SMART ORGAN PROCUREMENT SYSTEM

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ABSTRACT

Organ Transplantation is a lifesaving treatment for many forms of solid organ failure. Timely organ transplantation is one of the most challenging and complex areas of modern medicine. Wireless sensor-based systems, microcontrollers, healthcare-specific gateways and cloud-based servers can contribute a vital role in making a timely transplantation. This can help to increase the utilization of available healthy organs from the pool that are presently going unused. Internet of Things driven systems can help in well-timed transplantation particularly for organs like kidney and liver which has only few hours of preservation time. This paper propose an IOT based organ procurement and distribution system which can bring remarkable improvement in timely procurement, accurate serotyping, and resolving ethical, legal and clinical issues. It also helps to attain a healthy patient graft survival.

Keyword: - *Cloud-servers, HLA matching algorithm, Internet of Things, Organ Procurement, Organ Transplantation,Trac-Control.*

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1. INTRODUCTION

Transplants are one of the most miraculous achievements of modern medicine whereas transplantation is one of the most challenging and complex areas of modern medicine. Organ transplantation is the process of surgically transferring a donated organ into a patient with end-stage organ failure. The number of patients waiting for organ transplantation in United States alone has surpassed 123,175. Every hour adds at least six patients in to the organ waiting list. At present, out of the 1,50,000 patients requiring kidney transplants across India, only 200 get kidneys by way of donations from the deceased. In order to achieve a successful transplantation and improve the utilization of the available organ, it is important to reduce the time taken from the retrieval of the organ and transplantation of the same. The organ which is donated will be viable for transplantation only for few hours. This time vary from 4 to 24 hours based on the organ type. This is especially true for organs like kidney, heart and liver, which has only few hours of preservation time. A significant amount of time is taken by many of the pre and post procurement procedures like the serotyping of the donor and the recipient, assessment of the organ, estimation of transplant candidates immunological risk by the physician, transplant transportation and other bioethical and legal issues regarding the transplantation. Tracking of the organ during the transportation of the organ can be monitored and controlled by IoT based system. The emergence of Internet of Things equipped with sensors can transmit concurrent data related with this towards a single repository in the cloud server. The details of the registered patients along with the real time health data from a variety of sensors can be stored in cloud-based servers. These servers eventually can be used to analyze the data using various matching techniques and complex algorithms for a more specific, flexible and robust mean of high resolution HLA typing and serotyping. These analyzed data is then shared through wireless connectivity with medical professionals who can make appropriate decisions. RFID based ambulance system that are fitted with GPS capabilities alongside various other sensors can relay data about the vehicle?s location and current progress which can be used for the transportation of the organs without any delay. Efficiency of such an IoT based system heavily depends on the algorithms which correlate and analyze the collected data through IoT sensors and clinical information system.

2. LITRATURE SURVEY

Evolution of the Lymphoid System - Leukocytes from the various lymphoid tissues of rainbow trout (RBT) were tested for their capacity to respond to the lymphocyte mitogens concanavalin A (Con A), lipopolysaccharide (LPS), and purified protein derivative of tuberculin (PPD). Thymocytes responded to Con A but not to LPS or PPD. In contrast, leukocytes from anterior kidney were stimulated with LPS but not with Con A or PPD. Cells from spleen and peripheral blood were stimulated by each mitogen. How-ever, the degree of stimulation at optimally stimulatory concentrations of each mitogen was distinctive. The finding that the patterns of mitogenic responses of cells from each tissue were significantly different suggested that there is lymphoid heterogeneity in the RBT with a unique tissue distribution. Particle size-dependent organ distribution of gold nanoparticles after intravenous administration A kinetic study was performed to determine the inuence of particle size on the in vivo tissue distribution of spherical-shaped gold nanoparticles in the rat. Gold nanoparticles were chosen as model substances as they are used in several medical applications. In addition, the detection of the presence of gold is feasible with no background levels in the body in the normal situation. Rats were intravenously injected in the tail vein with gold nanoparticles with a diameter of 10, 50, 100 and 250 nm, respectively. After 24 h, the rats were sacrificed and blood and various organs were collected for gold determination. The presence of gold was measured quantitatively with inductively coupled plasma mass spectrometry (ICP-MS). For all gold nanoparticle sizes the majority of the gold was demonstrated to be present in liver and spleen. A clear difference was observed between the distribution of the 10 nm particles and the larger particles. The 10 nm particles were present in various organ systems including blood, liver, spleen, kidney, testis, thymus, heart, lung and brain, whereas the larger particles were only detected in blood, liver and spleen.

The results demonstrate that tissue distribution of gold nanoparticles is size-dependent with the smallest 10 nm nanoparticles showing the most widespread organ distribution. Multi-organ distribution of phosphorylated ?-synuclein histopathology in subjects with Lewy body disorders - A sensitive immunohistochemical method for phosphorylated ?synuclein was used to stain sets of sections of spinal cord and tissue from 41 different sites in the bodies of 92 subjects, including 23 normal elderly, 7 with incidental Lewy body disease (ILBD), 17 with Parkinson?s disease (PD), 9 with dementia with Lewy bodies (DLB), 19 with Alzheimer?s disease with Lewy bodies (ADLB) and 17 with Alzheimer?s disease with no Lewy bodies (ADNLB). The relative densities and frequencies of occurrence of phosphorylated ?-synuclein histopathology (PASH) were tabulated and correlated with diagnostic category. The greatest densities and frequencies of PASH occurred in the spinal cord, followed by the paraspinal sympathetic ganglia, the vagus nerve, the gastrointestinal tract and endocrine organs. The frequency of PASH within other organs and tissue types was much lower. Spinal cord and peripheral PASH was most common in subjects with PD and DLB, where it appears likely that it is universally widespread. Subjects with ILBD had lesser densities of PASH within all regions, but had frequent involvement of the spinal cord and paraspinal sympathetic ganglia, with less-frequent involvement of end-organs. Subjects with ADLB had infrequent involvement of the spinal cord and paraspinal sympathetic ganglia with rare involvement of end-organs. Within the gastrointestinal tract, there was a rostrocaudal gradient of decreasing PASH frequency and density, with the lower esophagus and submandibular gland having the greatest involvement and the colon and rectum the lowest. Organ and Isotype Distribution of Plasma Cells Producing Specific Antibody after Oral Immunization: Evidence for A Generalized Secretory Immune System - Mice were induced to produce IgA antibodies against ferritin after oral immunization. Such antibodies were detected by immunouorescence in plasma cells in the intestinal mucosa as well as in secretory sites located elsewhere, such as the lactating mammary gland, salivary gland, and respiratory tract. The observation suggested that cells immunized locally via the gut could home to distant secretory sites. To confirm this hypothesis, lymphocyte transfer studies were done with mesenteric node (MN) versus peripheral node (PN) cells from orally immunized donors into nonimmunized recipients. IgA anti-ferritin cells from MN homed to exocrine targets, whereas IgM and IgG anti-ferritin cells homed to PN.

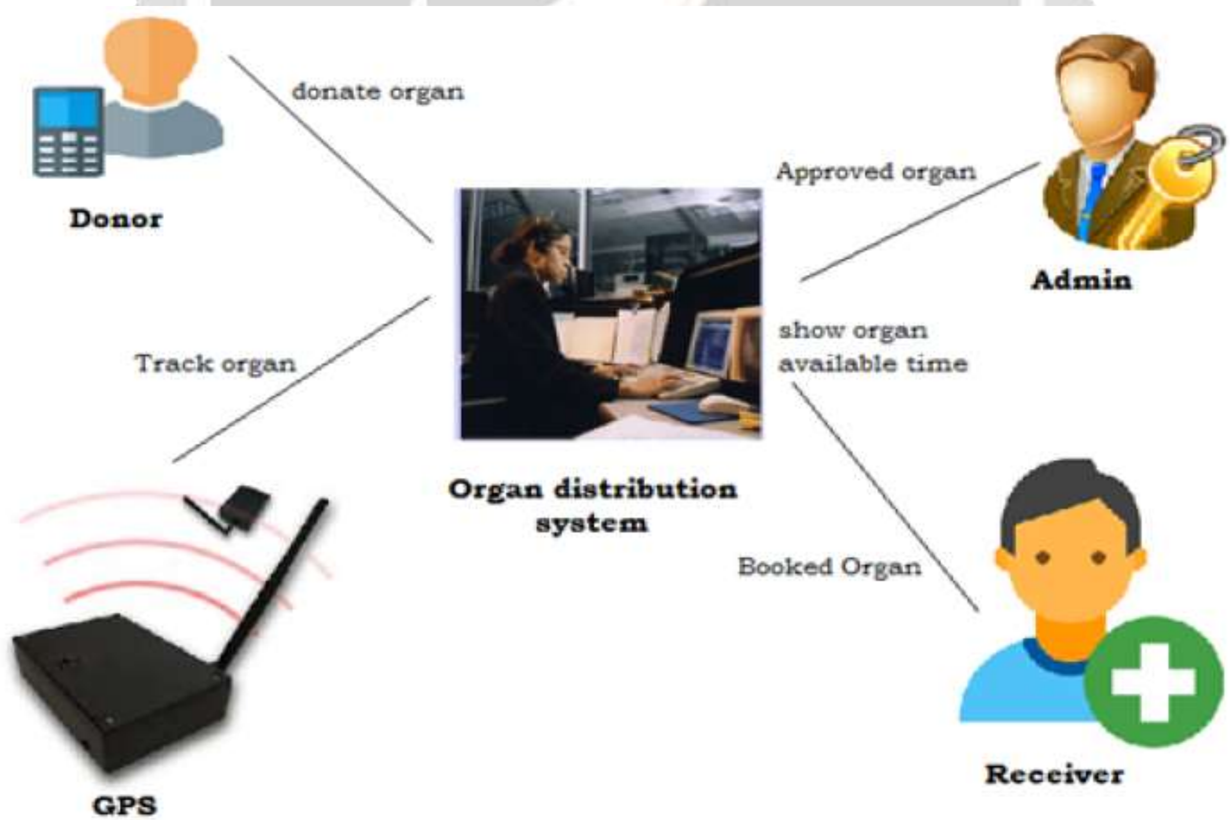
3. PROPOSED SYSTEM

3.1 Proposal for an opt-out system

We think that in order to set up a proper opt-out system, certain conditions must be met. First of all, it should be decided whether the system will be soft, which requires the relatives? consent, or hard, which considers only the existence of refusal by the person. After that, widespread public education and information campaigns should be carried out so that people would be sufficiently informed when making their choices. Another aim of this activity is to soften the possible social reactions by correcting misunderstandings and establishing a sincere communication. Education must be given continuously and reach every individual of the society; educational activities in that scale are only possible with widespread and specifically organised institutions such as healthcare centres. Its campaigns should be carried out as a part of public education which is a part of primary healthcare services.Besides, accessible and effective mechanisms should be established to ensure that all individuals can register their objections easily. Internet, health centres,and post offices can be used to that aim. As Watson has stated, a good program should provide putative donors a reasonable amount of time to opt-out of the system after being informed about the process and everything involved with it.31 On the health- care system side, it should be ensured that the information about individuals? Donation wishes is stored in easily accessible medium by the healthcare workers and managers.

A legal framework is important, but seems not enough.The evidence from Spain has shown that other measures are needed for the organ procurement system to be successful.32 Educating the healthcare workers to ensure that relatives are treated appropriately and sensitively, and that they are familiar with the arrangement of organ donation, is necessary. Appropriate infrastructure and resources should be arranged in order to operate the system properly. And as Quigley has stated, some of these measures can be put into place without altering current laws.33 In a soft system, which we propose as an option only for a certain transition period, relatives of a deceased individual would be told that the individual had not opted-out of donation and that his/her organs will be harvested, unless they object ? either because these relatives know that the deceased individual had later objected to donation or because the donation would cause these relatives major distress.34 This practice can be seen as contradictory, especially in the light of information of relatives? refusal rate can be really high; in 2007, 319 of 563 (56.7percent of) families refused to donate their deceased relative?s organs in Turkey. Nevertheless, it may be regarded as a safeguard that aims to decrease possible lack of confidence issues.

4.SYSTEM ARCHITECTURE DIAGRAM



5. CONCLUSIONS

The proposed framework is capable of providing its customizable list of recipients based on multiple possible optimization factors such as HLA matching, waiting time, medical status and distance. The dynamic management scheme operates in real time and emulates the judgment made by the transplant team. This system aims at saving a large amount of man-hours caused during registration, organ allotment, organ procurement, organ transportation and organ transplant which can save lives. It is able to manage priority emergency tag patients. As an enhancement to the proposed system, the cloud- based database can be utilized for storing the details of the life cells extracted from the umbilical code and the placenta of the new born baby which otherwise goes unused. Huge investment is required for the preservation and storage of the cells for life long. As soon as the life cells are procured, it should be matched with the existing recipients who have registered and should be efficiently utilized for saving the life of patients suffering blood cancer

6. ACKNOWLEDGEMENT

It is a great pleasure to acknowledge those who extended their support, and contributed time and psychic energy for this project work. At the outset, I would like to thank my project guide Ms. P.S.Tambe and Head of Computer Engineering Department Mr. K. N. Shedge, who served as sounding board for both contents and programming work. Her valuable and skillful guidance, assessment and suggestions from time to time improved the quality of work in all respects. I would like to take this opportunity to express my deep sense of gratitude towards him, for her invaluable contribution in this project without which my work would not have been completed.I am also thankful to the all staff members of Computer Engineering Department and Librarian, SVIT Chincholi, Nasik. Also I would like to thank my colleagues and friends who helped me directly and indirectly to this Project. Lastly my special thanks to my family members for their support and cooperation during this Project work.

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