Design and Implementation of a Multipurpose Hematopoietic Stem Cell Information System Based on the Biomedical Research Integrated Domain Model

Thomas Klumpp MD, Dania Beadle MS, Nicholas DeGregorio, Nicholas VanKuren, Joseph Neff, Christine Bonaccorso, John Ulicny MS, Jonathan Wofford, Dolores Grosso DNP, Pierluigi Porcu MD, Mounee Odeh, Neal Flameng MD.

Many hematopoietic stem cell programs capture transplant-related data into multiple data repositories simultaneously, including electronic medical record systems, repositories to support specific research projects, repositories to support specific quality management initiatives, repositories to track and guide the pre-transplant evaluation and workup, repositories to guide stem cell collection and harvest, repositories to support reporting to internal and external regulatory entities, and others. This state of affairs increases costs and decreases productivity as a result of marked duplication of data-capturing effort and poor quality, accessibility, and interoperability of captured data. An important barrier to addressing this issue is the fact that most data repositories in academic medical centers are based on different underlying data models, which constitute a so-called “chasm of semantic despair” with regard to sharing and/or combining data residing in two or more data repositories, both within and between institutions. To address this issue, NCI, FDA, ISO, HL7, and C-DISC have developed a Biomedical Research Integrated Domain Group (BRIDG) Model. The purpose of the BRIDG model is to bridge the multiple chasms of semantic despair that exist between data repositories maintained by basic researchers, translational researchers, clinical researchers, pharmaceutical companies, and government regulators. To our knowledge, we are the first academic cancer center in the world to design and implement a cancer research system based on the NCI-BRIDG model. Important aspects of our implementation derived from the BRIDG model include extensive utilization of the NCI/BRIDG standard data elements, and resolution of the many-to-many relationship between patients and treatment protocols with a patient treatment course instance table. The latter feature provides powerful support for quality assurance of both clinical documentation and patient management by enabling our software to continually compare what is supposed to be happening to each patient, based on the treatment protocol or protocols on which the patient is registered, against what the clinical documentation indicates is happening to each patient. In addition to enhancing data sharing between researchers, we have also begun to use the system to support clinical decision-making, administrative decision-making, and clinical quality assurance.

Introduction/Objectives: Immune effector cell (IEC) therapy is a novel treatment modality which can result in significant toxicities including cytokine release syndrome (CRS) and neurotoxicity. Consistent and thorough clinical monitoring is paramount to patient outcomes. Our goal was to create solutions in our electronic medical record (EMR), Epic®, to support our treating team in monitoring and providing treatment of these complex patients as well to aid in quality data monitoring that is essential for regulatory requirements.

Methods: Monitoring solutions created include a CARTOX10 nursing flowsheet (Figure 1), rounding synopsis (Figure 2), a CRS/neurotoxicity grading assessment tool (Figure 3), and two best practice advisories (BPA) (Figure 4).

Results/Conclusion: The CARTOX10 nursing flowsheet automatically calculates the patient’s CARTOX10 score after the assessment is completed by the nurse [1]. The rounding synopsis is a data collection tool used by the treatment team to complete a review of toxicities and minimizes the amount of time it takes to navigate patients’ charts. The grading assessment tool optimizes and standardizes provider documentation. It features drop-down menus for grading of CRS and neurotoxicity. Documentation with this tool includes discrete data elements that are easy to use and standardized focusing on the organs affected by CRS. The tool can efficiently be carried into the providers’ daily progress notes and tracks the patient’s daily trends. Additionally, this documentation tool is helpful for data reporting purposes and quality monitoring. Our best practice advisories are used to notify providers to avoid corticosteroids outside the context of neurotoxicity or treatment resistant CRS as this has been proven to impact the effectiveness of IEC therapy. In the event that the patient presents acutely to the emergency department during the initial 4-week monitoring period, our second BPA notifies the emergency room staff to notify the treating team and to avoid the administration of corticosteroids. Lastly, our electronic orders include both admission and toxicity order sets. The admission order set features all supportive care and communication orders for staff to monitor patients. The toxicity order set mirrors our treatment algorithm and contains drop-down menus for each grade of toxicity with corresponding monitoring parameters. Utilization of these tools in our EMR has greatly streamlined our documentation, increased our treatment teams’ ability to efficiently make critical treatment decisions in a timely manner as well as meet all data reporting regulatory requirements.
REFERENCES

Direct Data Transfer from SCT Institutional Systems to Agnis/CIBMTR.
Charles S. Martinez BS1, Roy B. Jones MD, PhD2. 1 Stem Cell Transplantation and Cellular Therapy, MD Anderson Cancer Center, Houston, TX; 2 The University of Texas MD Anderson Cancer Center, Houston, TX

Submission of transplant center data to CIBMTR commonly involves manual transcription of center data derived from departmental databases, EMR, or other institutional systems to FormsNetR (72%) or vendor/institutional applications (19%). This transcription method is expensive, error prone, and complex to audit. In contrast, if data were transmitted directly from institutional systems to CIBMTR, substantial cost reduction and improved data accuracy would be realized. Only a very limited number of centers have developed this type of solution which requires design complexities. MD Anderson Department of Stem Cell Transplantation and Cellular Therapy developed a direct electronic data transmission method of this type which has been in continuous use since 2009. More than 21,000 forms have been successfully accepted by CIBMTR. This method requires several components. An audited departmental Oracle database was developed with structured data fields and tables containing almost all specialized granular or derived data required to populate CIBMTR forms, as well as a much larger data set required for departmental research and quality purposes. This data was stored using common data elements (CDE) contained in the Cancer Data Standards Repository (caDSR) of the NCI. EMR interfaces were developed to acquire all HL-7 coded data necessary to contribute to the forms, and from specialized sources such as the HL-A Laboratory and centralized LIS systems. An interface engine with business rule functionality was designed to transform granular data to derived as well as to reconfigure “time stamped” elements to conform to the periodic forms (30 day, 100 day, 1 year, etc) structure used by the CIBMTR. This method has resulted in substantial reductions in data management effort and has served as a stimulus for CIBMTR to consider newer IT methods in the future. Schematic representations for these systems will be displayed on the full poster.

Pilot Study of Home Vitals and Activity Monitoring for Allogeneic Hematopoietic Cell Transplant Recipients
Laura Bernhard RN, BSN1, Julie Coffman RN, BSN2, Jamie Elberston RN, BSN, Brittany Hodgeman RN, BSN2, Jamie Starn RN, BSN3, Stacey Winners3, Victoria Winslow RN, BSN2, Peter Rasmussen MD4, Navneet S. Majhail MD, MS5. 1 Blood & Marrow Transplant Program, Cleveland Clinic Foundation, Cleveland, OH; 2 Blood & Marrow Transplant, The Cleveland Clinic, Cleveland, OH; 3 Blood & Marrow Transplant Program, Cleveland Clinic, Cleveland, OH; 4 Blood and Marrow Transplant Program, Cleveland Clinic, Cleveland, OH; 5 Cleveland Clinic, Cleveland, OH; 6 Digital Health, Cleveland Clinic, Cleveland, OH

Can leveraging fast growing technology assist with improving patient outcomes and streamline workflows at the same time? We piloted remote monitoring technologies to find out. In partnership with our hospital’s Digital Health team, we provided 39 allogeneic blood and marrow transplant (BMT) recipients with a Bluetooth enabled blood pressure, temperature and activity tracking device. After a one-time set up and pairing with the patient’s smartphone, the devices automatically transmitted real-time readings into the patient’s permanent electronic medical record (EMR). The patient’s transplant care team had the ability to view a dashboard with at home readings. Abnormal readings were also delivered directly to their EMR’s inbox. Patients were asked to monitor these readings for at least 100 days post BMT, with the option to continue using the remote devices longer, if desired. Approximately 60% of patients had consistent at home BP and temperature readings recorded in their EMR but only 16% had activity tracking data. We observed the following advantages of remote monitoring: (1) Ease of use by BMT team: The transplant nurse coordinators found it relatively simple to view normal and abnormal at home readings from the EMR. (2) Enhanced patient monitoring: Transplant nurse coordinators