Knowledge Engineering for Decision Support in Osteoporosis

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Summary: There are many barriers to the diagnosis and treatment of osteoporosis. They include process barriers, such as workflow and organization, and information and cognitive barriers, such as the saliency of the problem and suboptimal organization of information relevant to the treatment decision. Specific cognitive barriers to identifying and treating osteoporosis include failure to identify that a patient is at high risk for a fragility fracture, not knowing what level of risk justifies treatment, and uncertainty about when to initiate treatment. These are some of the reasons why, despite the high burden of osteoporosis, fewer than 25 percent of veterans who are at risk for fracture are currently treated for osteoporosis.

While computerized clinical decision support has the potential to improve appropriate treatment rates by identifying patients at risk, such systems are often poorly developed and may not reflect physicians' models for conducting clinical tasks or preferences for structuring tasks and navigating systems, thus reducing the system's optimal impact.

The overall goal of this project is to develop robust knowledge for supporting accurate osteoporosis-related treatment decisions to address these information barriers. Dr. LaFleur and her team are using electronic and survey data to create a new risk-stratification rule. This rule will adapt a currently accepted risk-stratification rule and the World Health Organization's treatment guidelines for the veteran population, identify information constructs that are important to clinicians for supporting the correct treatment decision. The findings will inform the development and pilot testing of a new tool.

While this project is focused on a specific clinical topic and setting, its approach to providing decision support at the point of care by integrating treatment guidelines, characteristics of the target population, and information needs of clinicians, could become a decision support template for other diseases and conditions.

Specific Aims:

- Create and validate a Veterans' Affairs (VA)-specific risk-stratification rule for fragility fractures. **(Ongoing)**
- Incorporate the risk-stratification rule into a computerized decision support system for osteoporosis treatment. **(Ongoing)**
- Pilot the decision support tool for initiating osteoporosis treatment. **(Upcoming)**

In addition to the research project goals, Dr. LaFleur will further her long-term career goal of identifying and preventing drug-therapy failures in chronic disease populations. Funding from this

Mentored Clinical Scientist Research Career Development Award will allow Dr. LaFleur to advance her skills in health services research through structured coursework, regular seminars, and mentoring in the fields of clinical informatics, decision modeling, epidemiologic methods, and statistical approaches.

2011 Activities: The development of the risk-stratification rule was almost complete during the year pending the addition of Medicare data to the dataset. The dataset currently combines variables related to fracture risk from three Veterans Affairs (VA) datasets: 1) the Medical SAS Dataset (all inpatient and outpatient services provided to veterans); 2) the Corporate Data Warehouse (clinical patient care information from VistA, the VA's electronic health record); and 3) the Pharmacy Benefits Management Dataset (records of prescriptions dispensed to veterans to identify drug exposures related to risk). The model incorporates outcome data from the Medical SAS dataset for fractures that were treated within the VA system, and outcome data from the Medicare-VA dataset to capture fractures that were treated outside the VA system. It took several months to receive approval from the Centers for Medicare and Medicaid Services (CMS) to access and integrate Medicare data into the tool. At the end of the year, Dr. LaFleur was still waiting to receive the Medicare data. During the year, she developed the preliminary models to validate the rule that does not contain the CMS outcomes, including models for bone mineral density, body mass index, smoking history, and family history of fracture. Once the CMS data are integrated into the models, Dr. LaFleur will calibrate the rule. This involves surveying veterans on risk factors for fracture using an existing survey that the project team adapted to assess risk factors for osteoporosis.

Even though the development of the rule is not complete, Dr. LaFleur has been able to begin the second aim, which involves conducting focus groups with providers and developing a series of case vignettes to identify risk factors and fracture risk constructs that are associated with osteoporosis treatment. These fictional patient cases are designed to include information that clinicians would typically have at their disposal when seeing patients. This will allow Dr. LaFleur to ask providers questions about the kinds of clinical information that are most important to help them make decisions about osteoporosis. The study team is scheduling focus groups for three sites, two VA and one non-VA site, to be conducted in early 2012.

One change from the original grant proposal was the addition into the rule of bone mineral density screening. While bone mineral density screenings are predictive of fracture risk, they are not codified anywhere in the electronic data. However, Dr. LaFleur and her team used natural-language processing software to integrate these screenings into the model as a variable. Dr. LaFleur presented this process at the American Society of Bone Mineral Research meeting in September 2011.

Preliminary Impact and Findings: This project has no findings to date.

Target Population: Adults, Osteoporosis, Veterans

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
