

From MOSS to MyKAS: Improving Kidney Allocation System in Malaysia

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On behalf of the MyKAS Committee

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Background

Reorganisation and streamlining of the policy and procedure to allocate the kidneys donated by deceased organ donors in Malaysia was initiated by a group of nephrologists in the Ministry of Health in the mid-1990s in anticipation of increased organ donation from deceased donors in the future. This was aimed at having an objective and a fair organ allocation system, improved efficiency of the process to identify the best potential recipient who might have the best patient and allograft survival outcome. Rather than selecting a potential recipient at random and ad hoc basis, a waiting list was created to include relatively healthier and younger patients who will be called and offered a transplant when kidneys donated by the deceased donors become available. The listing was initially confined to patients on dialysis treatment in the Ministry of Health dialysis units.

Rather than limiting the list of potential recipients only to those on dialysis in Hospital Kuala Lumpur and nearby, a suggestion was made to include other patients outside Klang Valley. The need for a national list became more pressing as deceased donors started to come from public hospitals and occasionally private hospitals. These developments eventually gave rise to the formation of a national cadaveric kidney transplant waiting list registry based in Hospital Kuala Lumpur in 1996. This was implemented to ensure a fair and equitable allocation of the kidneys donated by deceased organ donors. As the human leucocyte antigen (HLA) tissue typing test was not routinely performed on the listed potential recipients and on the deceased organ donors, previous kidney allocation system was, and until Dec 2019, based on the length of the waiting period of each patient after starting dialysis treatment according to various blood groups.

In 1998, the **Malaysian Organ Sharing System (MOSS)** was established by the Malaysian Society of Nephrology (MSN) to provide a standardised list of patients waiting for a deceased donor kidney transplant. It was opened to all suitable and willing patients on dialysis treatment (haemodialysis and peritoneal dialysis) regardless of whether they are in the non-governmental organisation (NGO), private or public dialysis units. [1]

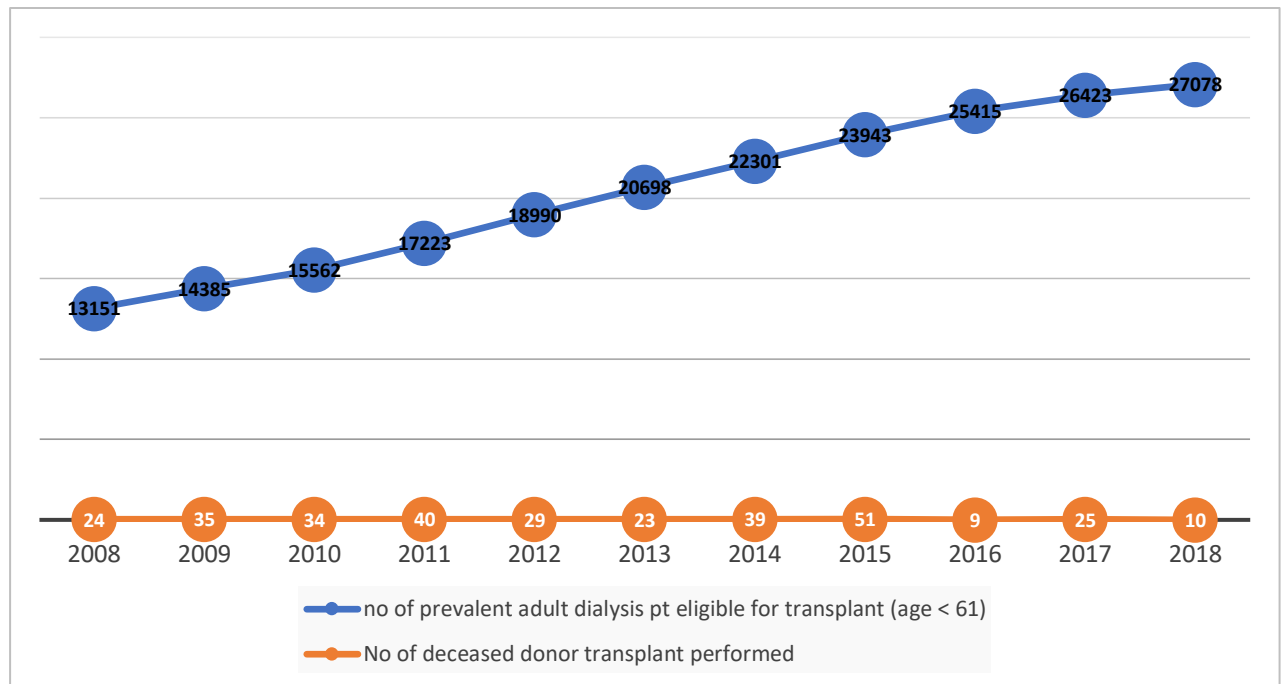
On 1st September 2006, an electronic version of MOSS, called **e-MOSS** was officially launched by the then Deputy Minister of Health, Dato' Dr Abd Latif Ahmad in Grand Seasons Hotel, Kuala Lumpur. The system which listed patients according to their blood group and states of residence, enabled all registered nephrologists nationwide to access the list of patients under their care and update their health status from time to time. The rank and position of each patient in the list were auto-generated, based on the calculated duration of dialysis treatment entered into the national dialysis database (National Renal Registry) at the time of the initial notification to the Registry. [2]

Subsequently, a reference to the need for a transplant waiting list became official with the publication of the **National Organ, Tissue and Cell Transplantation Policy** (Medical Development Division, Ministry of Health [MOH] Malaysia) in 2007. It described the need for a system of organ allocation under the section of Organisation of National Transplantation Programme. Section 4.7 of the Policy described the responsibilities of the National Transplantation Unit (MOH) which include the establishment of a system for organ and tissue allocation and National Transplantation Waiting Lists for potential organ and tissue recipients (4.7.3). Additionally, a separate section (Section 7) on 'Organ and Tissue Allocation and Transplantation Waiting List' describe in detail the need, function, policy, procedure and standard of the National Transplantation Waiting List. Section 7.2.1 specifically states that 'All potential transplantation recipients shall be listed in the National Transplantation Waiting List', while section 7.4.1 dealt with the criteria for organ allocation. [3]

Until today, the country is still struggling to increase the number of kidney transplantation due to poor organ donation rate especially from deceased donors. To make matters worse, the list of patients waiting for a kidney transplant increased exponentially after the introduction of the national waiting list which draw eligible subjects on dialysis from the National Renal Registry database. The system of allocating the scarce kidneys to those highest in the list simply just because they are the longest on dialysis treatment, is fraught with danger to the potential recipients (who tended to acquire high cardiovascular risk burden with increased dialysis vintage) and high probability of allograft failure. The expected poor allograft and patient outcomes will result in an unjustified wastage of expensive and extremely limited resources.

Meanwhile, the prevalence of end stage renal disease (ESRD) patient continues to increase over the years in Malaysia with 43,804 on dialysis at 31st Dec 2018. Out of these, 27,078 patients are eligible and waiting for a kidney transplant. However, the number of deceased donor kidney transplant performed in Malaysia annually remains small which created a huge gap in demand and supply (Figure 1).

Figure 1: The demand and supply gap of deceased donor kidney transplant in Malaysia



The existing deceased donor kidney allocation system was based on a point system adopted by other countries which include the United Kingdom (UK), Australia and the United States of America (USA). The MOSS criteria and the scoring system are as indicated in table 1. Due to logistics, human resource & financial reasons, it is impossible to have HLA & panel reactive antibody (PRA) tested for all patients in the waiting list especially when the transplant rate is extremely low. It is also difficult to test for HLA of the deceased donor prior to transplant. Therefore, HLA matching and PRA score has not been used for kidney allocation in Malaysia.

Table 1: MOSS Criteria and Scoring System

Criteria	Scoring System
HLA matching	12 points 2 points for every HLA match
PRA	10 points 1 point for every 10%
Waiting time	20 points 1 st get 20 points, last have 0 points
Logistic scores	6 points - when applicable (prolonged cold ischaemic time)
Age of patient	Organs from DD < 18 years allocated to recipient < 18 years

DD, deceased donor; HLA, human leucocyte antigen; MOSS; Malaysian Organ Sharing System; PRA, panel reactive antigen

For the various reasons stated above, the only criteria feasible in Malaysia then in determining kidney allocation is based solely on duration of dialysis. Kidney allocation systems that emphasized on waiting time place minimal attention to optimizing the use of extremely limited organs.

Why change is required?

With more than 20,000 patients currently on the e-MOSS list, and the list is growing by a few thousand new patients yearly, stricter selection criteria and a shortened list of patients waiting for the 30-40 kidneys available each year, will be more manageable and practical.

1. Ethical Principles of Organ Transplantation

The current selection process is solely based on the ethical principle of **justice** (being fair), but not on **utility** (quality of being fair). Allocation of scarce resources like kidneys from deceased donors should not only be fair but should also be based on good medical judgment and **equity** (social justice). This approach seeks to achieve the best use of donated organs, avoid futile transplants, optimise patient access and promote efficient management of deceased donor kidney transplantation with the hope to produce the greatest "good".

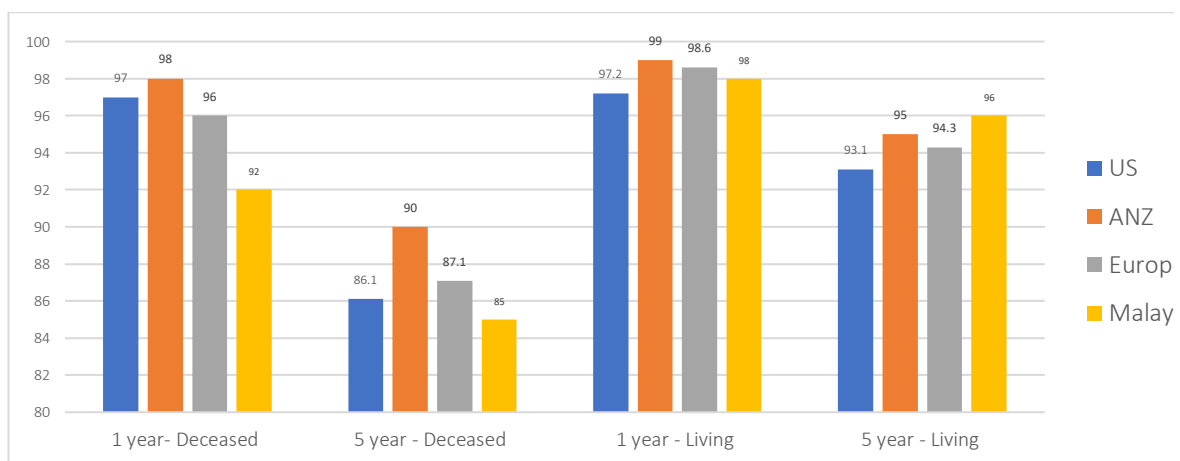
2. Comorbidities

Patients who have been on hemodialysis for a significant period have more complications such as cardiovascular disease, vascular calcification, and severe renal bone disease which led to increased mortality and morbidity. These patients are more likely to have a more difficult and prolonged transplant surgery, higher post-operative complications, and increased risk for cardiovascular events as well as poorer post-transplant graft and patient survival.

3. Poorer Outcome

Figure 2 indicated that deceased donor recipients in Malaysia has the lowest patient survival at one and five years in comparison to recipients in other countries

Figure 2: Patient Survival-International Comparison



ANZ, Australia and New Zealand; US, United States of America

From MOSS to MyKAS (Malaysian Kidney Allocation System)

MyKAS Committee 2018-2020

A task force was established by the National Renal Registry in 2018 to study the existing and alternative systems for a more effective and transparent kidney allocation criteria. Members of the committee were drawn from various healthcare sectors and stakeholders as indicated in Table 2.

Table 2 : The committee members of MyKAS 2018-2020 :

	Name	Role	Designation	Institution
1	Rosnawati Yahya	Chairperson	Consultant Nephrologist	Hospital Kuala Lumpur
2	Wong Hin Seng	MOSS Chairperson	Consultant Nephrologist	Hospital Selayang
3	Lee Wan Tin	NGO Representative	Consultant Nephrologist	NKF Board of Directors
4	Philip Jeremiah	Private Representative	Consultant Nephrologist	KPJ Ampang Puteri Hospital
5	Lim Soo Kun	MOE Representative	Consultant Nephrologist	University Malaya Medical Centre
6	Mohd Zaimi Abd Wahab	MOH Representative	Consultant Nephrologist	Hospital Kuala Lumpur
7	Suryati Yakob	MOH Representative	Consultant Nephrologist	Hospital Selayang
8	Fairol Huda	MOH Representative	Consultant Nephrologist	Hospital Serdang

MOSS, Malaysian Organ Sharing System; MyKAS, Malaysia Kidney Allocation System; MOE, Ministry of Education; MOH, Ministry of Health; NGO, non-governmental organisation; NKF, National Kidney Foundation

Following two meetings held in August and October in 2018, the committee proposed to adopt a scoring system used by the Organ Procurement Transplant Network (OPTN) in the USA as the local number of transplant recipients is too small for modelling to predict post-transplant survival in Malaysian patients (see Appendix 1). [4]

The proposal was further discussed in November 2018 in a round table discussion involving more transplant stakeholders which include representatives of the Transplantation Unit of the Ministry of Health, National Transplant Resource Centre, Malaysian Society of Urology, Malaysian Society of Nephrology (MSN), and National Kidney Foundation. The committee's proposal to adopt the Estimated Post Transplant Survival scoring system (EPTS) to ascertain patients' eligibility to be on the deceased donor waiting list was well accepted by the majority of those present.

Another committee meeting was held on 22 February 2019. The initial proposal was as follow:

1. All eligible patients (>18 and < 60 years old) who are registered with the National Renal Registry will have their EPTS score calculated.
2. Patients with EPTS score of $\leq 40\%$ will be placed on “Eligible for Assessment”.
3. The patients will be prioritized in their individual blood group using the following criteria:
 - a. Kidney donors who developed ESRD
 - b. Living kidney transplant recipient with primary non-function (due to technical reason)
 - c. Patients with a life expectancy of less than 1 year without a transplant (SOS list)
 - d. Duration of dialysis (i.e. patients with a longer duration of dialysis will be higher in the list)

Presentation at Town Hall

This proposal was presented to a bigger transplant stakeholder during a Town Hall meeting which was held at Bangsar Connexion Convention Centre, Kuala Lumpur on 25 April 2019 in conjunction with the 22nd Annual Scientific Meeting of the Malaysian Society of Transplantation involving patient representatives, dialysis providers, Person-In-Charge (PIC) of dialysis centres, members of the Malaysian Society of Nephrology, Malaysian Society of Transplantation, representatives from the National Kidney Foundation Malaysia and Transplantation Unit, Ministry of Health. The following were the consensus from this session:

- 1) The proposal by the MyKAS committee was accepted and the EPTS scoring was lowered to $\leq 20\%$ (which will include > 4000 patients) as the post-transplant survival data suggested that there was a significant difference in survival of patients with EPTS $\leq 20\%$ in comparison to those with EPTS > 20%.
- 2) The EPTS score to be in the eligible lists will be subjected to revision in the future, should the deceased donation rate improves.
- 3) The attendees also suggested to ensure that kidneys are allocated to those who have been evaluated under the existing MOSS list.

Presentation at MSN Annual General Meeting (AGM)

The following proposed criteria were presented at MSN AGM on 13 July 2019:

1. All eligible patients (> 18 and < 60 years old) who are registered with the National Renal Registry will have their EPTS score calculated.
2. Patients with EPTS score of $\leq 20\%$ will be placed on “Eligible for Assessment”.
3. The patients will be prioritised in their individual blood group using the following criteria:
 - a) Kidney donors who developed ESRD
 - b) Living kidney transplant recipient with primary non-function (due to technical/immunological reasons)
 - c) Patients with a life expectancy of less than 1 year without a transplant (SOS list)

- d) Duration of dialysis (i.e. patients with a longer duration of dialysis will be higher in the list)

During this meeting, there was a suggestion to add the following criteria to the prioritization list:

1. Family member (first degree) of a deceased donor
2. Organ pledgers who have pledged > 2 years prior to the knowledge of diagnosis of chronic kidney disease (CKD)

However, this will be considered in the future review of the allocation criteria.

Presentation at Special Meeting with the Director-General of Health of Malaysia

The proposal was finally presented to the Director-General of Health, Tan Sri Dato' Dr. Nor Hisham Abdullah on 3 December 2020. This presentation was conducted virtually due to the Coronavirus disease (COVID-19) pandemic. The proposal was well accepted and the committee opined that the proposed revised criteria for kidney allocation system would be a good move in order to optimise the use of extremely limited resources.

MyKAS: Work Process

All eligible patients (> 18 and < 60 years old) who are registered with the National Renal Registry will have their EPTS score calculated.

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The electronic-MyKAS (e-MyKAS) system will generate an auto e-mail to the Person-In-charge (PIC) and Nephrologist in-charge (NIC) of the patients high on the list. The PIC or NIC will need to counsel and obtain consent and identify any contraindications to transplantation:

- If there are no contraindications to proceed with transplantation, immunological evaluation to assess Panel Reactive Antibody (PRA) will be performed by sending patients' serum samples to a designated immunology laboratory. Given the limitation with immunology services in the country, only those with low immunological risk (defined as PRA level 0-20%) are considered for further evaluation.
- For those with a PRA value > 20%, the patients will be placed in "temporary off-list" and immunological assessment will be repeated 6 or 12 months later.

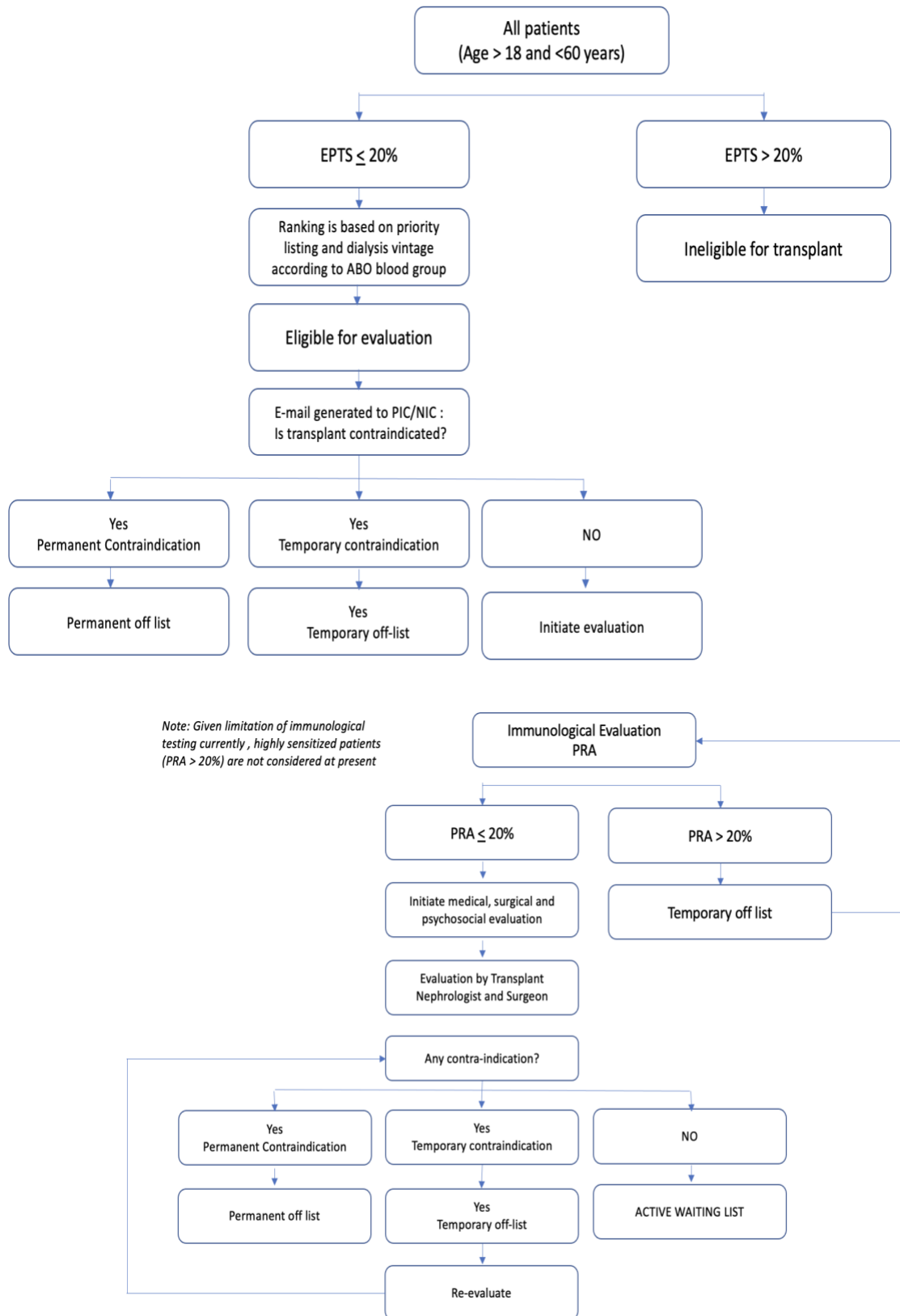
Once the patients have completed medical, surgical, and psycho-social assessments, they will be assessed at designated transplant centres to determine their fitness for transplant surgery, following which they will be placed in the active waiting list for a deceased kidney transplant.

Those who are not fit for transplant will be placed in permanent off-list or temporary off-list. Those in the temporary off-list will be re-activated for evaluation once the conditions that make them unfit for transplant have been managed adequately.

The MyKAS list will be re-run on a yearly basis. The outcome of the MyKAS system will be evaluated on a yearly basis and the allocation criteria will be revised every 3 years.

PROCESS FLOW

Figure 3 summarizes the process Flow of MyKAS



EPTS; Expected Post-Transplant Survival score; PIC, Person-in-Charge; NIC, Nephrologist-in-Charge; PRA, Panel Reactive Antibody

Implementation

The MyKAS allocation system was first implemented on 1 Jan 2020 and the recipient outcome of this will be monitored.

Future planning

The MyKAS allocation criteria will be subjected to review every two years to ensure that the allocation system fulfils the ethical principle of utility, equity, and justice. It is our ardent hope that future kidney allocation systems from deceased donors in the country will be based on HLA matches, once the National Transplant Immunology Service is able to regularly cater to the needs of the transplant programme.

Summary on Organ Procurement and Transplantation Network/United Network for Organ Sharing (OPTN/ UNOS) Kidney Allocation System

Organ Procurement and Transplantation Network (OPTN) in the USA introduced the new Kidney Allocation System in December 2014 with the following principles: to maintain a balance between

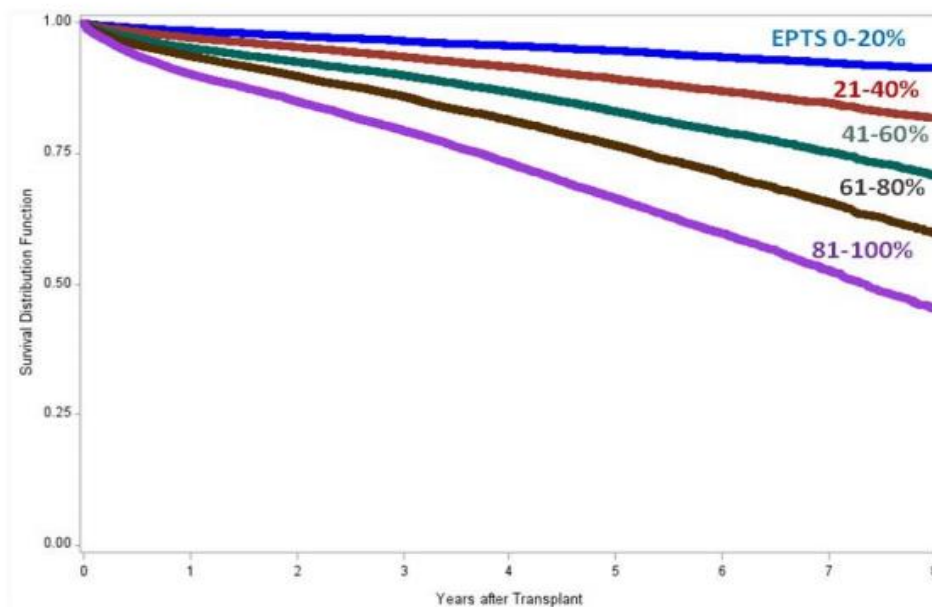
- **Justice** (fair consideration of candidates' circumstances and medical needs) and
- **Medical utility** (trying to increase the number of transplants and the length of time patients and organs survival).

OPTN also implemented longevity matching where kidneys that are predicted to have longer graft survival (based on Kidney Donor Profile Index [KDPI]) are matched to candidates who are expected/predicted to have a longer post-transplant survival [Expected Post Transplant Survival (EPTS) score].

What is EPTS Score?

Estimated Post Transplant Survival (EPTS) score is a numerical measure used to allocate kidneys in the new UNOS kidney allocation system. Every adult patient on the kidney waitlist receives an EPTS score. Factors included in the EPTS formula are the potential recipient's age (in years), duration of dialysis (in years), current diagnosis of diabetes and whether the potential recipient has had a prior solid organ transplant). EPTS scores range from 0% to 100%, where patients with EPTS score of 0-20% have been shown to survive the longest after transplant.

Figure 1: Kaplan-Meier Patient Survival Curves by EPTS Score
 Deceased Donor, Adult, Solitary Kidney Transplants from 2003-2010
 Based on OPTN data as of Feb 7, 2014



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4. Organ Procurement and Transplantation Network. A Guide to Calculating and Interpreting the Estimated Post-Transplant Survival (EPTS) Score Used in the Kidney Allocation System (KAS). Updated April 21, 2020. [cited March 2022] Available from: https://optn.transplant.hrsa.gov/media/1511/guide_to_calculating_interpreting_epts.pdf

