Introduction
In 2002, Saint Barnabas Medical Center (SBMC) Renal and Pancreas Transplant Program conducted a study and authored a paper on the benefits of using an electronic transplant database. At that time, SBMC transplant clinical data was a paper chart that was several inches thick with dog-eared tabs and pages of physician notes, test results, interpretive reports, and a wallpaper-like flow sheet filled with laboratory values and surgical comments. A paper-based call book was printed on several reams of green bar paper with dozens of handwritten notes and miscellaneous reports tucked in between pages so voluminous that it had to be carried around in a cart. Despite the passage of ten years and unimaginable developments in technology, these same circumstances prevail and challenge transplant centers nationally. Governmental agencies are now pushing for full integration of an electronic medical record (EMR), but transplant centers struggle to properly implement and maximize usage of features to directly impact and improve the delivery of patient care. SBMC Renal and Pancreas Transplant Division began in 1999 to find a computerized solution to transplant data management that would improve their data collection, facilitate daily operations, and ultimately improve the delivery of patient care.

Comparative Analysis – Then and Now
The Renal and Pancreas Transplant Division, with programs at both SBMC and Newark Beth Israel Medical Center (NBIMC), is one of the world’s most progressive transplant programs and the combined volume ranks as one of the largest programs among 240 in the United States. In 2010, the SBMC Division achieved record-breaking volumes - performing 298 transplants including 135 living donor transplants.

Saint Barnabas Medical Center
In 1999, SBMC performed approximately 180 transplants – including 15 pancreas, 5 pediatric, and 160 adult kidney transplants. In 2011, SBMC performed 213 transplants – including 6 pancreas, and 9 pediatric transplants. The 10-year SBMC transplant volume analysis graph illustrates the growth of the SBMC Renal and Pancreas Transplant Division program. The infrastructure and systems have allowed for sustained volume amid increased competition as well as increased regulatory oversight. Additionally, with
decreasing availability and utilization of deceased donor organs, SBMC has succeeded in sustaining a 50% volume of living donor transplants over the past ten years. Since 1999, SBMC continues to share a patient base with five kidney transplant centers and is located within 30 miles of New York City, which has more than 20 transplant centers. SBMC is also in close proximity to several transplant centers in Philadelphia, Maryland, and Delaware. Maximizing the use of the transplant database has allowed SBMC to remain competitive while improving the quality of care to their patient base. The following provides a graphical analysis of a 10-year pediatric transplant volume.

Newark Beth Israel Medical Center
Newark Beth Israel Medical Center (NBIMC), located less than ten miles from SBMC, is faced with the same competition and in 2003, the SBMC and NBIMC centers were administratively combined to benefit from the best practices of SBMC. NBIMC was historically the larger of the two transplant centers and only performed adult kidney transplants. Over time, volume decreased in all areas - patient referrals, evaluations, living donor transplants, and total transplant remained stagnant. SBMC initiated the conversion to share administrative transplant leadership between NBIMC and SBMC and this, coupled with the implementation of an automated transplant database, fostered the program, realizing increased growth in all areas. Volume in 1999 was 50 transplants and had grown
close to 90 transplants per year in 2011. Living donor transplant volume is comparably less than that of SBMC, averaging 20%-25%, primarily due to patient demographics and comorbidities resent in both the potential recipients and donors. NBIMC also implemented a pancreas transplant program in 2005; however, volume remains low – averaging one to two pancreas transplants annually. The following graph depicts the 10-year transplant volume analysis for renal and pancreas transplants at NBIMC.

Each database captures patient data from the point of entry, which is the first call received from the patient inquiring about transplantation, until their death or graft loss.

Both divisions now share the same patient flow, policies, and procedures, as well as electronic data capture. Although the databases are separate and distinct, the process and care mapping is the same for both centers. Each database captures patient data from the point of entry, which is the first call received from the patient inquiring about transplantation, until their death or graft loss. The successes of SBMC and NBIMC have been directly attributable to their ability to efficiently and effectively manage the care provided to their patients as well as their timely communication to both patients and providers. Rather than adapt the computerized systems to the manual processes, both SBMC and NBIMC has strived to integrate systems and practices to improve the quality and timing of care. The by-product has not only been sustained volume but compliant practices amid ever changing regulatory requirements.

Operations and Infrastructure

While SBMC and NBIMC processes are similar, each transplant center is set up somewhat differently – primarily due to staffing levels. The SBMC Renal and Pancreas Division program is comprised of the following departments: Pre-transplant, Inpatient, Post-transplant clinic, Transplant Short Stay Unit, Transplant Research, and a Pediatric Nephrology practice. The patients range from newborn to mid-70s.

In 1999, SBMC received approximately 900 referrals, performed approximately 800 pre-transplant evaluations, maintained approximately 1,200 patients listed for transplant, and accommodated over 6,000 post-
transplant clinic visits annually. The Research Department follows 200 patients who are enrolled in about a dozen clinical trials. The referral base consists of 1,400 physicians and surgeon designees from dialysis units. With all of this activity, it was imperative to integrate transplant data and bridge the span across the patient continuum without a significant increase in resources.

The NBIMC Division consists of a Pre-transplant, Inpatient, and Post-transplant clinic. Patients range from 18 to mid-70s. The division utilizes 5.6 nurse coordinators, 3 medical assistants, 1 data/financial coordinator, and 1 support staff. They receive approximately 350 referrals, perform approximately 250 pre-transplant evaluations, maintain approximately 1,200 patients listed for transplant, and accommodate over 4,000 post-transplant clinic visits annually. They competitively share the referral base of 1,400 physicians and surgeon designees from dialysis units and share administrative leadership with SBMC.

Staffing levels are always under scrutiny – especially when overall transplant volume can fluctuate from year-to-year, yet patient case loads can remain stable or even increase. Each center performed analysis that revealed that their patient case loads, for both patients in the evaluation and listed treatment phases had grown substantially and coordinators were struggling to manage and prioritize cases. As their program grew, patient volume increased but movement of patients decreased as coordinators became overwhelmed and unable to organize the process. Manual systems and strategies were failing to provide them with the necessary guidelines and tools to do their job and effectively assess and manage patients. Additionally, budget constraints did not allow for increased staffing, so the solution was to find a way to work smarter instead of harder by maximizing the database features.

Despite having a database in place, it was clear that in the absence of a clearly defined system, cases remained in the evaluation phase for months and patients who were listed were not reviewed as previously defined by policies and protocols.

Following is a comparative graph of staffing for SBMC between 1999 and 2011:

 OTTR is able to integrate every aspect of patient care management, and through real-time updates and interfacing, the transplant staff has immediate access to critical clinical information necessary to provide the best patient care.

From data coordinator to physician to hospital administrator, OTTR is able to provide information regarding a patient’s medical status at any given moment.
Before and after implementation of the transplant database in 2000, SBMC conducted a time study to measure time spent by transplant staff on nondirect patient care. Transplant coordinators can spend inordinate amounts of time handling paperwork or addressing immediate patient issues which can prevent them from effectively managing their case loads and performing on-going patient review necessary for successful transplantation. It is essential that transplant centers develop a systematic and compliant approach to wait list management and provide the necessary tools to help coordinators move their patients to listing efficiently and maintain a wait list of patients who are ready and able to be transplanted when an organ becomes available.

The centers knew intuitively that OTTR™ supported the patient’s overall management and provided secure, live communication by being able to select indicators to evaluate performance and improve internal procedures. Many centers have nurse coordinators who wear multiple hats and are required to perform many administrative and clerical tasks in addition to the clinical evaluation and care of transplant patients.

By tracking tasks via time studies, we realized that the elimination of paper charting and efficiently managed workflow has decreased admin-
 strore time by 20%. Nurse coordinators reported an increased ability to track patient clinical information and automate correspondence which dramatically decreased clerical tasks, and improved accuracy and availability of patient medical information. In addition, the automation of patient information taken for initial patient referrals expedited the process of scheduling, financial coordination, and retrieval of pre-transplant medical information which facilitated processing for their support staff. Follow-up patient contact and appointment confirmation improved as an indirect benefit. Data coordination has also significantly improved. Monthly performance statistics and requests for clinical information have been automated for periodic review by administration and the transplant team. Any number of factors can be easily selected as indicators on a regular basis – a task that in the past required many hours of manually tracking and sorting data. The following is evidence of the decrease in time spent on administrative tasks the team realized, directly attributable to the automated and streamlined processes the transplant database afforded post-implementation.

Customizing the transplant database so that patient correspondence can be automatically generated to notify patients of pending actions, candidacy, listing and removal has also been critical to successful wait list management – with copies automatically generated to the dialysis unit and primary nephrologist.

OTTR and its automated features have proved to assist in successfully managing patient care and meeting and even exceeding standard requirements by removing rote tasks, automating lists, and reports to facilitate patient tracking while using less man power.

**Automating Accountable Care Throughout the Phases of Transplantation**

So how has the transplant database changed the way we function as a transplant center? SBMC began in October 1999 with the desire to develop the concept of a comprehensive automated patient tracking solution for the delivery of care throughout the continuum of transplantation. SBMC purchased OTTR and customized it to serve their program as a whole, as well as at each point of entry for the patient. OTTR mimics the historical plain paper flow sheets described above by tracking transplant
patients from the patient’s first phone call to the transplant center, essentially making all clinical and demographical information easily accessible. OTTR maintains all patient information including the pre-transplant evaluation, inpatient care, post-transplant follow-up, and transplant research activity. OTTR has enabled the centers to integrate every aspect of patient care management through real-time updates and interfacing so that the transplant staff has immediate access to critical clinical information necessary to provide the best patient care. Additionally, OTTR did not require a substantial investment in new hardware, as we did have some automated systems in place and the standard desktop computers were all that we needed.

OTTR has allowed for full integration of all activities at the transplant center. It has also allowed for analysis, for the purposes of measuring both the direct and indirect benefits realized from the increased coordination of data, to determine if the system was serving the program to its fullest potential as well as to automate the processes and streamline their ability to formulate information and utilize such to increase both their efficiency and efficacy, therefore, profitability.

With OTTR, a comprehensive, multi-user patient care transplant management system, the centers have access to a wealth of searchable, real-time data presented exactly the way the transplant team wants to view it. From the data coordinator to physician to hospital administrator, OTTR is able to provide information regarding a patient’s medical status at any given moment. Data integration is vital for both data accuracy and integrity which lends to improved internal quality assurance, as well as expeditious external reporting. Antiquated manual systems become increasingly time-consuming, translating into less effective and more costly procedures and processes and also lend to increased opportunity for improper posting and errors. Rather than merely replace manual thinking with computer entry, the centers began with a flowchart of the operations and then sought to imagine how innovation could change their operations.

From pre-transplant through post-transplant, there are numerous examples of how OTTR has changed the way the centers operate. Beginning with a standard patient referral, the staff is able to capture critical patient information such as their diagnosis, referring physician, insurance coverage, dialysis unit, etc. This data entry sets off the chain of events to deliver exceptional service to not only the patient, but the patient’s providers. Prior to their appointment for transplant evaluation, vital information

This diagram depicts the process prior to implementation and how and where we could consolidate and work differently to deliver better care with less steps and improved documentation. The elements in red indicate the steps that were replaced with implementation of OTTR.
about testing already completed by the patient and details of insurance coverage for transplantation can be obtained.

Since OTTR promotes the computerization of each patient file, the usage has coordinated efforts to maintain current clinical information. The OTTR system accurately tracks and monitors patients and expedites evaluations and listings, facilitates marketing efforts and referral base communications, and even automates correspondence. Additionally, as per regulatory guidelines and to maintain proper communication with the patient’s providers, documentation is easily extracted from the system and sent to the patient, sent to their unit, and sent to their providers so that all are aware of the status of treatment and evaluation. This not only has improved patient care, but strengthened the clinical documentation and facilitated marketing efforts for the centers. Referral trends can be easily generated by region and by provider to allow issues to be identified as well as opportunities for patient access. An integrated solution assists in all aspects of care and successful centers cannot ignore or isolate these aspects. In other words, you cannot achieve regulatory compliance without meeting the needs of the patient while properly following protocol and documentation requirements. Furthermore, you cannot grow your center if you are not able to provide good care in a timely manner while satisfying the needs of the patients and their providers. Another example is managing 24/7 organ offer call. OTTR enables the utilization of an electronic call book which is updated and stored daily on a laptop computer, available on a secure portable drive as well as remote access, and contains all of the patient’s demographic and medical information for the coordinator to easily search and review to determine the selected candidate’s transplant suitability. Automation must not only provide a means to collect the data, but also the ability to access and transmit this for patient care.

Transplant centers of all sizes struggle to manage patient case loads, maintain appropriate case load ratios, and effectively and efficiently list patients for transplantation. This issue is ever-present and OTTR helped to develop a comprehensive automated approach that assists pre-transplant coordinators to manage both patients being evaluated and those already listed so that they are systematically reviewed. The OTTR methodology facilitates patient listings and ensures that patient information is current and accurate in the event of an organ offer.

Automated screens to facilitate intake and improved communications
with both providers and dialysis units are credited for an increase in referrals by 17% during the first year after going live with OTTR. One way this was achieved was through informational mailings and surveys to providers, an uncomplicated task with OTTR since SBMC can easily produce labels and personalized letters with a few clicks of a mouse. SBMC also developed reports for dialysis centers and referring physicians in order to keep providers informed of their patients and their status. An indirect benefit was the bolstered relationship and additional confidence of their referral base.

![Annual Patient Referrals Evaluated](chart1.png)

Over the past ten years, the systems have also reduced the time from patient evaluation to Status 1 listing per the following:

![SBMC/NBIMC Comparative Analysis of Average Median Days from Evaluation to Status 1 Listing](chart2.png)

Patient care and outcomes are truly at the crux of success in that the centers have also been able to implement procedures that assist in the periodic review of listed patients. With a combined total of over 1,600 patients listed at both centers, there was a need for the ability to systematically identify patients with certain risk factors and monitor their status and to ensure their continued suitability for transplantation.

OTTR not only tracks the referral and evaluation, but also allows for coordinators to view lists of patients that the Transplant Candidate Review can discuss and review, to determine if patients are still viable transplant candidates.
viewing these patients was labor intensive and resulted in listed patients who were no longer suitable.

OTTR generated lists called “Top 10.” On a biweekly basis, SBMC/NBIMC was able to concentrate on the either the top ten patients with the most wait time by blood group or the top 10% of a population and bring cases for team review. The coordinators meet with a physician for clinical review. Charts needing financial or psychosocial review are given to the social work team. These processes enable coordinators to determine which patients can be moved forward and prevent patients from languishing.

OTTR has also customized patient correspondence that is automatically generated to notify patients of pending actions, candidacy, listing, and removal has also been critical to successful wait list management – with copies automatically generated to the dialysis unit and primary nephrologist. Benchmarks for patient listings were established – performance improvement measures the median number of days from Evaluation to Listing and coordinators are reviewed based on a quota for patients listed on a quarterly basis.

OTTR assists in a detailed review of policies and protocols and helped to develop a variety of tools such as lists, reports, worksheets, and benchmarks to help coordinators increase efficiency by streamlining the review process and improve compliance with regulatory requirements. This resulted in consistent and effective operations that delivered improved patient care. When patient data is routinely reviewed and trended through OTTR, it has also allowed for protocol review and revision, such as High Body Mass Index, to give clear guidelines to the team regarding proceeding with a work-up or closing out a case for a patient who is not a candidate at this time.

Data also permitted the ability to measure an improvement in the length of stay of transplant patients. OTTR interfaces helped to analyze morbidity and clinical protocols, which enabled decisions to be made that improved clinical outcomes via changes in medication protocols and courses of standard treatment. OTTR stimulated programmatic changes to inpatient care and patient management which directly attributed to a decrease in the average length of stay and indirectly improved patient outcomes and patient safety.

These are just a few examples that demonstrate how OTTR has helped to
improve the ability to evaluate the patients in any treatment phase on an on-going basis which has not only enhanced the quality of their program, but has also proved to facilitate a more efficient use of their resources as indicated per above. The centers realized that decreased administrative time, increased accuracy and enhanced availability of clinical data, and patient information would enable the ability to fully maximize their program’s capabilities. By-products of this streamlined care also allows for the centers to not only focus on achieving status as a “Center of Excellence,” but be able to easily apply for such by quickly and accurately retrieving data for payor Request for Information (RFI). Obtaining the data is only part of the challenge. If retrieval, collation and analysis of the data is difficult, its value to a center quickly diminishes. OTTR has allowed a paradigm shift in the programs - not only improving the data capture, but also transforming how we view data. While contextual documentation tells the story, OTTR allows for full capture of discreet data fields - making all events easily identifiable. Patient care can be essentially categorized into discreet data fields which enables searchable information on almost and parameter of the most complex of patients. Every event that occurs to a transplant patient is either a Medication, Action, or Diagnosis within the context of OTTR programming. As a result, OTTR can be queried on these data elements to produce an infinite amount of data and provide raw clinical information into statistical analysis or figures for review. A patient’s medical history no longer needs to be pieced together like a puzzle, but rather is assembled and organized to meet standard criteria in an effective charting system.

Regulatory Compliance and the Transplant Database

Ever-changing regulatory requirements are overwhelming in both volume and capacity to implement at every facility. Transplant centers are focused on functional aspects of their programs and try to interpret and incorporate prescribed procedures into their daily operations; however, executing such is an enormous endeavor – one which is difficult to coordinate for both large and small transplant centers. Despite the volume and tenured staff, the centers still struggled with regulatory reporting requirements and compliance. For example, it has become increasingly difficult to manage the completion and submission of forms as per the Organ Procurement and Transplantation Network (OPTN) and the United Organ Sharing Network (UNOS) Data Advisory Committee standards for submission of data collection. Utilizing OTTR to assist in collecting the information required by UNOS in order to expedite forms processing and increase adherence to regulations has allowed a paradigm shift in the programs - not only improving the data capture, but also transforming how we view data.
to reporting guidelines. The increase in availability and access to information has increased on-time reporting by 34%, based on actual forms submitted within the specified due dates.

The process improvements that have contributed to compliant practices are the use of OTTR patient worksheets were created to capture all chart activity in an organized fashion that not only facilitates chart review but also promotes regulatory compliance.

OTTR data allowed for the team to review adherence to internal policies for patient care and also review the observed practices to determine if compliance was being achieved.

In 2007, when the Centers for Medicare and Medicaid (CMS) implemented the Conditions for Participation for Transplant Centers, the centers performed an initial assessment to identify transplant specific regulations. OTTR data allowed for the team to review adherence to internal policies for patient care and also review the observed practices to determine if compliance was being achieved.

Any deficiencies identified resulted in a modification of the policies and procedures and action plans determined and subsequently implemented. As new regulations are presented, administrative team immediately reviews policy, the potential implications on the department, and proposes best practices to be presented to the entire transplant team. Final policy is determined, forms and policies are updated, and the team is educated. Newly implemented policies and procedures are periodically audited and added to clinical pertinence review to ensure sustained compliance. Policy changes are highlighted at monthly staff meetings and team is required to demonstrate annual competency on compliance topics and practices. Incorporating and maintaining statutes into daily practice is the best way to ensure compliance. Staff members are not merely given a directive, but allowed to participate in a coordinated effort to find a workable solution and assist in its implementation.
Checklists and audit processes were created to increase efficiency by streamlining a review process which resulted in consistent and cost-effective operations as well as improved patient care. At specific time points tools were developed to identify missing data and monthly audits were performed. Data is collated and shared with team for educational and programmatic review. Trends and issues are also identified for team review and resolution. Summary reports and data sharing prompt coordinators to methodically and consistently review patient documentation, per protocol, both quickly and thoroughly, so compliance is not neglected.

As new regulations are presented, the administrative team immediately reviews policy and the potential implications on the department and proposes best practices to be presented to the entire transplant team. After final policy is determined, forms/policies are updated and the team is educated. Newly implemented policies and procedures are periodically audited and added to clinical pertinence review to ensure sustained compliance. Policy changes are highlighted at monthly staff meetings and team is required to demonstrate annual competency on compliance topics and practices. Initial use of checklists and audit tools yielded programmatic information used for practical analysis but after implementation, staff are held accountable and counseled/disciplined for inaccurate data collection and/or noncompliant practices.

**Novel Therapies and Database Management**

One notable change is the advent of New Jersey’s only Living Donor Institute (LDI), created in 2006, that promotes living donation as the best treatment option for patients with chronic kidney disease, at both centers. Restructuring of the staff to create the streamlined LDI was enabled by the time gained at both facilities by the decrease in staff time spent on administrative tasks – primarily those that were duplicative, manual or paper-based. The unique one-of-a kind LDI enables the team to forge new opportunities for people who want to donate a healthy kidney to someone in need of a transplant. The experienced team, coupled with well-designed policies, procedures and the database allows for expert care to facilitate expanded options in living donation along with the coordination of the screening process for donors who reside out-of-state or out of the country. The LDI blends the most modern technology and resources with attentive personalized care, to provide comprehensive support for patient and their families throughout the process of obtaining a transplant and maintaining a healthy organ.
The Transplant Service Leader

OTTR enables the team to initially identify patients for these novel options and then facilitates the evaluation, communication, and care for both the donor and the recipient.

We have successfully utilized the OTTR database to be able to offer the following LDI options to the patients:

- Living Related Donor Transplantation
- Emotionally Related Donor Transplantation
- Living Donor Kidney Exchange Program (patients who have a willing living donor that is not compatible to them)
- Altruistic Living Donation
- Program for Incompatible Transplants (ABO and HLA incompatible donor/recipient pairs)

Not only is the medical and clinical care a critical function of the LDI, but just as vital is the organizational foundation for the processes. OTTR enables the team to initially identify patients for these novel options and then facilitates the evaluation, communication and care for both the donor and the recipient. The complex care required for a living donor transplant increases exponentially when the patients decide to pursue an incompatible high risk or paired exchange transplant. Real-time tracking of everything from serologies to donor advocate assessments is the backbone of the service.

Paired Exchange and incompatible transplantation is a medically complex process and the approach to such has been to utilize existing features within OTTR to identify patients for potential paired exchange – not to adapt OTTR to serve as a mechanism for matching. OTTR is the clinical database that houses the data to identify potential candidates for this treatment option so that the team can screen the patients prior to approaching them for education on alternative living donor options. This practice preemptively assesses both clinical indicators and psychosocial status to determine if patient may be suitable to eliminate discussing a treatment that may not be suitable medically or financially for a patient. OTTR has been able to the centers to achieve significant milestones with both of these innovative treatments via a few reports and lists. SBMC and NBIMC collectively performed New Jersey’s first paired kidney exchange. In 2009, the teams participated in a ground-breaking 12-person, paired kidney exchange transplant chain featured in a three-part, multimedia series, “Chain of Life,” by The NJ Star-Ledger. In 2011, SBMC participated in a national chain that transformed 60 lives and resulted in 30 kidney transplants and was featured in a New York Times article in February, 2012. In 2006, The Division became the first program in New Jersey and
among a few in the country to offer patients participation in its Program for Incompatible Kidney Transplants -- an innovative program for ABO and HLA incompatible transplantation that expands transplant options for more patients. The ability to facilitate collaboration between different paired exchange registries and their own centers, increased the opportunity for potential matches and demonstrates the capability of nationally merging pair data. With a national exchange system currently in development, consensus agrees that current match methodologies require review for success and equal matching strength of existing registries. OTTR provides a means to achieve such at individual centers. Without focus on this, centers could have incompatible pairs waiting on the wait list or in various different registries that currently do not communicate or collaborate with each other. OTTRs ability to facilitate elements of paired exchange and incompatible transplants not only increases opportunities for transplant but also decreases patient morbidity and mortality and proves the power of synergistic matching through collaboration.

The divisions are also a leader in the robotic technique for transplant surgery including the world's first robotic-assisted kidney transplant. Again, without the ability to select and assess patients suitable for this innovative treatment through OTTR data, advances could be delayed and thwarted. Supporting clinical progress is a key factor in growth and volume. Not only is the centers able to deliver progressive treatments to patients, the teams can perfect novel therapies and attract patients seeking such.

Barnabas Health is one of a few nonacademic renal transplant programs in New Jersey involved in clinical research trials for patients. Barnabas Health physicians have actively participated as primary investigators for clinical research trials in new anti-rejection drug therapies since 1993. OTTR enables patient selection for potential participation in trials -- by creating lists of patients who meet the set inclusion/exclusion criteria specific to each trial. If the center is searching for potential participants for a trial that converts a patient to a new post transplant medication, OTTR can provide a queried list of these patients by such factors as time since transplant, age, gender, current medication regimen, and diagnoses. This has allowed for the centers to participate in the pioneering research in new immunosuppressive therapies which not only provides for the availability of novel treatments for the patients but also furthers the advances of the field of transplantation globally. The team actively participates in pharmaceutical sponsored research and investigator initiated trials such as steroid avoidance protocols or use of medications new to the market such
as Nulojix®. Health Resources and Services Administration (HRSA) grants have been conducted that is leading research on living donation and effective patient education strategies. Transplant research brings academic and scientific advances but also has netted significant funding to the division. In the past six years alone, SBMC realized more than $1,200,000 in net revenue from transplant research initiatives.

![SBMC Gross Research Revenues Received (cash basis)](#)

**Future Planned Uses OTTR**

Day-to-day operations in all aspects of transplantation continually yield opportunities for improvement and change. In each transplant phase, issues are frequently identified or are presented with a new regulation which challenges the center. The best tool to combat any problem or answer any question is data.

Currently, we tie OTTR to the Performance Improvement Logs as well as all of the quality and logistical improvements. The center is currently working on fast tracking candidate listings, promoting external and internal paired exchange, and implemented an transplant wellness program (BeFit – Barnabas Exercise and Fitness in Transplant) – all of which would not be possible without the use of the OTTR database. A pending application for a National Institutes of Health (NIH) grant which analyzes effectiveness of recipient education and another on medication compliance and adherence would not be possible without the point of service data entry to capture and identify encounters.

The future holds more automation and technology and the center is committed to integrating OTTR into the house-wide EMR rather than replacing it. The disease specific data requirements for transplant are so complex that a standardized system, even with customization, would not be able to serve the team and patients as well as OTTR.
OTTR continues to be a discreet data field system that requires little support and is user friendly and easily customizable. The vision for the centers is directly related to the data yielded from OTTR – for both the short term and long term. The future planning and justification for such is directly related to the historical experience and OTTR provides this critical evidence. Trends, both positive and negative, are easily tracked and identified for both proactive and reactive strategies.

Conclusions
What has the OTTR database taught us and how has it helped to be transformative throughout the years? Intuitively and through experience and observation, the centers recognize that transplant team members can spend inordinate amounts of time handling paperwork or addressing immediate patient issues which can prevent them from effectively managing their case loads and performing on-going patient review necessary for successful transplantation. It is essential that transplant centers develop a systematic and compliant approach to all transplant treatment phases and provide staff with the necessary tools. The benefits of a well defined and coordinated structure have not been limited to increased work efficiency, but have also included an increase in volume, regulatory compliance, survey preparedness, patient satisfaction, and more importantly, patient safety.

The centers also understand that due to strict regulatory requirements, Quality Assurance and Performance Improvement are necessary elements of every transplant program. Regulatory changes have forced each program to focus on high risk, high volume and/or problem-prone areas, in addition to ever increasing data collection. With CMS, The Joint Commission (TJC fka JCAHO), the Department of Health (DOH), and UNOS in mind, the centers utilized OTTR to consolidate efforts and develop a comprehensive and effective automated solution to ensure compliance throughout the continuum of care as well as allowing for insight into their operations to enable us to make changes to improve delivery of care.

The OTTR system has proven that a systematic approach utilizing checklists and audit processes is critical for successful compliance and beneficial to the entire transplant program. The implementation of the automated processes necessitated a reorganization of many transplant elements including regulatory requirements, patient protocols, re-evaluation strategies, referral sources, and patient communications. These changes were
not only identifiable by the use of OTTR data, but also achievable via OTTR reporting and analysis. OTTR data coordination has streamlined workflow and eliminated costs, both in terms of time, duplicative procedures, and potential corrective action.

Auditing OTTR data via reports and lists prompts review, maintains accurate information, fosters compliant practices, prevents staff confusion, and more importantly improves overall patient care. The OTTR periodic auditing introduced a new departmental focus on the clinical care of their patients, in terms of patient safety, patient satisfaction and continuity of care which resulted in a cohesive effort toward program efficiency and efficacy. OTTR checklists and audit tools consolidated efforts to effectively manage data and regulatory requirements makes chart auditing meaningful to all and not another futile task.

As the centers implemented OTTR and customized patient lists and reports to their center’s needs, we began to examine how beneficial its use would be in order to achieve performance improvement initiatives. The methods for measuring the benefits the program has realized were based upon provider, patient and staff feedback, time study, statistical review and retrospective cost analysis. This analysis allowed for the benchmarking and monitoring of a variety of factors that effect both performance and operations and overall it was evident that enhanced data collection through OTTR has a cyclic effect, and as each initiative was addressed, it produced a multitude of performance improvements.

The summary of the experiences also made it possible for the centers measure the effect of improved data collection in terms of profitability. Each of the above mentioned performance initiatives can be directly and indirectly translated into dollar savings as they have increased productivity of staff, decreased administrative overhead, decreased the average length of stay, decreased readmissions, decreased comorbidity, increased global revenues and reimbursement, and increased growth and volume.

Being prepared with OTTR data better equipped the centers for managed care contract negotiations as well yielding the maximum monetary reimbursement. From the ability to produce statistics regarding insurer’s requests for information, payer mix, morbidity, and length of stay, monitoring, and negotiating consistently with payers ensured profitability. After initial OTTR implementation in 200, the center analysis revealed a 65% increase in profitability for their transplant program during the first year.
The results of the analysis conclude that data integration through the use of OTTR has maximized performance while decreasing administrative time, increasing data accuracy and availability and decreasing costs. The savings have sustained or increased since that time, despite rising costs and stricter payor guidelines.

Lastly, the centers have seen that the availability of information that OTTR has afforded the centers has expanded the capabilities and opportunities for the study and analysis of data for the purposes of publication and clinical research trials, both internal and those sponsored by pharmaceutical companies. OTTR data is now verifiable and therefore comparable. Research capacity has benefited since potential trial participants can be easily identified via protocol selection criteria and events can be readily researched and documented for case reporting and monitor visits.

The results of the analysis conclude that data integration through the use of OTTR has maximized performance while decreasing administrative time, increasing data accuracy and availability, and decreasing costs. The cost of the initial investment in OTTR was almost immediately offset by decreased administrative time translates into increased clinical time and efficient and effective operations. The benefit analysis overwhelmingly supports a continued cost verses benefit due to increased performance and program savings, and the prospect of continued improvement of both factors in the future. At the center, OTTR requires very minimal ongoing annual cost – as we share a .5 FTE for administration for both of the transplant centers. The only additional cost after implementation for OTTR has been the annual support fee. OTTR allows for the centers to focus on statistics and indicators that will lead us toward future improvement and assist us in their primary responsibility – patient care. As we continue to enhance the continuum of care by the expedience and availability of clinical information, we will endeavor to improve the patients’ quality of life and physical fitness.