

## TOPICS IN PATIENT SAFETY

**VOL. 9, ISSUE 4  
JULY/AUGUST  
2007**

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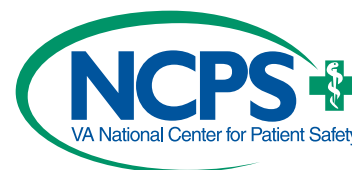
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TIPS is published bimonthly by the VA National Center for Patient Safety. As the official patient safety newsletter of the Department of Veterans Affairs, it is meant to be a source of patient safety information for all VA employees. Opinions of contributors are not necessarily those of the VA. Suggestions and articles are always welcome.

Thanks to all contributors and those NCPS program managers and analysts who offered their time and effort to review and comment on these TIPS articles prior to publication.

# TiPS



## VA Patient Safety Professionals Speak Out

*By Joe Murphy, APR, NCPS public affairs officer*

VA patient safety managers and officers spoke positively about their programs and hopes for the future of patient safety during their annual national conference, held in Arlington, Va., March 20-22, 2007, and sponsored by NCPS.



**Pam Nichols**

"Through the root cause analysis process, we have been able to make some very positive changes in several areas," said Pam Nichols, PSM, VAMC Chillicothe, Ohio.

Focusing on a system approach to problem solving, changes were made to the facility's falls

prevention program. Nichols said a review of incident reports helped to establish falls patterns and trends, but because of the importance of falls reduction, more was required. "We recently implemented pressure-sensitive alarms to assist the patients and staff to identify where the falls occur," she noted, "and to prevent them."

Nichols sees root cause analysis as fundamental to the future of patient safety and hopes that it becomes "second nature" to medical professionals: "So that when something happens the first thing that they think of is, 'Oh, what we need is to use root cause analysis to look at this.'"



**Tanya Kotar**

When looking for ways to improve the program at her Milwaukee, Wis., facility, Tanya Kotar, PSM, spoke of the importance of taking a personal approach. Kotar, PSM at the Clement J. Zablocki VAMC, started a thank you card program to

promote close call reporting. "I think that close calls are very difficult to get out of people sometimes because they don't feel that they are as relevant as an adverse event, per say," she said.

Developing material for the patient safety portion of mandatory educational fairs held at the facility was one way to get the message out, but lacked the kind of direct involvement that might encourage more reports. "I personally would write a little thank you note to the reporters, visit them in person, and hand them the little VA patient safety pin that they could wear and show their employees," noted Kotar.

She made it a point to offer the card and pin when coworkers were present. She gave one such presentation to a circulating nurse while members of his OR team looked on. "I gave him the pin and the card," she added. "You could tell he was tickled by that."

Her emphasis is on encouraging staff to understand that close call reporting is not part of an old-style punitive system, but part of the VA's Culture of Safety, based on prevention, not punishment. The results have been telling, Kotar stated: "We've seen in the last fiscal year our close call reports more than double. And we are already on pace to double last fiscal year."



**Craig Renner**

Another aspect of the VA's Culture of Safety – moving beyond the name and blame culture of the past – was addressed by Craig Renner, PSM, William S. Middleton Memorial VAMC, Madison, Wis.

He is working to create an environment where systems, not people, are the center of facility patient safety efforts. He characterized it as an environment "where

**Continued on back page**

# Broadening the Utility and Understanding of Patient Safety Data

By Aartee Ignaczak, NCPS program analyst, and Scott McKnight, NCPS biostatistician

Since fall 2006, NCPS has been combining its four-year-long Primary Analysis and Classification (PAC) project with a new Natural Language Processing (NLP) tool to extract and organize information from the NCPS Patient Safety Information System, commonly known as “SPOT.”

We receive approximately 100,000 reports annually via SPOT and conduct between 125-150 database searches per year that lead to formal analyses provided to the field. The way we have researched our database in the past has proven extremely valuable, but we have long planned to institute a much more robust research tool. Our increasing ability to effectively search SPOT significantly benefits patient safety staff, because requests for information on specific issues are being addressed using a much more effective and thorough method.

## Background

Though NLP is not a new science, we believe its application at NCPS represents an important new approach to using and understanding patient safety data. NLP is a subfield of artificial intelligence and linguistics. It studies the problems of “training computers” to understand natural human language.

The reporting system at NCPS was designed to facilitate the VA’s root cause analysis (RCA) method to analyze patient safety events at VA facilities. A major byproduct of this is a large amount of natural human language text data recorded from the multidisciplinary team analysis of events. Of all the information that can be collected, we believe the text from an RCA analysis is the most valuable data for NCPS staff to retrospectively understand and reconstruct each event.

When trying to capture this information for retrospective analyses, NCPS has constantly resisted what is known as “granular taxonomies,” or highly detailed categorization structures. We believe the use of granular taxonomies at hospitals distract from the proper analyses of events. Such

“check box” information obtained from granular taxonomy classification is not sustained well over time, making it difficult to reconstruct and understand the patient safety system issues.

Instead, we use PAC, a high-level, non-granular, classification developed by NCPS (available to VA employees: <http://vaww.ncps.med.va.gov/dialogue/frp/pacglossary.pdf>). We use it to categorize all RCA cases, with respect to the following:

- Type of Event
- Location of Event
- Activity/Process Surrounding the Event
- Actions
- Outcomes

The PAC design combines an acknowledged necessity for NCPS analysts to read all RCA cases, with an efficient and reliable minimalist taxonomy to “tag” all cases in the RCA database to the above categories. This allows an automated high-level separation of RCA cases into those more relevant, versus those less relevant to patient safety issues being studied.

Using PAC, RCA cases can be separated according to desired topic specifications, and the language of these cases can be determined through NLP, which can then create models for predicting other cases that most likely belong to this “family” of cases.

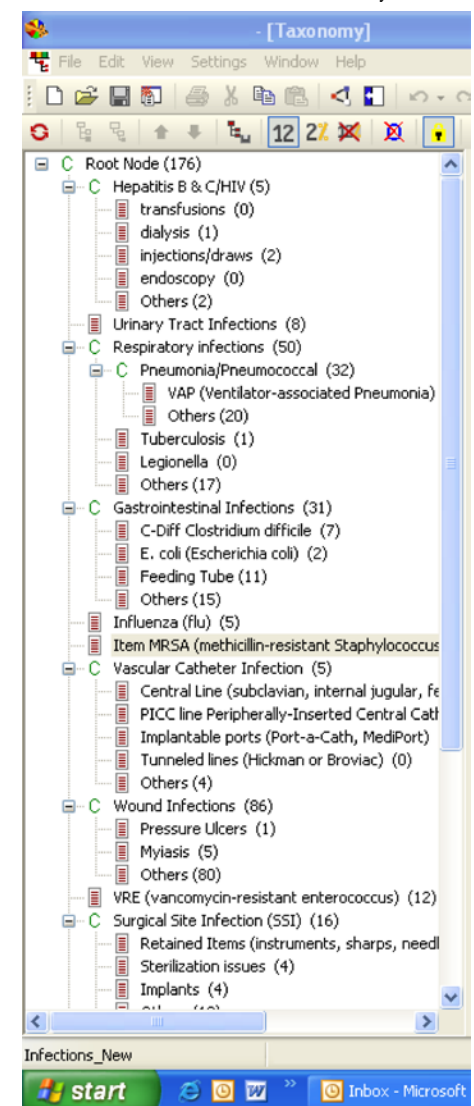
The text fields used in PAC, and from which NLP can be “trained,” are listed below in the order of the amount of ancillary information usually contained in these text fields:

- Description of Event
- Flowchart
- Root Causes
- Actions
- Outcomes

The ancillary information is important to human analysts for a complete retrospective reconstruction and understanding of an event, and is not being discouraged here. But for the NLP software program, a large amount of ancillary information can hinder its learning ability. Fortunately, with five different text fields to learn from, it can be trained to consider words and

phrases that are repeated among the five different text fields as most relevant to an event, while considering other words/phrases as background or medical history.

Using the PAC categorization of thousands of reports in SPOT to initially identify families of events, NLP dissects the language of the five text fields of these cases and creates five different models for predicting the strength of relationship for cases yet to be received at NCPS. A final logistic regression model then uses the predictions from the five NLP models to determine a final classification model. Then, for any new



Screen Shot 1. An example NLP “taxonomy” for creating a customized categorization of “Hospital Acquired Infection” cases.

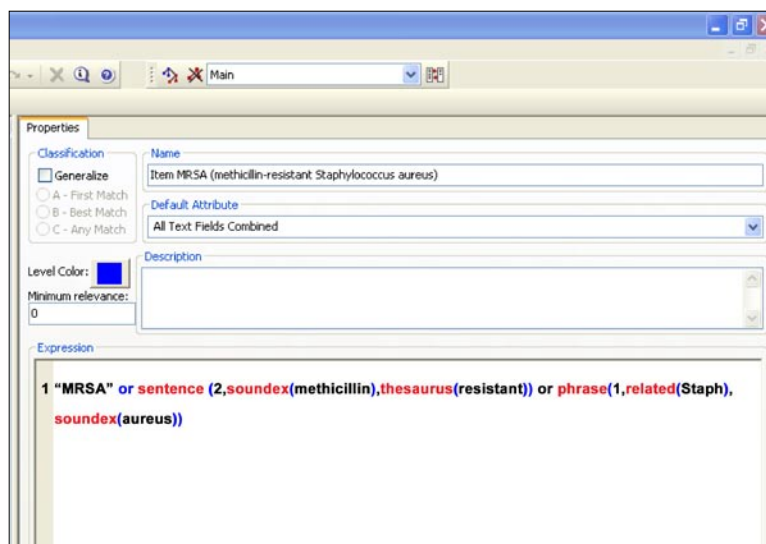
case added to the database, NLP dissects words and phrases from its five text fields and calculates the five probabilities for belonging to the family. These five probabilities are plugged into the final logistic regression model to arrive at a final probability prediction of the case's relationship to the family of events. The greater the number of text fields that agree on the classification, the greater power the final logistic regression model has in determining a correct final classification. Clearly, one way to increase agreement among the five text field models is to have relevant information repeated across each case's five text fields. In this way, a common thread is consistently described throughout the RCA, so that important ancillary information is retained for human consumption without compromising NLP learning capabilities.

Once a final model of classification is determined from NLP, that model can be applied to Safety Reports that do not receive RCAs. In this way, NLP provides a valuable search and discovery tool for close call reports, which previously had not undergone any categorization process.

## Application

NCPS users can respond to data queries by applying a number of NLP modeling tools. Some of the more familiar tools are linear classification, neural networks, decision trees, case-based reasoning, and logistic regression. However, NLP software provides much more than the modeling utility to mine the huge SPOT database.

Prior to the use of NLP software, conducting a focused search of the SPOT database was time intensive, prone to human error (due to the amount of textual data that an analyst had to explore), and usually hard to reproduce when necessary. The inclusion of NLP software into the analyst's repertoire has enhanced exploration capabilities and overall efficiency, while also capturing



Screen Shot 2. Example of search criteria of taxonomy creation. "Sentence" enables the user to search for multiple words in a specific sentence. "Related" enables the user to match words that are hyponyms of the selected word. "Soundex" enables the user to match words that sound similar to the selected word, regardless of spelling.

the logic of a search for future reference, reproduction, and for updating a project.

These are two types of search requests frequently received by NCPS:

- Requests to uncover patient safety "themes" from a given group of cases.
- Requests to find other events similar to a specific known event.

The first type of search request can be fulfilled by NLP phrase and/or keyword extraction functions. These two functions identify language that is frequently used within the five text fields mentioned above, and calculates a comparison measure by matching words/phrases that match or closely match between cases. Additionally, the frequently identified phrases and keywords can be output as function statements, which can then be applied to other case sets as independent variables in the NLP models described above.

The "Dimension Matrix" NLP module is particularly useful when combined with PAC categorization and other SPOT database fields, such as VISN, station numbers, and date fields.

For example, hospital acquired infection (HAI) is a PAC event category. An analyst can use the Dimension Matrix to quickly create a data set of all RCA events that meet any union and intersection criteria for location, event type, activity, plus other SPOT fields, such as SAC scores.

An NLP "taxonomy" module (See Screen Shot 1) can then be used to create a real-time customized categorization hierarchy of the HAI cases. The analyst can use the taxonomy function to probe further into this data (see example, Screen Shot 2), creating "parent" categories: MRSA, urinary tract, respiratory, etc. Further, the analyst can create "children" subcategories (e.g., mode of transmission [injections/draws]; type of infection, tuberculosis, or pneumonia). Such child categories can lead to further "offspring" and be subcategorized into ventilator-associated pneumonia and other categories. This process can continue until all cases are accounted for in the taxonomy – and their stories revealed. The level of detail is at the discretion of the user.

## Conclusion

This new NLP technology constitutes a significant new aspect of our systems approach to problem solving. It is of direct benefit to patient safety staff because NCPS program analysts are now able to provide significantly more detailed search results via the modeling capabilities of the NLP software. Additionally, they can provide search results from the largely unexplored data set of Safety Reports that do not receive RCAs. The robustness of these search results is dependent upon the quality of the narrative text submitted in an RCA report, and is helped when RCA recorders repeat the most pertinent information across the text fields in a consistent manner.

**VA employees can request searches by clicking on the 'Request National RCA Database Search' link on the NCPS website ([vawww.ncps.med.va.gov/contact.html](http://vawww.ncps.med.va.gov/contact.html))**



# VA Patient Safety Professionals Speak Out

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we can engage front-line people to get ideas from them and then come up with actions where you get a good fix on the problem.” Once a review of a care system is complete, he said the next important step in a systems based approach to problem solving is to “standardize a process to make it easier for everybody to do it the same way.”

When asked about her idea of an ideal patient safety culture, another PSM noted: “My idea for a patient safety culture is that it is more than a patient safety program. It is a way of life for all who enter the doors, be it staff, visitors, or patients.”



Jimmie Davis

Emphasizing the importance of moving beyond a culture of finger-pointing and blame, Jimmie Davis, PSM, VAMC

Birmingham, Ala., added that each employee must feel that attention can be drawn to patient safety concerns without fear of punishment or retribution, “and that they have the freedom and power to do so.”

The acting PSO for the VA Capitol Health Care Network, Vivian Mathews, spoke about how she has worked to focus RCA teams on taking a systems approach to problem solving. “I continuously say, ‘Remember, this is



Vivian Mathews

not about blame. This is not about what we found that the nurse did, or what the physician did, or anesthesiologist did – this is looking at *why* this happened.

Was it staffing? Was it because they were tired?’ So I continuously rein-



Anna Louise Scandiffio

force, ‘It’s not a blame system.’”

Anna Louise Scandiffio wants to see teams so enthusiastic and involved in the RCA process that they have “heated discussions;

dynamic exchanges.” She also believes that leadership support for patient safety activities is a critical element in program success. As PSM for the VA Maryland Health Care System, Scandiffio outlined what she believes is a simple way for senior managers to encourage participation in root cause analysis teams. After a presentation to leadership concerning the results of a root cause analysis: “Your leadership and the director or the chief of staff turns to the team that’s presenting and says, ‘Thank you for a good job.’ And they walk out of there so proud at what they have accomplished, knowing that not only have they accomplished something great for



Mary Ann Hamman

the VA, but also great for patients and patient safety.”

When Mary Ann Hamman, PSM, Montana Healthcare System, Fort Harrison, was asked what she took the most pride in during the past year of her program, she noted it was watching root cause analysis teams’ actions implemented.

“I think the thing that I am most proud of is that the aggregate teams were able to identify strong actions and

those actions have come to fruition this past year,” she said.

For instance, a medication team identified that the pharmacy needed an automatic dispensing machine and it was purchased. The falls team identified that the facility needed new beds in certain units that had alarms that would sound when a patient was getting up from the bed. “The last shipment was delivered in January of this year, so we have all new beds on the med-surg unit,” said Hamman. And the process isn’t over: “We are looking at obtaining new beds for our nursing home.”



Kent Wagoner

Kent Wagoner, PSM, VAMC Martinsburg, W.V., sounded a theme that had been repeated by all who were interviewed.

Not only is it at the heart of patient safety – it is one that can only grow in importance in the continued development of the VA’s Culture of Safety: “It’s not just one person’s responsibility, it’s everyone’s responsibility. That includes all employees, no matter what their position.”

## Things to Consider

- Recognize representatives personally for their valuable efforts.
- Stronger systems based fixes are critically important because they go further than training and policy.