DECREASING THE NEED FOR KIDNEY TRANSPLANTATION THROUGH PROACTIVE MANAGEMENT

Levent B. Kıdak PhD, MD
Hospital and Health Care Institutions Management Izmir Training and Research Hospital, Izmir, Turkey

ABSTRACT

• ***Objective:*** *Both in Turkey and in developed countries, the urinary tract infections (UTI) in children are an important cause of chronic kidney disease (CKD). This problem necessitates an approach involving the management sciences for health as well as the medical solutions. The objective of this study is to discuss the results of the UTI control program in children aged 0-30 months and its contribution to decreasing the need for organ transplants using a proactive management approach.*

• ***Material and Method:*** *The study has been planned and conducted in 264 (100%) primary care facilities within the boundaries of the city of Izmir for a period of one year. This is a descriptive cross-sectional study. The target group was defined as any children applying to these facilities for vaccination at the 9th and 16th months of life. During the years 2005-2006, the children between 0 to 30 months of age who applied to primary care facilities for vaccination have been assessed for UTIs. The children's urine samples have been tested in terms of presence of leukocytes, nitrites, proteins, blood and glucose parameters using dipsticks, and if one of these parameters were positive, the cases have been taken under further examination. The data have been sent monthly online by healthcare facilities and assessed by frequency analysis.*

• ***Results:*** *In total, 16,908 (9,080 males, 7,828 females) children were analyzed. The mean age of the subjects was 15.6±13.4 (0-30) months. In the first assessment in healthcare facilities, 14098 (83.4%) urine samples were normal whereas 2810 (16.6%) urine samples were positive. Further examination was conducted in 1096 positive cases and UTI, vesicoureteral reflux, hematuria and asymptomatic proteinuria have been detected in 543 (49.5%-3.2%) of these cases.*

• ***Conclusion:*** *The proactive management approach can be used effectively to prevent UTIs in children that may lead to kidney transplantations. This is an issue where healthcare administrators and policy makers as well as medical caregivers should come up with solutions.*

• ***Key Words:*** *Proactive management, urinary tract infection, organ transplantation* ***Nobel Med 2010; 6(1): 61-67***

PROAKTİF YÖNETİMLE BÖBREK NAKLİ İHTİYACININ AZALTILMASI

ÖZET

• **Amaç:** Çocuklardaki idrar yolu enfeksiyonu (İYE), kronik böbrek yetmezliğinin (KBY) ülkemizde ve gelişmiş ülkelerde önemli bir nedenidir. Bu soruna tıbbi çözümlerle birlikte sağlık yönetim bilimlerinin de katkısı gerekmektedir. Bu çalışmanın amacı 0-30 aylık çocuklarda İYE'lerin kontrolü programı çalışmasının sonuçlarını, organ ihtiyacının azaltılması yönünde, proaktif yönetim yaklaşımıyla tartışmaktır.

• **Materyal ve Metod:** Çalışma, İzmir ilindeki 264 (%100) birinci basamak sağlık kurumunda, bir yıllık süre için planlanmış ve gerçekleştirilmiştir. Tanımlayıcı kesitsel bir çalışmadır. Bu kurumlara aşı için 9. ve 16. ayda aşı için başvuran tüm çocuklar hedef gurup olarak belirlenmiştir.

2005-2006 yıllarında ildeki birinci basamak sağlık kurumlarına, aşı için başvuran 0-30 aylık çocuklar İYE yönünden değerlendirildi. Çocukların idrar örnekleri; daldırma çubukları ile lökosit, nitrit, protein, kan ve glukoz parametreleri yönünden değerlendirilerek herhangi bir parametrenin pozitif bulunması halinde olgular ileri incelemeye alındılar. Veriler sağlık kurumlarının aylık çalışmaları ile bilgisayar ortamında gönderildi ve frekans analizi ile değerlendirildi.

• **Bulgular:** Toplam 16.908 (9.080 erkek, 7.828 kız) çocuk değerlendirildi. Yaş ortalaması 15,6±13,4 (0-30) aydı. Sağlık ocaklarındaki ilk değerlendirmede, 14.098 (%83,4) idrar sonucu normal, 2.810 (%16,6) idrar sonucu ise pozitif olarak saptandı. Pozitif bulgu saptanan olguların 1.096'sı ileri değerlendirilmeyi kabul etmiş ve bunların da 543'ünde (%49,5-%3,2) İYE, vezikoüreteral reflü, hematüri veya asemptomatik proteinüri bulundu.

• **Sonuç:** Proaktif yönetim anlayışı, çocuklarda böbrek nakline gidebilecek İYE'larını önlemede etkin olarak kullanılabilir. Sorun, tıbbi çözüm gerektirdiği kadar sağlık yöneticileri ve politika yapıcıları tarafından da çözüm üretilmesi gereken bir konudur.

• **Anahtar Kelimeler:** Proaktif yönetim, idrar yolu infeksiyonu, organ transplantasyonu **Nobel Med 2010; 6(1): 61-67**

INTRODUCTION

Recently, the proactive management approach has been the outstanding trend in various areas of healthcare services. These areas are mainly the monitoring and prevention of chronic health problems such as diabetes, heart failure and obesity; the active use of imaging and databases in healthcare services and the psychosocial management of chronic diseases as well as the reduction of the healthcare costs of social security organizations.[1-5] The concept of proactive stands for taking action before the event happens. A proactive style of management is based on designing the desired future and the managerial environment in this future. This approach, necessitating the development of new ways and strategies for organizations and services in order to shape the future, targets long term results.[6, 7]

Today, the number of patients with chronic kidney disease (CKD) is growing continuously. The renal replacement therapies of end-stage renal disease (ESRD) patients caused by CKD are carried out either through dialysis or transplantation.[8, 9] There are about 1 681 000 ESRD patients in the world.[10] There are about 38 thousand chronic kidney disease patients in Turkey and 34 thousand (89.2%) of them are spending three days a week undergoing dialysis while they wait for a kidney transplant. But only 830 of this number have received kidney transplants in one year. Every year, 3700 new dialysis patients are added to this number. 110 of every 1000 ESRD patients every year lose their lives while waiting for an organ.[10] Besides, the management of the disease through dialysis or kidney transplantation has both social and economic impacts.[11]

While the number of ESRD patients is increasing, the progress in medical technologies, the developments in surgical techniques and the new drug treatments after the operation make organ transplantation a valid and powerful option.[12] Although the number of donors is growing across Europe thanks to the awareness supported by the media, the increase in Turkey is far lower than the intended number.[12, 13] Still, there is an ever-growing gap between the incidence of the disease and the organ donations both in the world and in Turkey.[13] In order to break this trend, scientists are working on the incidence, early diagnosis and therapy of the disease.[8, 9, 11, 14] Three basic strategies are available: Increasing the organ supply by motivating donations, raising the patients' quality of life through the treatment methods available and decreasing the organ demand with the help of proactive management.[15, 16]

The need for organs may be considered a problem to be solved by increasing donations. But as long as the real issues causing the organ failures are neglected, the need→

for organs will continue today's increasing trend. Is the current need for organs a problem in itself, or is it the outcome of another problem? The point here is the definition of the problem for which a solution is needed.[17] According to the proactive approach, the main question is why so many organ failures arise. From this angle, it is obvious that one of the basic options in altering the current situation in organ transplantation is to decrease the demand for organs. This concept leads us to the idea that there are other critical processes within this field to be managed using the proactive approach like determining the factors causing organ failure and finding preventive solutions.; i.e. the main target must be to lessen or prevent the insufficiency or failure of the organs as a result of the disease. The common point of the proactive management approach and the healthcare services can be called the "modern medicine" including preventive medical practices.[18] In this context, a program has been started in 2005 in the city of İzmir to determine the incidence of UTIs in children and to diagnose kidney anomalies at an early stage in order to start treating the affected children immediately and prevent the occurence of permanent kidney damage.[19] This program, led by the Health Authority of the City, has been planned and applied by the academicians and specialists in pediatric nephrology from two teaching and research hospitals. The objective of this study is to discuss the results of the study entitled "Urinary Tract Infection Control in Children" conducted according to the above-mentioned program with a proactive management approach to decrease the organ demand.

MATERIAL and METHOD

This study includes all the primary care facilities within the boundaries of the city of İzmir with 239 (91%) health centers and 25 (9%) maternity and child health and family planning (AÇSAP) centers. The program has been planned and realized for a period of one year between July 1st, 2005 and June 30th, 2006.

The target grup of the study consisted of all the children within the city limits who applied to these healthcare facilities for inoculation. The most appropriate and efficacious period to reach the target age group has been chosen as the rubella vaccination scheduled at the 9th month, and the diphtheria, pertussis and tetanus boosters together with the polio booster at the 16th month. The population of İzmir is 3.5 million people and the population at the age of 0 is around 45 thousand.[20] Families applying for vaccination have been informed of this study and those who accept to be enrolled have been asked to give urine samples. A total of 16908 children have submitted urine samples for this purpose. Considering the possible lack of knowledge, confusion in terminology and the obstacles

Table 1: Results of the evaluated cases

	Number	Ratio (%)
Total number of children evaluated	16908	100
Normal	14098	83.4
Abnormal (Positive finding)*	2810	16.6
-Treated	302	1.8
-Referred to hospital	2508	14.8

*The colourful items are the breakdown of the abnormal cases (positive findings).

in the filing system in primary care facilities, a coordinated study between primary and secondary care facilities has been planned in the first place. The main components of this study can be summarized as education, solidification of infrastructure and implementation. Therefore, teams from each facility consisting of a physician and a nurse midwife (responsible of the lab) have been given training. The training material has been prepared by the teams serving at the children's nephrology clinics of the related hospitals and the same team also completed the training of the 528 employees in groups of 50.

The urine samples of the children applying to primary care facilities have been tested for leukocytes, nitrites, proteins, blood and glucose parameters using a strip. If one of these parameters were positive, the cases have been taken under further examination. The cases outside the normal values are planned to be referred to the pediatric nephrology clinics of the advising (central) hospitals of the project for further analysis and treatment. The urine samples of the cases referred to the centers have been re-analysed using strips and urine microscopy, and bag and urine cultures have been taken from the asymptomatic patients positive for pyuria and/or nitrites. The symptomatic patients and those whose bag and urine cultures showed evidence of multiplication have been taken catheterized culture specimens for the final diagnosis of the UTI. All children with UTI were evaluated for urologic anomalies with urinary ultrasonography, voiding cystourethrography and DMSA scan.

Different urine bags, urine cups and urine strips were used according to the sexes of the infant girls and boys and the same kind of standard strips has been used throughout the cases. The analyses of the cases in the primary care facilities have been performed using the Dirui H-500 series (Dirui Industrial Co., Ltd) strips. The sensitivity of the test in the test parameters was 0.15-0.3 g/L for proteins, 5-15 µ L for blood, 13-22 µ mol/L for nitrites, 5-15 leuko/µ L for leukocytes and 2.8-5.5 mmol/L for glucose.

Data collection forms have been designed, printed and distributed for the documentation of the project.→

Table 2: Results of the cases after further evaluation		
	Number	Ratio (%)
Normal	490	44.7
Pathological*	543	49.5
-UTI	483	44.1
-Proteinuria	32	2.9
-Hematuria	28	2.6
Discontinued	63	5.8
Total	**1096**	**100**
*The colourful items are the breakdown of the pathologial cases.		

Every month, all the urine test results documented with these forms have been sent digitally to the ACSAP Department of the Local Health Authority and assessed using frequency analysis.

RESULTS

Within the one year period when the study was conducted, 16908 children in İzmir aged 0-30 months have been assessed for urinary tract infections. Of these, 9080 (53.7%) were male while 7828 (46.3%)were female. Their mean age was 15.6±13.4 months with a median value of 12 months; and the age distribution was 0 to 30 months.

During the first evaluations made in the primary care facilities using a urine strip, the samples taken from 14098 (83.4%) children were assessed as normal, whereas 2810 (14.8%) samples tested positive for findings. The 1.8% (302) of children who tested positive have been treated in the primary health facilities, 14.8% (2508) of them have been referred to screening centers for further analysis (Table 1).

Among these children referred to the centers, 1096 (44%) reached the screening centers, whereas 1412 (56%) did not. It was detected that 44.7% (490) of the 1096 cases evaluated further in the screening centers have been assessed as normal while 49.5% (543) of them were classified as pathological. The pathological cases were reported as UTI in 483 (44.1%), proteinuria in 32 (2.9%), hematuria in 28 (2.6%) and urogenital anomalies in 27 (2.5%). The UTI was co-existence with urogenital anomaly in 27 (2.5%) patients. Among the patients in this last group, 63 (5.8%) have discontinued investigations after the first examination (Table 2).

DISCUSSION

The most important result of this study is the revelation of the fact that the urinary tract disease detected in 543 children (3.2%) who had no complaints at all and had applied to the local healthcare facility only for vaccination, has been demonstrated to be a disease progressing insidiously without giving any evidence. The studies show that the urinary tract disorders, with sometimes barely detectable clinical evidence, difficulties in obtaining the appropriate urine sample together with the difficulties in final diagnosis, with their repetitive nature, their frequent co-occurrence with urogenital system anomalies and the probability to cause permanent kidney failure in the long term constitute an important health issue.[8, 9, 14, 19] This study results directly support this opinion. One of the common features of these cases is the fact that the families consider their children healthy and apply to healthcare facilities only for vaccination. Another common feature is the absence of any complaints related to the detected findings.

The main issue here is that most of these cases are preventable cases of UTI (483). The number is 2.8% of all the children screened. According to the study findings, there have been a significant number of cases without any complaints or clinical evidence. Of course not all of the detected cases shall develop CKD; but still, unless they are treated appropriately, all of them are candidates for CKD. According to the studies, even in developed countries UTIs are still an important factor leading to CKD.[9] It is generally known that in Turkey the most common reason for CKD are UTIs (65.4%) and vesicoureteral reflux.[21, 22] Compared to the average incidence of 20% in developed countries, the UTI rates in Turkey are significantly higher.[21] This is an indication that UTIs are of greater significance for Turkey, and the results of the study support the assumption that the main reason for the higher number of kidney failures in our country is the UTIs.

In addition, in majority of cases, UTIs are accompanied by urinary system anomalies. The most common findings of various anomalies are recurrent UTIs and the most common anomaly type is the vesicoureteral reflux.[14] This idea was further supported by the fact that our study results revealed urogenital anomalies together with UTIs in 27 children, of which 21 had vesicoureteral reflux. The co-occurrence of anomalies and UTIs is an important risk factor for permanent kidney damage.[14, 19]

If we go back to the problem that the need for kidneys is much higher than the number of the donations, it becomes obvious that the whole question must be reviewed: According to the study results, the real problem is not the insufficiency of the donations, but the loss, insufficiency or failure of a higher number of organs as a result of disease. Re-defining the problem this way is a step taken towards its solution. Because the main obstacle between the CKD patients and a transplant is the ever-growing need for new kidneys→

unmatched by the increase in the number of onors.[13] So, it becomes clear that the crucial task to be undertaken is to reduce the need for organs. This may be understood as preventing the affecting diseases and reducing the damages causing insufficiency and loss of that organ. From the angle of reducing the need for kidneys, we shall agree on the point that UTIs must be prevented or detected and treated at an early phase.

Epidemiologists on one side and clinicians on the other, are working to find the true and accurate facts about the incidence and prevalance of CKD in various populations.[8, 9, 14] Besides, the preventive medicine phenomenon is being perceived in a totally new manner around the world. It is clear that the ever-increasing health problems getting more and more complicated every year cannot be managed solely from a medical point of view and that the intervention of the management sciences for health is needed. The need for a solution to the organ situation is a health management issue as well as a medical issue and managerial solutions must also be included in the process. That's where the proactive management approach comes in.[2,3] The proactive style of management is based on always being one step further than the failure in progress and preventing it before it happens.[23] This approach may resemble the preventive medicine (secondary prevention) in a sense, but it is also a management approach that involves calculating the risks and obstacles, estimating the future conditions and developing new strategies accordingly. UTIs, the most frequent reason for CKD, come in second rank in childhood infections following the respiratory tract infections and they are greatly preventable. Except for certain congenital diseases, the early diagnosis of nearly all the anomalies and of UTI followed by the appropriate treatment and monitoring of the results may prevent permanent and life-threatening impacts of these disorders. Besides, children at the toddler age are especially susceptible to kidney damage.[19] Therefore, the detection of UTIs at an early stage in life through the proactive management approach, the investigation of their reasons and their treatment shall play an important role in preventing the future impacts of the disease.[24, 25]

In a study conducted by Khan and Amedia in 2008, the financial aspect of the attempts to slow down the progress of CKD and to ameliorate its clinical impact has been evaluated. The early diagnosis of CKD at an early stage and the intitiation of treatment for those affected at an early stage have been shown to reduce both the clinical impact and the economic burden of the disease. And early diagnosis has also been shown to reduce the need for organ transplants. It has been emphasized that the proactive management appproach may reduce the incidence of the disease, slow down its progress improving the clinical results and the financial picture.[26] In his work on renal anaemia management period, Pereira emphasized the importance of a proactive approach for an early diagnosis and aggressive treatment of anaemia causing significant morbidity and mortality in CKD.[27] These works indicate that the proactive method of management has just recently become popular in the early diagnosis and treatment of kidney diseases.

An important impact of the proactive health management is on healthcare costs.[2,3] The insufficiency of organs for CKD patients not only costs lives and social losses, but it is also a great burden on the economy of the countries.[8, 11, 13] For instance, the annual treatment cost of a patient undergoing dialysis is 25 thousand USD compared to the annual amount of 10 thousand spent for a patient who underwent kidney transplantation.[10] The results of ESRD are causing distress on the use of resources allocated to health services 8. This economic distress may be reduced through screening programs, early diagnosis and effective treatments to help us better understand the nature of CKD.[11, 24] According to the studies, a proactive management in this field may save a lot of resources in the long run.[26, 27] The results of the study reveals that it is possible to lower the unnecessary drug use and to reduce the treatment costs of end stage renal patients resulting in a serious reduction in the spendings of social security organizations.

Moreover, like all the chronic diseases, the CKD occurring in children is a condition affecting the growth and education of the child causing great psychological problems both in the child and in the family as well as important work hour loss since support of the family is needed.[28, 29] The study shows that both these psychological problems that may occur in the children and the families, and the social and economic losses are possible to be reduced.

This study constitutes an example for the training, solidification and application of the infrastructure, and the collection and evaluation of the data throughout the three steps in healthcare services.[19] Evaluation of the targeted number of children and complete training supports this view. As in this study, the primary, secondary and tertiary health services may be supplementary and complementary for each other even in a highly technical subject like organ transplantation. The study has also shown that the health system must be managed with a multidisciplinary approach for a more effective and productive use of the sources allocated to healthcare services.[14, 24]

Another finding, that only 1069 of all the cases that tested positive in primary care facilities applied to screening centers and that some of the cases→

discontinued tests and treatment after the initial application to the centers indicates the shortcomings of this cooperative effort that must be worked on. Proactive monitoring systems as a vital part of this proactive management approach must therefore be formed with the registration system activated and the data flow process improved.[1, 5, 30] The findings about the cases testing positive in this study must be entered into the personal health files in the health service institutions so that the children or their parents may be tried and reached again in their next visits or during field work. The lack of applications and the drop outs during the study must be the subject of other studies.

The study had certain limitations. First of all, in order to obtain the urine samples, the children have to wait for a long time with a bag, which discourages the families from participating in the study. Besides, since the study duration was one year, the cases testing positive and referred for further examinations applied to the centers at different times. For this reason, the examinations of the positive cases didn't occur simultaneously. Some cases may have healed by themselves and some may have taken medication in the period between the positive urine test and the application to the center. Such reasons may have reduced the positive predictive value of the test.

CONCLUSION

Evidently, the application of screening and prevention programs in order to reduce the need for kidney transplants arises as a basic necessity. Therefore, through the proactive management approach involving early diagnosis and screening programs, the UTIs beneath the visible part of the iceberg can be diagnosed and treated at an early stage and the number of the ESRD cases may be reduced. The early diagnosis and screening techniques must be in a way applicable in primary care facilities. Collecting urine samples from children, like in this study, can easily reveal normal and abnormal specimens. This screening test must be integrated into the routine healthcare. This method will help reduce the number of the patients undergoing dialysis and waiting for an organ transplant, making comprehensive social and economic improvement possible. The study also shows that the primary care infrastructure of Izmir is suitable for similar practice.

Additionally, besides the kidney, screening studies for organs like liver and heart that may develop failures must be started rapidly on a basic level and developed by monitoring. Control programs within the proactive management framework must be set for situations medically complicated, managerially hard to solve and becoming a serious economic and social burden to the system like organ failures. In this context, diseases individual organs are affected by must be studied, the potential disorders detected and the preventable ones singled out. The incidences, etiologies, clinical progress, treatments and prognoses of the preventable diseases of each organ (individually) must be investigated and the critical processes with the possible interventions according to its phases must be determined. Proactive monitoring systems for critical processes must be developed in order to focus on the long term gains.

C **CORRESPONDING AUTHOR:** Levent B. Kıdak MD. İzmir Egitim ve Arastirma Hastanesi, Bozyaka, İzmir/Turkey leventkidak@gmail.com

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