed with 100 mg succinylcholine and administered 100 mg of lidocaine. Three more large-bore IVs were started.

For every patient who is admitted to an emergency medicine or trauma unit and does not survive, a discharge summary must be written, usually by the nurse in charge of the case. This summary is based on a real incident, but all identifying features have been removed, and some of the details have been changed. Discharge summaries use many abbreviations and incomplete sentences. I have had to change the language to make this summary even minimally comprehensible, but I have deliberately retained much of the technical language in the document.

Cefazolin 2 g and a 200 mg bolus of Propofol were also administered. Blood pressure remained stable, running at 140/80 in the ER. Neurosurgery present in the ER.

CAT scan of the head done in the ER showed multiple skull fractures with bilateral intraventricular bleeds, subarachnoid hemorrhage and hydrocephalus with a small left epidural hemorrhage. C-spine CAT scan showed a right lateral mass of C1 fracture, and a C4 pedical fracture. CAT scan of abdomen showed a left lung contusion. Pelvis was cleared by the radiology resident.

Patient was transferred to SICU [surgical intensive care unit] at 01:50, where he was hyperventilated; a mannitol drip was started. Neurosurgeons installed an ICP monitor which showed a pressure of <15 mm mercury. C3 transverse process fracture on CT also noted. 20 G right radial arterial line installed. Triple lumen left femoral line installed. Patient assessed by orthopedics. At 02:20 blood pressure began to drop and inotropes were started. At 03:00 temperature was 91°F (33°C), and he was noted to have right pupil at 6mm and left at 3mm and nonresponsive, with no corneals and no gag reflex. At 03:00 decision was made to warm patient to 94.5°F (35°C) and bring pCO<sub>2</sub> up to 40 mm Hg. At 03:00 a decision was made to stop all sedation and do an apnea test, if toxicology screen negative. If no spontaneous respirations at pCO<sub>2</sub> 60 mm Hg, and no brainstem reflexes present, then diagnosis of brain death would be confirmed, and so advisable to discontinue treatment.<sup>1</sup> At 06:00 exam showed right pupil 7 mm fixed and nonreactive, left pupil 4mm fixed and nonreactive. Tox screen negative for acetaminophen, salicylates, tricyclics; ethanol was 28. Ventilated assist-control 8 tidal volume 800. Nil acute on chest X ray. Still on Levophed drip to maintain BP. Hemoglobin 89. Diagnosis likely brain-dead; plan to do apnea test, maintain BP with Levophed, alert transplant team; social services to ID patient.

Social services saw patient, noted police report #47-99-134-98-093, contacted Constable Brown 330-9483.

At 18:00 no change in neuro exam, failed apnea test, no eye movements in caloric test, doll's eye test negative. Plan to repeat apnea test later. At 20:30 police came to claim patient's keys. At 23:00 patient identified by police as John Smith, born 14 April 1969, address, 1234

1. The absence of a breathing reflex in the presence of a high concentration of carbon dioxide in the blood, which would normally trigger breathing, can indicate lack of function in the brain stem. This condition is established by using the apnea test, one of a set of clinical tests used to establish brain death.

South St., phone 555-1234. Social services traced and contacted parents who came to ID patient at 04:30 on 16 Sept.

Seriousness of injuries explained to parents, but that patient not clinically dead at that time, but very close. Parents agreed that once apnea test was repeated and was positive they would consent to withdraw active treatment, including ventilator.<sup>2</sup> Parents informed that they would be approached about organ donation in the event that patient was confirmed brain-dead. Parents agreed to consider in that case. Québec Transplant notified of potential donor. Apnea test was repeated at 06:30 and was positive.  $\text{PCO}_2$  before 40, after 10 min  $\text{pCO}_2$  61. Parents present at declaration of brain death, met with transplant coordinator. Consented to donation. Transplant team notified.

2. In this case, the medical staff and parents agreed that the situation was so bad that there was no need to do a second apnea test. All recognized that there was no possibility of survival.

## THE PROCUREMENT

The pager on the bedside table goes off at 12:30 A.M. Jarred from a deep sleep, I stumble into the next room and dial the number displayed on the tiny screen. The transplant surgeon answers immediately from his car phone: "I'm ten minutes from the hospital, we'll be starting a procurement in about half an hour."

I drag on some clothes, stuff tennis shoes and thick socks in a bag, and call a taxi. During the fifteen-minute journey to the hospital I feel apprehensive about being an intruder into the efficient, sterile space of the operating room, in particular because it will be to observe not a lifesaving procedure, but the "harvesting" of human organs.

The cavernous hospital, overflowing with patients by day, is strangely quiet, the long corridors empty save for one man dozing fitfully across two upright chairs, perhaps waiting for news. The elevator takes me up to the surgical unit on the fifth floor, where I pass through double doors into a deserted reception area. Fortunately, this is not my first time as an observer in the OR, and I know where to find a set of "greens" into which I change. I pull on the thick socks and tennis shoes, essential for standing in one spot for three or four hours. Thus prepared, I go through a second set of double doors into a transition area, the busy assembly point for successive teams of surgeons during the day. Here I put on plastic hair and shoe covers before proceeding to room 12, the only one lit up and in use at this time of the night. I tie on a face mask before entering.

The OR is a place of intense activity: three nurses prepare the instruments, swabs, drapes, and other accoutrements; a transplant coordinator is on the telephone; one orderly departs after delivering the “patient,” while another prepares containers for the organs; a senior surgeon stands at the foot of the operating table. He chats with his two residents, both women, until the nurses are ready to clothe all three of them in sterile gowns. Two anesthesiologists confer among the monitors clustered at the head of the table. No one gives more than a brief glance at the body, connected to numerous tubes and lines extending to a battery of monitors, the diaphragm rising and falling to the rhythm of the artificial ventilator.

Preparations complete, the nurses turn to the patient and remove all the drapes, except for one covering the groin. They place the arms on supports at right angles to the body. The donor had recently painted her fingernails a bright red; now, in death, they appear incongruous. The nurses swab the entire torso with providone iodine to sterilize it before the surgeons make the long incision. The body is then draped again, leaving only the iodine-stained center of the torso exposed. The catheter, inserted to collect the urine that the donor’s kidneys will produce until the moment they are removed from the body, is carefully checked. Meanwhile, a waist-high barrier of drapes has been erected to separate the body of the donor, recumbent in the sterile area, from her head and neck, in the nonsterile domain of the anesthesiologists.

Using a scalpel, the surgical team makes a single long cut from just below the sternum to just above the pubis. With a cautery, the team works its way through the layer of fat beneath the skin and the abdominal musculature; then they use their gloved hands to expose the liver, lying deep in the right upper quadrant of the abdomen, beneath the ribs. The disquieting smell of burning flesh fills my nostrils as the cautery cuts and seals off small blood vessels to minimize bleeding into the abdominal cavity. Nevertheless I feel relatively little discomfort as I peer, along with the surgeons and nurses, into the body. Fascination and curiosity overcome feelings of horror or repulsion.

Her phone calls finished, the transplant coordinator can now relax a little. She has made all the necessary arrangements for delivery of the kidneys to other hospitals to which prospective recipients, already alerted by their pagers that the “gift of life” is on its way at last, will be admitted as quickly as possible. Preliminary tests have revealed that the

heart is not in good condition, and so it will not be used.<sup>1</sup> The liver will be transplanted immediately into another patient, already undergoing preliminary sedation in another room of this hospital.

The coordinator was formerly a nurse, and she tells me enthusiastically how much she likes her present work, despite the inconvenient hours. She says that the donor lying in front of us had gone that morning to her bank, where she had suddenly collapsed, never to regain consciousness. Rushed by ambulance to the nearest hospital while attendants pumped air manually into her lungs, she was then intubated: that is, tubes were inserted through her mouth into her trachea, to which a mechanical ventilator was then attached. The staff in the emergency room had struggled to stabilize the patient; warmed fluids were forced into her veins to maintain her blood pressure, but it was clear from the outset that something was terribly wrong. A CAT scan revealed that a massive hemorrhage had virtually destroyed her entire forebrain, indicating that nothing further could be done to save her life.

The possibility that this patient could be an organ donor was now uppermost in the hospital staff's minds. The various electrodes, tubes, catheters and lines monitoring and administering medication were kept in place in the body while two neurologists were summoned. As it was late morning, they were on hand in the hospital, and they came independently to an opinion that the patient met the criteria for brain death. A little later she was unhooked briefly from the ventilator, and the apnea test was applied to see whether spontaneous breathing would start, but after a few minutes, when there was no response, the ventilator was reconnected. The same neurological tests were repeated six hours later, as is commonly recommended when establishing brain death, and the diagnosis was confirmed. The death certificate was signed. By this time it was known that the patient had signed her donor card and that her next of kin supported donation.

With the patient legally dead, care of the organs, rather than of the person, became the dominant concern. The donor was transferred from the suburban hospital to the tertiary care hospital in the city center for

1. The heart is tested with an echocardiogram before the patient is taken out of the intensive care unit where brain death is declared. In many parts of North America, provided that the organ is in good condition, hearts are procured from donors up to sixty-five years of age. In some locations, fifty-five or sixty is regarded as the upper age limit. For the liver there is no upper age limit; for kidneys some centers have an age limit, but others prefer to judge by the condition of the kidney once it is removed from the donor.

the organs to be procured, but the body had to be kept stable and at an appropriate temperature during this journey.<sup>2</sup> Ventilation was continued manually, the tubes and lines kept in place so that medication could be administered, and the heart rate and blood pressure were monitored continuously. It was essential that the organs, precious commodities, remain in good condition.

Now, in the operating room, the liver is exposed, but on seeing it the surgeon lets out an expletive. He asks someone to call a pathologist to determine whether the spots on its surface are due to cirrhosis, in which case the liver will be of no use. "She only drank a little, did you say?" Turning to the transplant coordinator, the surgeon frowns behind his mask. "Looks like more than a little to me." The team continues with the meticulous, tedious work of removing the hepatic artery and portal veins attached to the liver, noting as they do so certain deviations from "normal" anatomy—which, they tell me, are not uncommon.

During this part of the procedure, I stand near the anesthesiologist, just behind the donor's head, and peer over the mind/body barrier formed by the drapes. In stark contrast to the half-hidden, pale, lifeless face of the brain-dead person, the interior of the body is colorful and alive. The diaphragm, untouched by the surgeons, rises and falls as air is delivered to the lungs from the ventilator. Beneath the diaphragm, the continued activity of the heart is clear: blood courses through the vessels, and the liver has the burgundy hue of health, so that even the offending spots are no longer visible. From inside the massive incision, held apart by powerful retractors, a bright melee of colors spills forth: yellow, orange, red, cream, beige, white. The surgeons handle the omentum and the intestines with familiarity and move them deftly to expose the critical vessels and the bile duct, which are clamped and tied off one by one.

The pathologist arrives thirty minutes later and takes a small liver biopsy for microscopic examination. The surgeons continue working in rapt concentration, heartened by the good color of the liver. The pathologist returns about twenty minutes later to declare that there is no evidence of cirrhosis or any other pathology. After further careful dissection and perfusion of the liver to preserve its condition, the blood

2. Transplant teams usually travel to the hospitals where brain-dead patients have been identified to procure the organs. Sometimes this involves dramatic, hastily arranged helicopter and small plane flights. On other occasions, especially within a city, donors are transferred from small centers to tertiary-care hospitals to ease the job of the transplant surgeon, particularly if he or she is already occupied with another case.

vessels all neatly tied off, the liver is snipped free from the still-breathing body with several centimeters of each blood vessel left intact.

The senior surgeon leaves the donor to the care of his residents and carries the liver to a bowl filled with ice and perfusion liquid at the side of the room. Here he conducts further, minute dissection of the blood vessels. This painstaking work is designed to ensure success several hours later, when he will be suturing the blood vessels to corresponding vessels in the recipient. The gall bladder, intimately associated with the liver, is delicately separated, black bile flowing out when it is deliberately punctured. The liver is then placed carefully into a large plastic bag with ice and liquid and placed in cold storage until it is transplanted into the recipient, a few hours later, by the same surgical team.

The residents meanwhile turn their attention to the kidneys. Here they systematically expose and isolate the blood vessels and the ureter, first on one side and then the other, while the senior surgeon rejoins them at intervals and praises their progress. The kidneys are removed as a pair, then separated and made ready for donation in the waiting bowls; this will be the end of their partnership, for they will go to two different recipients. Right and left kidneys, carefully distinguished, in turn will shortly be placed in plastic bags, put into containers, and handed over at the door of the OR to a driver who will transport them to other hospitals. One or two small pieces of spleen are taken as backup for cross-matching of blood and tissue, in case some accident should befall the blood samples already stored in tubes. At this point, the delicate and technical part of their work just about complete, people relax and start to talk—all except the senior surgeon, who remains apart, meticulously preparing the kidneys for donation. Watching the delicacy with which the surgeon handles the kidneys and the way an arriving surgeon goes straight over to admire these newly procured, mulberry-colored organs glistening with health, I am reminded that throughout this entire process it has been the organs, and not the donor, on which everyone has been concentrating. The donor is merely a container that must be handled with care.

The patient's family had reported that the donor smoked a pack of cigarettes a day. The procurement just about complete, it is decided to separate the sternum and take a look at the effects of this habit on the lungs and heart. The beating heart is enclosed in a layer of protective yellowy fat. Its rhythmic throbbing seems mechanical as it continues to labor, exposed, amid the lungs, which are blackened from the years of tobacco use.



The ventilator is then turned off, followed by the monitors that have kept track of heart rate and blood pressure throughout. The anesthesiologists leave the room, the first part of their night's work complete. Breathing ceases, and the heart too gradually ceases to function, finally transforming the body into a cadaver. One of the residents sets to work returning the intestines neatly to the body cavity, which is carefully sewn together with large sutures, topped off by a long strip of surgical tape. The surgical drapes are removed and replaced by a single sheet covering the cadaver to its neck. Now that the head is clearly exposed again, and the body discreetly covered, my eyes are drawn to the strips of tape placed over the eyes some hours ago, before the donor left the ICU, to keep the corneas moist. An ophthalmic surgeon is expected at any moment to remove them for donation, and I find myself repelled by this last intrusion in a way that I had not expected. For me, it seems, removal of the eyes represents more of a violation than does procurement of internal organs. More likely it is simply that the tension in the room has entirely dissipated, and now that people are leaving, stripping off their surgical gear as they go, I am permitted to reflect on the enormity of what is, to them, a routine procedure. The procurement complete, the cadaver is wheeled out of the OR and thence to the hospital morgue, eighteen hours after the incident in the bank and eight hours after brain death was confirmed.