

Is the Human Organ Transplant Act (HOTA) to Blame? Addressing Our Organ Shortage from a Public Policy Perspective

Christopher WY Liu,¹ *MBBS, MMED (Anaes.)*, Vui Kian Ho,¹ *MBBS, MMED (Anaes.)*, Jean CJ Liu,^{2,3} *PhD*

In 1906, Jaboulay performed the first transplant surgery in the history of mankind. He transplanted a goat and porcine kidney into 2 different patients, who unfortunately did not survive.¹ Later in 1952, John Merrill, Joseph Murray and Hartwell Harrison performed the first successful kidney transplant at the Brigham Hospital in Boston, United States.² Since then, transplant medicine has progressed significantly and is now recognised as a life-saving and cost-efficient treatment for patients.

Despite the availability of transplant teams and technology, the main barrier to accessing this life-saving treatment is the scarcity of organs worldwide. To increase the rates of cadaveric organ procurement, a presumed consent system was adopted in Singapore through the legislation of the Human Organ Transplant Act (HOTA) in 1987.³ Under this policy, Singaporeans and permanent residents are organ donors unless they opt-out (by registering their objection with the National Organ Transplant Unit).⁴ Despite the adoption of this system, Singapore has not achieved the expected increase in the number of actualised organ donors. In 2013, the national cadaveric transplant rates for kidney, liver and heart were 7.97 per million of population (pmp), 3.52 pmp and 0.74 pmp, respectively.⁵ These figures pale in comparison to countries like Croatia that boast national cadaveric transplant rates of 48.4 pmp for kidneys and 32.3 pmp for livers.⁶

A logical question that follows is whether our low donation rate stems from of a lower number of brain deaths. We assume that with better car safety technology, improved legislation (e.g. ban on mobile phone usage while driving and mandatory seat belt laws) and a lower traffic speed, there would be a low number of traffic-related deaths, a correspondingly low incidence of brain death and hence, fewer organ donors. Indeed, based on data from the Singapore Department of Statistics, there was a 25% decline in the absolute number of traffic-related deaths between 1987 and 2016, despite an increase in the total population

of the country.⁷ The traffic death rate in Singapore now stands at 3.6 per 100,000. Although this rate is low, some countries that have a high donation rate (e.g., Spain and Croatia) have similarly low traffic accident rates (3.6 and 9.2 per 100,000, respectively).⁸ Taken together, we believe that there is potential for an increase in the number of organs that can be retrieved.

Is Mandated Consent a Silver Bullet for Singapore?

In response to the shortage of transplantable organs, both the public and parliamentarians have asked the government to consider a mandated consent over a presumed consent policy.^{9,10} To provide a background for readers not familiar with these terms, there are 3 types of consent policies that countries adopt with respect to organ donation: explicit, presumed and mandated consent. For explicit consent, a person is an organ donor only if he/she voluntarily goes to an agency and signs up for it; for presumed consent, all residents are donors unless they have explicitly opted-out; and for mandated consent, all residents are required to state their organ donation preference without a default being shown (this is carried out during common tasks such as driver license renewals or income tax filing).¹¹ In Singapore, the presumed consent policy has been in force since HOTA was first enacted in 1987.³

The call to consider mandated consent in Singapore is not without basis. Even with a hard opt-out system (where families cannot decide against organ donation when a patient has been declared brain dead), there are ways that families have circumvented donation.¹² For example, families can end life support for their relatives before brain death is even certified.¹² This decision is sometimes carried out because family members have little knowledge of the deceased relative's views on organ donation; consequently, they act conservatively and are less willing to accept organ donation for relatives than they are for themselves.¹³ In such cases, a mandated consent system could reduce the premature

¹Department of Anaesthesiology, Singapore General Hospital, Singapore

²Division of Social Sciences, Yale-NUS College, Singapore

³Neuroscience and Behavioral Disorders Programme, Duke-NUS Medical School, Singapore

Address for Correspondence: Dr Jean Liu, 16 College Ave West #02-221, Singapore 138527. Dr Christopher Liu, Department of Anaesthesiology, Singapore General Hospital, Outram Road, Singapore 169608.

Email: jeanliu@yale-nus.edu.sg, christopher.liu.w.y@singhealth.com.sg

termination of life support. If all residents were made to state their organ donation preferences explicitly, there would be no ambiguity about what the deceased patient desires, resulting in a higher rate of donor actualisation. The switch to mandated consent seems even more attractive because it appears to come without costs. In a seminal publication, Johnson and Goldstein reported that: 1) both presumed and mandated consent increased the number of organ donors compared to explicit consent; and 2) no significant difference was observed in consent rates between presumed and mandated consent policies.⁴

Although mandated consent appears promising, we suggest that it may not be Singapore's magic bullet. First, we know of no country that has changed its policy from presumed to mandated consent; any such move would need to be taken very cautiously. Second, and perhaps more importantly, we recently published the first local study comparing organ donation rates as a function of policy type.¹⁴ In a group of 157 university students, we examined willingness to enlist as organ donors when presented with either an explicit, mandated or presumed consent policy. In stark contrast to the findings of Johnson and Goldstein, our findings suggested that switching to a mandated consent policy could potentially decrease the pool of donors in Singapore (with 79.85% of students donating if a mandated consent policy was in place, compared to 92% under a presumed consent policy).

Beyond Mandated Consent: The Need for a Holistic Approach

Moving beyond policy types, it is important to recognise that donation rates vary significantly even amongst countries with a presumed consent policy. Croatia is an interesting case in point. In 1988, Croatia adopted a presumed consent policy for organ donation. Like Singapore today, this policy did not yield the expected increase in organ donation and by the year 2000, the donation rate in Croatia was a mere 2.7 pmp. Since then, however, Croatia has developed its transplant programme by adopting a multipronged approach. The measures they adopted included appointing hospital transplant coordinators, establishing 24-hour duty desks, adopting new legislation, developing a new financial model, organising public awareness campaigns and starting a donor assurance programme.¹⁵ These measures yielded great dividends and by 2014, the donation rate had increased thirteenfold to 35 pmp⁶ – one of the highest in the world (Fig. 1).

The case of Croatia suggests that Singapore's presumed consent policy may not be a key reason for her low organ donation rate. Instead of abandoning presumed consent, we should direct our efforts at improving the transplant

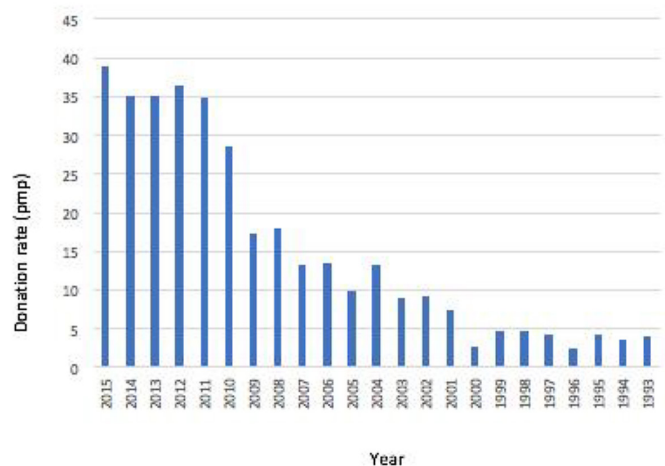


Fig. 1. Deceased donor rates in Croatia from 1993 to 2015 (International Registry in Organ Donation and Transplantation).

infrastructure and workflow, aiming at increasing referral rates, improving donor management, decreasing family objection and improving public perception of the programme.

Additionally, as part of a holistic approach, it is notable that HOTA only covers Singapore citizens and permanent residents. This represents a missed opportunity, as 3 out of 10 people who reside in Singapore are foreigners on long-term passes.¹⁶ Currently, foreigners can become organ donors only if they have explicitly consented under the Medical (Therapy, Education and Research) Act. The inclusion of foreigners in HOTA's presumed consent scheme or an alternate mandated consent scheme could significantly increase the nation's donation rates, a move that has been implemented in countries with both presumed consent (e.g., Spain, Portugal) and mandated consent policies (e.g., Canada).¹⁷

As a further avenue for growth, donation after cardiac death (DCD) programmes have gained traction worldwide and could be pursued within Singapore. Although the majority of organ transplants arise from living-related donors and donation after brainstem death (DBD),¹⁷ the first kidney transplant programmes involved donors who had sustained circulatory death.¹⁸ Compared to DBD, organs harvested from DCD sustain a longer warm ischaemia time and are therefore, of inferior quality and more prone to failure.^{19,20} However, this is partially mitigated through the use of extracorporeal membrane oxygenators in controlled DCD, such that DCD is increasingly being explored to address organ shortage. Indeed, in 2016, DCD represented nearly half of all deceased organ donors in the United

Kingdom (UK).²¹ This statistic suggests that a similar DCD programme could increase the total yield of organ donations in Singapore, although mounting such a programme will likely require not only technical expertise but also debates in Parliament to overcome the ethical, professional and legislative challenges that UK has faced.

Conclusion

Our transplant policies have come a long way since we performed our first kidney transplant in 1970. The introduction of the Medical (Therapy, Education and Research) Act and HOTA have resulted in significant increases in donor rates, and many patients with failing kidneys, livers and hearts have benefitted from organ transplantation. Until xenografts and artificial organs become a reality, patients on the transplant waitlist will continue to die unless organs can be found. To optimise the number of organs harvested, public policies need to be continually modified. We need to enhance our infrastructure and workflow to improve organ donation rates, supported by research (e.g., feasibility of financial reimbursement models, cultural barriers) to inform us about the direction of future public policies.

REFERENCES

- Morris PJ. Transplantation – a medical miracle of the 20th century. *N Engl J Med* 2004;351:2678-80.
- Merrill JP, Murray JE, Harrison JH, Guild WR. Successful homotransplantation of the human kidney between identical twins. *J Am Med Assoc* 1956;160:277-82.
- Ministry of Health, Singapore. Human Organ Transplant Act. Available at: https://www.moh.gov.sg/content/moh_web/home/legislation/legislation_and_guidelines/human_organ_transplantact.html. Accessed on 8 February 2017.
- Johnson EJ, Goldstein D. Medicine. Do defaults save lives? *Science* 2003;302:1338-9.
- International Registry in Organ Donation and Transplantation Database (Singapore). IRODaT 2013. Available at: http://www.irodat.org/?p=database&c=_S - data. Accessed on 8 February 2017.
- International Registry in Organ Donation and Transplantation (Croatia). IRODaT 2014. Available at: http://www.irodat.org/?p=database&c=_S - data. Accessed on 8 February 2017.
- Singapore Department of Statistics. M651281 – Road Traffic Accident Casualties, Annual. Available at: <http://www.tablebuilder.singstat.gov.sg/publicfacing/createDataTable.action?refId=5513>. Accessed on 10 February 2017.
- World Health Organization. Road traffic accidents. Data by country. Available at: <http://apps.who.int/gho/data/node.main.A997>. Accessed on 10 February 2017.
- Ministry of Health, Singapore. Increasing Singapore's Organ Transplant Rate. Available at: https://www.moh.gov.sg/content/moh_web/home/pressRoom/Parliamentary_QA/2016/increasing-singapore-s-organ-transplant-rate.html. Accessed on 8 February 2017.
- The Straits Times. Organ donation: consider mandated consent. 25 May 2016. Available at: <http://www.straitstimes.com/opinion/organ-donation-consider-mandated-consent>. Accessed on 8 February 2017.
- No authors listed. Strategies for cadaveric organ procurement. Mandated choice and presumed consent. Council on Ethical and Judicial Affairs, American Medical Association. *JAMA* 1994;272:809-12.
- Kwek TK, Lew TW, Tan HL, Kong S. The transplantable organ shortage in Singapore: has implementation of presumed consent to organ donation made a difference? *Ann Acad Med Singapore* 2009;38:346-8.
- Sanner M. A comparison of public attitudes toward autopsy, organ donation, and anatomic dissection. A Swedish survey. *JAMA* 1994;271:284-8.
- Liu CW, Lai CKY, Lu BZ, Thangavelautham S, Ho VK, Liu JCY. A comparison of mandated, presumed, and explicit consent systems for deceased organ donation among university students in Singapore. *Ann Acad Med Singapore*. In press.
- Zivicic-Cosic S, Busic M, Zupan Z, Pelcic G, Anusic Juricic M, Jurcic Z, et al. Development of the Croatian model of organ donation and transplantation. *Croat Med J* 2013;54:65-70.
- Population.sg. Who is in our population 2017? Available at: <https://population.sg/articles/who-is-in-our-population>. Accessed on 25 June 2017.
- Rudge C, Matesanz R, Delmonico FL, Chapman J. International practices of organ donation. *Br J Anaesth* 2012;108 Suppl 1:i48-55.
- Manara AR, Murphy PG, O'Callaghan G. Donation after circulatory death. *Br J Anaesth* 2012;108 Suppl 1:i108-21.
- Weber M, Dindo D, Demartines N, Ambühl PM, Clavien PA. Kidney transplantation from donors without a heartbeat. *N Engl J Med* 2002;347:248-55.
- Chan EY, Olson LC, Kisthard JA, Perkins JD, Baktavatsalam R, Halldorson JB, et al. Ischemic cholangiopathy following liver transplantation from donation after cardiac death donors. *Liver Transpl* 2008;14:604-10.
- Organ Donation and Transplant. Donation after circulatory death. Available at: <http://www.odt.nhs.uk/donation/deceased-donation/donation-after-circulatory-death/>. Accessed on 22 June 2017.