A CASE STUDY

Sports Medicine Research Data Technology
Collecting Athlete Injury Information

In 2005, the State of Florida's legislature provided $500,000 to the University of South Florida (USF) to establish a Sports Medicine and Athletic Related Trauma Institute (SMART). A year later, Florida passed another $3 million appropriation for further funding of SMART. The distinguished University was no stranger to research. Prior year research funds topped $300 million. In fact, USF is classified as one of the top 63 public research universities in the United States, and one of the top three in Florida.

The mission statement of SMART is stated as:

> *A comprehensive sports safety program that utilizes a multidisciplinary approach with a team of professionals through the use of education, research, and injury care and prevention thereby elevating the standard of care for the youth, recreational, high school, collegiate and professional athlete.*

"SMART is funded by the Florida Legislature to improve sports safety and reduce needless deaths on the playing and practice fields," says Jeff G. Konin *(Ph.D., A.T.C., PT)* SMART's Executive Director. Dr. Konin also serves on the faculty of USF's College of Medicine and has authored a variety of textbooks for the sports medicine community.

"The purpose of SMART is to identify areas that threaten the safety of Florida athletes and do what we can to change that," said Robert Alan Pedowitz (MD, PhD). Dr. Pedowitz is Professor and Chairman of the Department of Orthopaedics & Sports Medicine at the USF College of Medicine, and he guides SMART from the top.

A key element of the SMART group's strategy was immediately to establish a student athlete research operation from among the high schools of Florida. To that end, SMART was able to gain ten high schools in the Tampa area who agreed to participate. Tampa is the university's primary location, with a student body of more than 45,000 students on campuses in Tampa, St. Petersburg, Sarasota-Manatee and USF Polytechnic.

This research effort was placed in the hands of Karen Liller (Ph.D.), the Associate Dean for Academic Affairs at the USF College of Public Health. Dr. Liller is a tenured full professor specializing in children's injury prevention, with a substantial background in research.

The research project design called for a comprehensive outreach program in which full-time salaried certified athletic trainers would be assigned to each of the ten participating high schools. Barbara Morris (M.S., A.T.C., C.S.C.S., R.O.T.) is the Assistant Director of SMART. She would oversee the SMART Institute Outreach Program which is responsible for providing not only the research duties but the full athletic trainer services coverage and sports medicine care to the local high schools.

At the heart of a scientific research effort is the collection of data necessary for conducting analysis and supporting research conclusions. The approach to collecting data for the USF SMART project was innovative. It was the most in-depth approach known to be implemented in the field of sports medicine in the public schools.

Previous sports injury research projects followed traditional and typical data collection designs. First, they would establish the specific informational elements to be analyzed, and then they would go about collecting data for those pre-determined elements. The SMART approach was ground-breaking and two-part. The SMART approach was first to place full-time athletic trainers at each of the ten high schools participating in the project, and to provide full sports medicine services with those athletic trainers to the entire high school athletics programs. In that way, data collection would be by professionals in their field (the high school athletic trainers) who would be providing first-hand data (their own records), thereby providing extremely high quality data for the research effort. Then, second, the approach was to document all sports medicine activity at all schools for all sports for all athletes, thereby providing an extremely broad amount of data. In other words, the USF SMART strategy was to collect everything, do general research on the big picture, and then do detailed research as injury patterns unfolded and suggested specific areas with more narrow research opportunities.

This was revolutionary in sports medicine for four reasons:

1. It permitted the information to dictate the research topics (a real time scientific process), not the research project dictate the information, similar to clinical trials,
2. It permitted conducting multiple research investigations simultaneously, a parallel research project structure, instead of a series structure in which one project gets done before another begins, stringing them out over long periods of time and delaying results,
3. It allowed for collecting and retaining more information than might have been collected under a more narrow traditional project design, and
4. It enabled retrospective analysis *(looking back at historic data with new ideas that were not considered or perhaps warranted under this project initially)* which could produce additional data of relevance, precluding the need in some cases to launch new research efforts, thereby reducing the response time for results and the costs of further research.

The primary initial SMART task was to put in place a data collection system that would fit the athletic trainers' daily roles as they went about the practice of their profession uninhibited by the research project overlay. It is well known that the athletic training profession is demanding and leaves little time for ancillary roles such as research data collection projects, so the data collection process had to be smooth and not disruptive. But there was little time to get such a system in place for the 2007-2008 school year, and SMART needed to find something that would be ready for their needs right "off the shelf" and that could be easily and quickly learned by the staff.

Having reviewed a number of data collection process possibilities, SMART's attention focused upon one developed by Premier Software, Inc. called Simtrak™ Mobility (Simtrak™). The Simtrak™ software had been established years earlier, and was widely

used in professional sports, with many collegiate and high school implementations as well. But, of particular interest to SMART, there were special features of this software system that fit well into the project design. First, the software was PC-based, which meant it could be operated on servers controlled by USF/SMART, thereby maintaining better data security, loss prevention, and access control than available with a web-based system. Second, this particular software system had a unique ability to tie together remote locations (the ten high schools that were not on a common network) through its proprietary data synchronizer feature. Third, the software could be implemented immediately with ISS (injury surveillance system) features already built in for research data collection. This meant there would be no need for duplicate documentation. The software could double as both the medical information system and the research tool simultaneously with single entries by the athletic trainers. Fourth, the Premier Software company was willing to do training on site on short notice, and Premier Software was willing to do additional customization of the system reporting features to tailor database assembly and reports to specific SMART requests. In the end, SMART selected Simtrak™ and began a fast-track implementation to be ready for football just a few weeks away. As stated by Dr. Liller, “Our collaboration with Premier Software has been invaluable not only for the design of the software but for their willingness to be available round the clock for answering questions the ATCs and researchers had about the data collection process.”

The success of the project depended heavily on the efforts of the ten athletic trainers at the high schools. It was very important that they were motivated to make consistent and complete documentation entries. The software that was chosen was designed to make their roles as easy and time-efficient as possible. But, there was considerable additional effort made to provide even more fit and convenience for them. As a result, said Dr. Liller, “The ATCs have embraced their roles as data collectors with much diligence and enthusiasm. They are very conscientious and eager to make our project successful.”

There were training sessions at the beginning and along the way in the project, so that the athletic trainers could first gain a familiarity with the software and then progressively further develop their expertise as they grew into the research project. These group-wide training sessions were conducted over an online connection between a remote instructor and a conference room outfitted with internet presentation technology. Then, there was additional software setup to better enable the athletic trainers to make their entries accurately with minimal effort. For example, their entries were cast in the software as pull-down field choices, logical checkbox selections, or data entry fields. This kind of “automation” of their entries would reduce the potential for error as well as speed up data entry, saving valuable athletic trainer man-hours. Furthermore, there were prompts set up in the software displays to help speed the athletic trainer’s eye recognition of fields and field purposes**.**

No coding was needed for the project because the software already had built into it all the routines and capabilities to conduct a full injury surveillance project on this or a greater scale. This was a huge cost savings to the project.

As a testament to the successful use of the modern technology throughout the project, the entire technology implementation and operation was conducted remotely. The delivery of systems, insertion of prompts and pull-downs, as well as training, various and numerous planning meetings, and ongoing support functions were all done remotely, without onsite visits, through internet connections. This was a success beyond that anticipated at the beginning of the project. The impact of such fully remote integration was to greatly contain costs, due to the elimination of travel expenses and per-diem consulting fees for the days of travel.

A noteworthy feature of the project was that it called for measuring participations (or exposures), the number of times an athlete participated in a possible injury producing event (practices and games). The purpose of this data was to permit measuring injury rates as a function of individual participations or exposures rather than simply games played or seasons played. The software did not have this data collection feature in it, so it was retrofitted by Premier Software. There were four fields added to the software that could accept additional information. Three of them were used for: number of injuries, number of games, and number of practices. The fourth was reserved for future use. These new fields were key. In fact, as Dr. Liller states, “One of the important things of the injury registry will be to look at the athlete's exposure to the sports to determine true risk. With this information we can make a difference through the development of targeted intervention programs that will be evaluated for efficacy in reducing injuries and their outcomes.”

Furthermore, there were three dozen variables (fields for additional data) set up in the software by Premier Software, Inc. for the project, which then called for almost 1000 pre-determined selections as available responses/values for those new variables. These were added following a detailed literature review by Dr. Liller with supporting literature review by project staff member Siwon Jang, and with expert input from Dr. Konin, Barbara Morris, and each of the ten athletic trainers. These new variables focused on injury mechanism, activities, and similar descriptions of the injury related action and physical circumstance. “The injury mechanism as it relates to a sport activity is one of the main things we added that we feel is unique,” says Dr. Konin. “Other research data collection processes capture mechanism of injury in terms of inversion, eversion, and so forth, but ours captures in detail the sport specific activity such as dribbling, shooting, or rebounding. This will greatly help the project identify what activity within each sport contributes to injuries.”

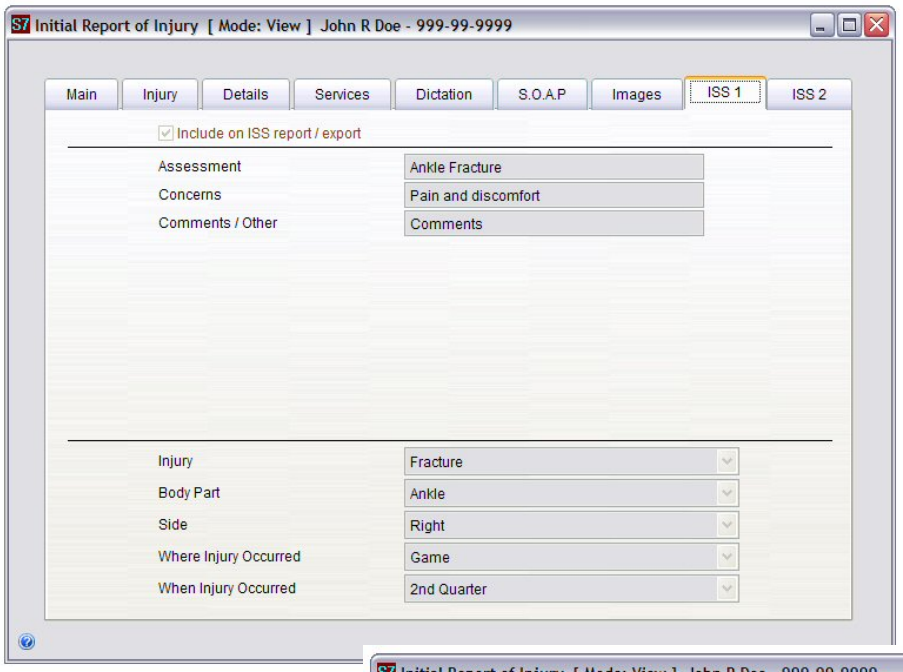
Last, the software developer wrote a special supporting data consolidation system for the project research team. The purpose and operation of this system was to simplify the assembly of the data and its preparation for statistical analytical processes. Through a series of rules and filters, it produced two spreadsheets. One contained exposure information, the other injury information. Each sheet included the data from all ten high schools, consolidated into one data set.

Once again, the purpose of this employment of specialized data technology was for streamlining and error minimization. The team member doing the statistical review and analytical handling of the data would have only to double-click an icon on their computer, select a season from a pull-down list, and click a button labeled “Process”. Those simple mouse clicks instantly produced the two spreadsheets. The spreadsheets

could then readily be imported into the widely used SPSS® software for state of the art statistical study.

At the end of the first year, the project leader made an overall review of the athletic trainer research roles and informational practices, decided on some adjustments based on what was learned about the process of collecting the data during the first year, and implemented those improvements into the second year of the project's operation.

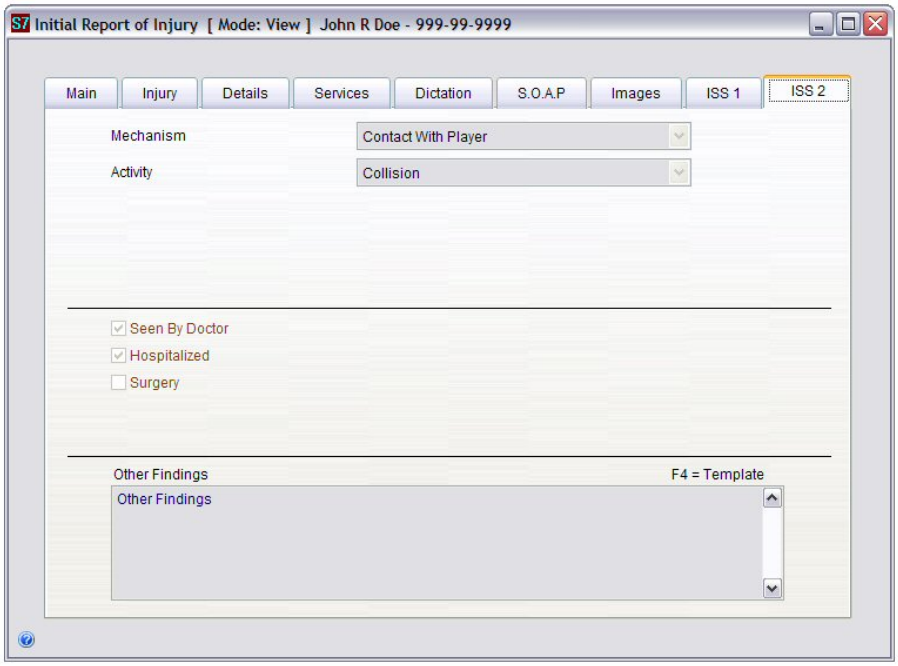
ADDENDUM



In most sports injury research projects, only the de-identified data would be collected at the research project level, though the complete athlete and injury health information would be entered by the athletic trainer in the overall documentation software.

To facilitate such research projects, the Simtrak™ Mobility software provides two input screens for de-identified injury research data.

To the left and below are two Injury Surveillance System (ISS) screens from within the Simtrak™ Mobility software.



The athletic trainer normally would use these screens to submit injury data when serving on a research project team.

In the extensive USF SMART project, these screens were used to their fullest. And, additional software setup was performed to enable a unique and broader recording and reporting of even more de-identified data from other locations within the Simtrak™ Mobility software.