

# USE OF AN INTERNET BASED MEDICAL RECORD IN TRANSPLANTATION

Laura Murdock, MHA, Jeffrey M. Sneddon, Ronald M. Ferguson, M.D. Ph.D.  
 The Ohio State University Medical Center, Comprehensive Transplant Center  
 363 Means Hall 1654 Upham Dr. Columbus, Ohio 614.293.8592

## Purpose

To assess if an Internet based medical record, accessible to transplant staff, referring nephrologists and patients, has an effect on patient outcomes or clinic operations. The transplant electronic medical record (EMR) is an Internet based medical record that provides secure, encrypted browser access to the patient medical record. The system has been available to the transplant staff and referring nephrologists since April 2001 and patients since May 2002. Outcomes analysis will include primary kidney transplants that had been transplanted after the initiation of the Internet based EMR. All patients have at least one year of follow-up.

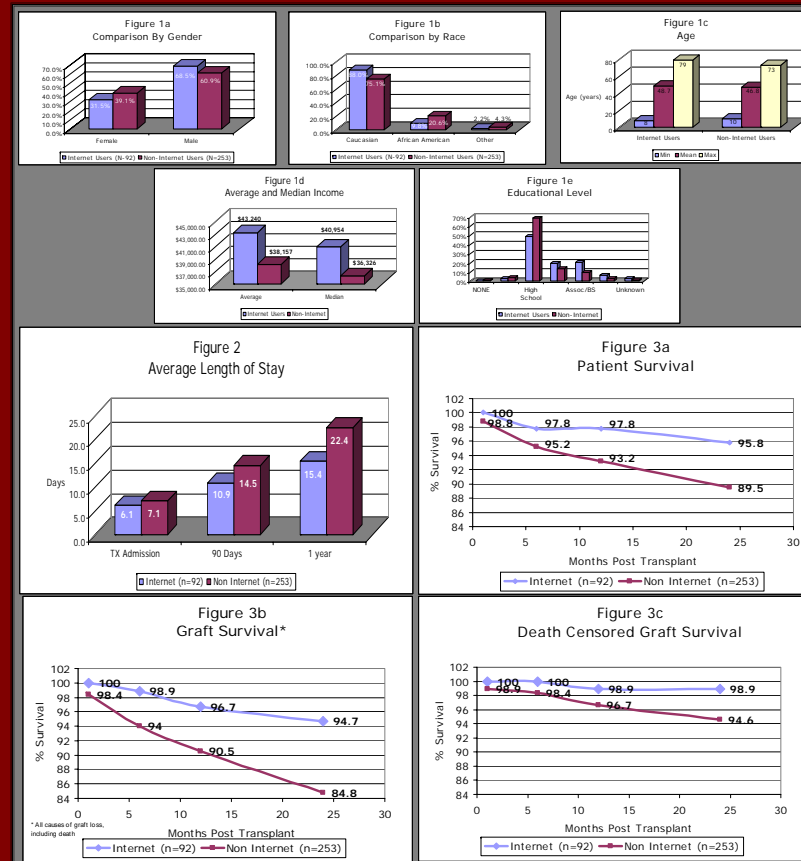
## Method

Analysis of historical data was conducted on all primary kidney transplant patients transplanted at The Ohio State University Medical Center (OSUMC) since May 2002 with at least 1 year of follow-up. Groups include an Internet Access (IA) group comprised of 92 patients who have utilized the EMR at least 5 times, and a Non-Internet Access (NA) group comprised of 253 patients who have not utilized the EMR. Demographics, education and income levels were compared. Patient and graft survival and admission rates were studied. Additionally, post transplant clinical workload was evaluated before and after access to the EMR became available and included analysis of clinic telephone logs and staff interviews.

## Patient Outcomes

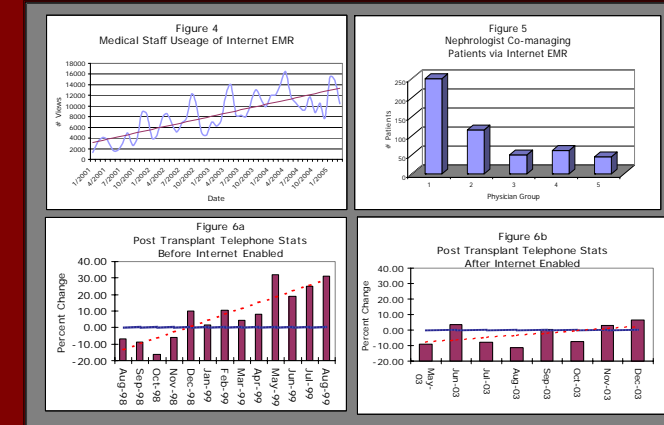
An initial survey (developed in 2001) of 600 transplant patients indicated that 72% of patients had access to the Internet. 52% of those surveyed responded favorably regarding accessing their labs and medication history via the Internet. 28% of all active post transplant patients currently utilize the EMR. Demographics of each group are shown in figures 1a-e. The IA group mean [median] income difference of \$6,897 [\$5,082] more than the NA group was significantly different ( $p = 0.000$ ) (figure 1d). The IA group had a significant number of patients with at least some college education (figure 1e) as compared to the NA group ( $p=0.001$ ). The average length of stay is shown in figure 2.

Kaplan-Meier life table analysis calculated using log-rank statistical analysis was significant for both patient survival ( $p=0.032$ , figure 3a) and graft survival ( $p=0.014$ , figure 3b). Death censored graft survival (figure 3c) was not significant.



## Clinic Workload

Transplant on-call staff increasingly utilize the medical record to perform real time charting as indicated in figure 4. Referring Nephrologists co-managing patients currently access 24% of all active patients' information using the WEB based EMR. The primary use is to print chart documentation and review progress notes. Additionally, 28% of active post transplant patients currently access the EMR to view or enter essential laboratory and vitals and to review their medications. Since the inception of the Internet based transplant EMR the transplant clinic has experienced a 12% increase in patient volume while demonstrating a 24% decrease in phone volume (Figures 6a&b). The need to retroactively document on call activities was eliminated as real time documentation and notification occurs during the delivery of care.



## Conclusion

Our experience using an Internet based EMR that is available to patients, referring nephrologists, and on-call medical staff has had a significant impact on outcomes and clinic workload. Patient hospital days in the first year for the IA group were 7.0 days less than the NA group. The number of readmissions per patient was 1.19 for the IA group vs. 1.68 for the NA group. Graft and patient survival using multiple statistical models was demonstrated to be significantly different. All significant participants (transplant staff, referring doctors, and patients) are accessing the same medical record on demand. The efficiencies seen in the clinic can be attributed to real time documentation of on-call charting; patients taking the initiative to review lab and medication data and referring physicians preparing the patient chart from the EMR. This resulted in a decrease in workload with regard to coordinators preparing charts and follow up needed on patient related calls.

It is clear that patient educational levels have an effect on outcomes and that those patients with at least some college education are more likely to use the EMR and have better outcomes. Income may not be a significant factor. Although there is a significant income difference between groups, the difference was much less when comparing patients losing their graft and those not losing their graft. We suspect that other sociological factors have a role in patient outcomes but more data is required to come to a definitive conclusion.