

Excellence and Efficiency Through a Structured Large Scale Approach: The Hospital Do Rim in São Paulo, Brazil

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RATIONALE FOR A LARGE-SCALE STRUCTURED MEDICAL APPROACH

Considering the rapid changes in the global burden of noncommunicable diseases, new healthcare strategies need to be developed, tested and implemented to provide high level care to the exponentially growing demand of patients. Although family doctors remain the ideal providers for preventive and primary medical care, highly efficient, high-volume, and cost-effective approaches may provide excellent care and outcomes for complex and highly prevalent conditions. At first glance, this model may appear counterintuitive as one may consider it overly ambiguous or overly goal oriented and to the detriment of a close physician/patient relationship. However, it is possible to provide both: high-quality healthcare based on a trusting patient relationship with a continuity of care in a multidisciplinary team approach.

THE BRAZILIAN TRANSPLANT SYSTEM

Brazil, with over 200 million people and a universal health coverage has a decentralized National Transplant Program characterized by government funded regional organ procurement and allocation systems in each of its 27 states. Currently, there are 117 active kidney transplant programs, 110 000 patients on chronic dialysis and 21 264 of them (19.3%) on the waitlist for transplant. Kidney allocation is primarily regional and based on HLA matching and more than 5000 kidney transplants are performed every year (27 per million population). Follow-up care and immunosuppressants are provided by the national health system.

HRIM is in São Paulo, a metropolitan area with 22 million inhabitants, 4 organ procurement organizations, and 17 kidney transplant centers (Figure 1). With a single waitlist of 10 950 patients, over 2000 kidney transplants (46 per million

population) are performed every year in this area, a significantly higher amount than the national average.

THE MEDICAL NEED AND THE IDEA

The first kidney transplant at the University general hospital in São Paulo was performed in 1976, followed by a steadily increasing kidney transplant volume that reached 200 transplants/year by the mid-1990s. The increasing demand for kidney transplants in addition to space limitations within the University hospital motivated us to pursue public funding to build a dedicated facility. In August 1998, the HRIM transplant center opened its doors initially with 60 of its 151 beds and 4 operating rooms, committed to perform 1 kidney transplant per day.

HOSPITAL DO RIM (HRIM): A LARGE SCALE TRANSPLANT CENTER

To accomplish this rather ambitious goal, innovative and large-scale management strategies had been applied. Intuitively, the kidney transplant program at HRIM adopted management models established for industrial production but ignored by healthcare systems. First introduced by Frederick Winslow Taylor in 1911,¹ the approach applies principles of scientific management involving planning, structured, and sequential working modules combined with a systematic performance monitoring to provide quality assessment and constant improvement. This model provides efficiency, quality, cost-effectiveness, and most importantly, patient and healthcare worker satisfaction.^{2,3}

Module 1 is the HRIM organ procurement organization, with 12 full-time employees, coordinating organ procurement, education, and campaigns, in collaboration with coordinators in 75 hospitals, covering an area of 7 million inhabitants within the São Paulo metropolitan area. In module 2, healthcare workers evaluate, select, and prepare patients referred for kidney transplantation nationwide. The first appointment is scheduled within 2 weeks after patients contacting the center, and the workup is expedited by a multiprofessional internal team with minimal referrals to outside providers or specialists. For recipients of kidneys from living related donors, the mean time from the first appointment to the transplant procedure may be as short as 2 weeks. Module 3 coordinates hospital admission, transplant surgery, and immediate postoperative care until discharge. Because kidney allocation in Brazil is based on HLA compatibility, it is not possible to predict the waiting time. Recipients for a deceased donor kidney transplant will

Received 8 May 2017. Accepted 11 May 2017.

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The authors declare no funding or conflicts of interest.

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ISSN: 0041-1337/17/10108-1735

DOI: 10.1097/TP.0000000000001831

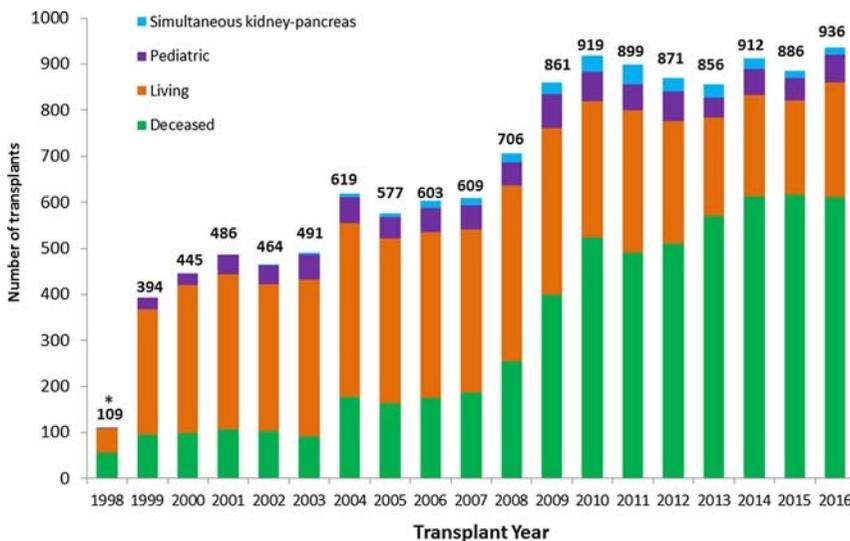


FIGURE 1. Map of Brazil.

therefore be reassessed before transplant to assure medical fitness. Currently, the median waiting time is 38 months, ranging from less than 1 to 348 months. Living donor kidney transplants are scheduled daily from Monday to Friday. A surgical team, consisting of 8 experienced surgeons, is on call to evaluate and perform all transplant procedures and reinterventions. Donor and recipients are maintained in 1 specialized postoperative care unit (6 beds) for 18 to 24 hours. Follow-up is completed in 1 of the 30-bed units with 2 hospitalists and supervised by a senior nephrologist; multidisciplinary rounds are performed daily. Module 4 is the posttransplant outpatient clinic (13 offices and 1 emergency room) with a multidisciplinary team of physicians (n = 40), nurses (n = 6), pharmacists (n = 1), psychologist (n = 1), and social workers (n = 2) who see over 300 patients per

day. Importantly, we focus on a patient-centered approach, with each patient having their own physician supervised by 3 senior nephrologists who monitor adherence to our transplant center-specified guidelines for immunosuppression, comorbidities, and hospital readmission. Most transplant patients are followed up in our outpatient clinic, regardless of the distance of their home city. Each module relies on independent supporting components including emergency, intensive care, day hospital, and dialysis units, in addition to immunogenetics, clinical and renal pathology laboratories, an imaging unit, urological and cardiac support and an infection control committee.

The transplant program, including all employees, is funded by the government through the national healthcare system (78%) in addition to private healthcare providers, based on



* Number of transplants from August to December, 1998.

FIGURE 2. Annual transplants volume at HRIM.

predefined fee for procedure and bundle reimbursements. Cost-effectiveness is achieved by using carefully selected and highly specialized human resources in each module, optimized patient to worker ratios, and high efficiency in every process.

The weekly early morning Monday meeting is critical for the success of our program. During this less than an hour meeting, performance and indicators are monitored, deviations are adjusted, and opportunities for further improvement

are identified. This meeting monitors the close supervision of the interconnected work among modules, and the communication between administrative members and senior management. Moreover, the potential impact of political and economic instabilities that may interfere with the activities of the program is analyzed.

Overall, this management model provides fast and effective treatment for a large proportion of patients.

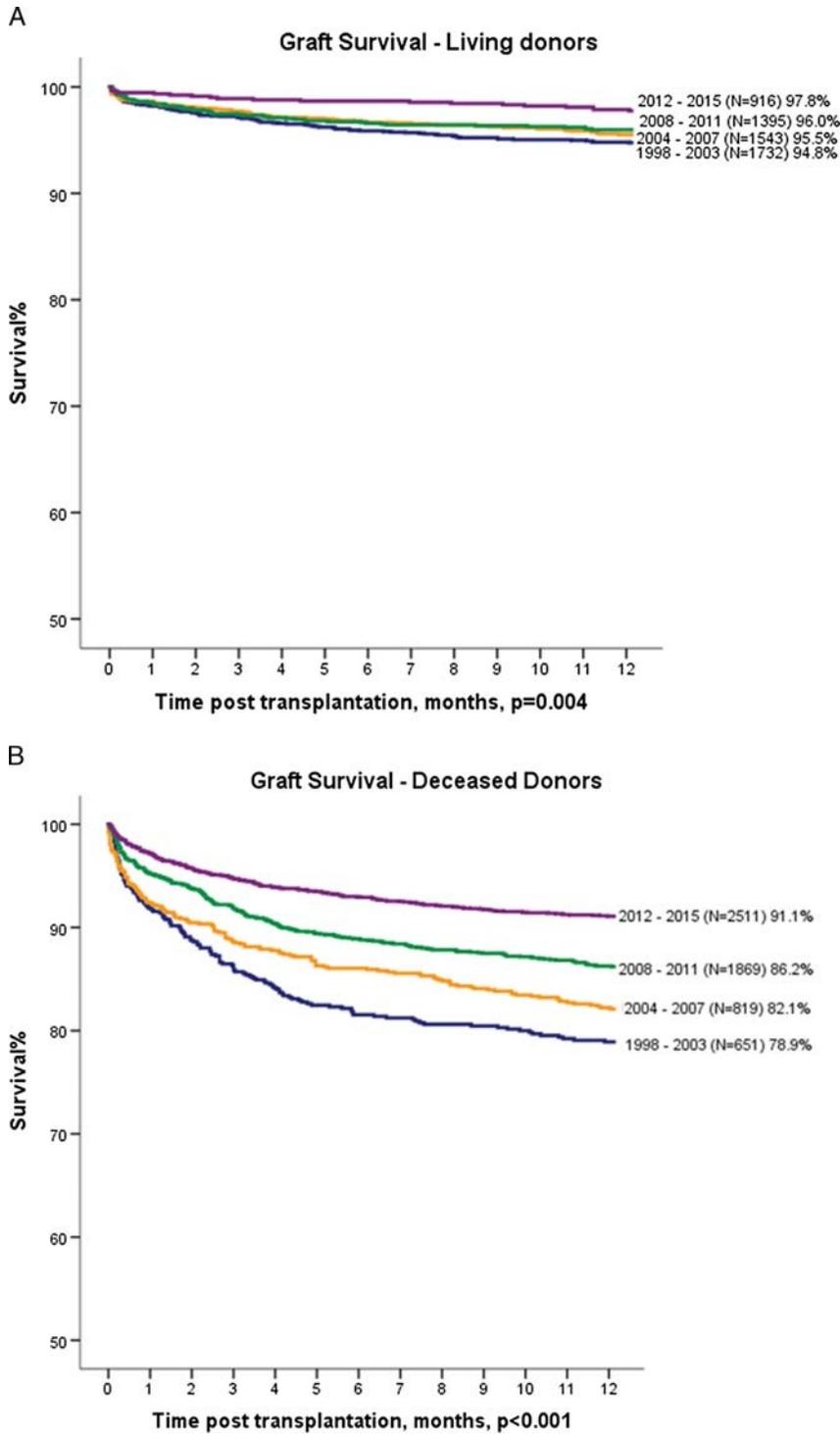


FIGURE 3. One-year graft survival of first living (A) and deceased (B) donor kidneys (data collected by the Collaborative Transplant Study).⁴

PERFORMANCE

The first benefit of this management model is increased productivity. The number of effective donors within the HRIM region increased from 6.1/million population in 1999 to 27.8/million population in 2016. The number of patients listed for a deceased donor kidney transplant doubled, from 3050 in 1999 to 6582 patients in 2016 representing 63% of all patients listed in the state of Sao Paulo (10,439) and 30% of those listed in Brazil (21,264). Therefore, the number of kidney transplants increased steadily from 394 in 1999 to 861 in 2009 with more than 930 transplants performed in 2016 (Figure 2). At the same time, HRIM has continuously increased the number of deceased donors while the volume of living donor kidneys has been slightly reduced (from 271 in 1999 to 249 in 2016), reflecting an increasing selectivity in the evaluation of living donors. The length of stay has been 8.1 days in 2002 and 7.7 days in 2016 for recipients of living donor kidneys, and 17 and 12.8 days for recipients of deceased donor kidney transplant recipients in 2002 and 2016, respectively. These figures reflect an improved surgical care, infection control and lower number of complications, aspects that appear relevant with the growing complexities in older recipients. The readmission rate within the first 30 days after discharge has been reduced from 28% in 2011 to 19% in 2014 to 2015. Finally, the number of patients followed in our outpatient clinic has increased from 439 in 1999 to 8,608 in 2016. In parallel, the number of patients seen daily increased from 28 in 1999 to over 300 in 2016.

With an improved efficacy, we have observed a continuous improvement in 1 year patient and graft survival rates from 1998 to 2015 both for recipients of living and deceased donor kidney allografts (Figure 3).

TEACHING AND RESEARCH ACTIVITIES

HRIM is an accredited hospital and a certified teaching facility of the Federal University of Sao Paulo (module 5). In parallel to its clinical progress, HRIM has developed a strong teaching expertise and clinical research program. Between 1999 and 2016, 1470 physicians visited and participated in continued medical education activities. HRIM has conducted 75 phase I to IV clinical trials enrolling 3141 kidney transplant recipients. In 2016, 299 undergraduate students, 78 residents (nephrology, urology, cardiology, infectious diseases, nurses, and pharmacy), 148 trainees, and 15 fellows participated in regular activities in the hospital, contributing to 17 published articles.

PERSPECTIVE

Considering the worldwide debate on increasing healthcare costs, low efficiency processes, and growing patient and provider dissatisfaction, this management model may be an attractive option for a variety of healthcare systems, from the British NHS to the recent changes proposed by the Patient Protection and Affordable Care Act (Obama care). The model may be even more relevant in healthcare systems of extreme limited resources, such as those in developing countries.

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Research Highlights

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Colony Stimulating Factor-1 Receptor Is a Central Component of the Foreign Body Response to Biomaterial Implants in Rodents and Nonhuman Primates

Doloff JC, Veisoh O, Vegas AJ, et al. [Published online March 20th, 2017]. *Nat Mater*. doi: 10.1038/nmat4866.

Received 10 May 2017. Accepted 15 May 2017.

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The authors declare no funding or conflicts of interest.

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ISSN: 0041-1337/17/10108-1738

DOI: 10.1097/TP.0000000000001828



Implanted biomedical material is recognized by the host as foreign, resulting in an immune mediated rejection based on immune recruitment and adhesion with tissue injury, myofibroblast induction and fibrous capsule formation. Macrophages play a major role in this response, adhering to the foreign material within days after implantation. Overcoming the response to implanted materials is of particular relevance for transplanted islets treating diabetes.

The authors examined the role of innate and adaptive immunity on alginate spheres as a major component encapsulated islets. Historically, the foreign body reaction to alginate was thought to be linked to endotoxins. However, endotoxins could not be detected in commercially purified alginate.

Here, alginate spheres were implanted into the intraperitoneal space of wild-type mice that were treated over a 14-day implantation period with a targeted macrophage depletion agent, a neutrophil depletion agent or a combination of both. After retrieval of the spheres, the degree of fibrosis was analyzed and cells around the implantation site were assessed sequentially during the implantation period.

In the liquid environment surrounding the implant, neutrophils increased, B cells decreased, and macrophages remained