

Leveraging an Information Warehouse to Create Translational Research Environment for Wound Care Center

Rakesh Dhaval, MS¹, Jason Buskirk, BS¹, Jessica Backer, BS¹,
Chandan K Sen, PhD², Gayle Gordillo, MD², Jyoti Kamal, PhD¹

¹Information Warehouse; ²Comprehensive Wound Center

²The Ohio State University Medical Center, Columbus, Ohio 43201, USA

Abstract

In order to discover new biomarkers and therapeutic agents for personalized wound care, a vast amount of clinical information is collected and stored at The Ohio State University Medical Center (OSUMC) Comprehensive Wound Center (CWC). The Information Warehouse (IW) group at OSUMC has developed and implemented a comprehensive data collection network and analysis pipeline to support clinical, translational and outcomes research, and cost analyses that can be converted into clinical best practices for wound care.

Introduction

Chronic wounds such as pressure ulcers, diabetic ulcers, vascular ulcers, etc suffered by Americans result in an annual \$8 billion wound care industry¹. In order to cater to this, CWC along with the IW is facilitating the development of a translational research environment at OSUMC. To the best of our knowledge, our systems based approach to data management and integration that involves a multi-disciplinary combination of expertise, workflow, and computational facilities in the wound care domain is unique and further may provide a unique mechanism for conducting translational research in this critical area. The IW contains several clinical, research, business, education and external datamarts, and provides an environment for correlating disease phenotypes with other clinical data points and underlying genetic causes.

Methodology and Implementation Approach

The experience, expertise and existing methodologies of the OSUMC IW are being utilized in the design and implementation of data integration processes, data marts and data access related to Wound Healing patient care and research efforts. Data sources containing wound information are being transferred, validated, organized and stored in a data mart(s) specifically designed to address these needs. The components of the overall system architecture are as follows: (i) A de-identified Comprehensive Wound Data Mart (WDM) that contains patient information from the National Healing Corporations (NHC) of more than 90 clinical centers; (ii) An integrated identified WDM containing both inpatient and outpatient patient data from the OSUMC CWC and its network clinics. Patient identifiers enable linking of data asso-

ciated with patient from other OSUMC IW datamarts; (iii) A web-based application to collect wound consult information collected at the OSUMC CWC; (iv) Clinical trials data from the OSUMC Local Wound Center comprised of lab data, clinical data and tissue annotation data.; and (v) Gene expression microarray data derived from tissue specimens stored in the CWC tissue bank. Additionally, various open source projects from the National Cancer Institute (NCI) such as *caTissue Core* and *caArray* have been customized and used to capture correlative data elements. The *honest broker* status of the IW enables dissemination of various kinds of de-identified data in accordance with IRB protocols. Data access to the WDM is provided using the standard in-place OSUMC IW data access and Online Analytical Processing (OLAP) tools. A computational server with *SAS*, *R* and *Bioconductor* packages, and backend access to clinical data enables statistical analysis by researchers at the Mathematical Biosciences Institute.

Results and Discussion

The WDM is capable of being integrated with other OSUMC data marts such as Physician Order Entry, Pharmacy, Emergency Visits, Lab Results, etc. to provide a complete view of patient encounters, wound analysis, diagnosis and outcomes. The framework integrates clinical data with experimental genomic data, and provides researchers with the ability to perform complex ad-hoc queries and generate reports across multiple domains. This CWC environment has become a hub for wound sciences and care where basic research meets clinical application and the fundamental principles of wound healing are translated from the genetic level (bench) to the bedside. The current architecture can be utilized for analysis of outcomes, cost, resource utilization, product utilization, new product development, and the development of clinical best practices. Future work includes grid enabling the data services to enable exchange of data both within and outside the institution, and integrating wound image analysis and genomic profiling for healing and non-healing wounds.

References

1. Beckrich K, Aranovitch SA. Hospital-acquired pressure ulcers: a comparison on costs in medical vs. surgical patients. *Nursing Economics* 1999;17:263-271.