Pennsylvania Department of Health
Final Performance Summary Report
Formula Grants

Overview of the Health Research Project Performance Review Process and Criteria

An applicant that receives a health research grant under Tobacco Settlement Act / Act 77 of 2001, Chapter 9, is subject to a performance review by the Department of Health upon completion of the research project. The performance review is based on requirements specified by Act 77 and criteria developed by the Department in consultation with the Health Research Advisory Committee.

As part of the performance review process, each research project contained in a grant is reviewed by at least three experts who are physicians, scientists or researchers. Reviewers are from the same or similar discipline as the research grant/project under review and are not from Pennsylvania. Reviewers use the applicant's proposed research plan (strategic plan), the annual progress report and final progress reports to conduct the review. A grant that receives an unfavorable performance review by the Department may be subject to a reduction in funding or become ineligible for health research funding in the future. The overall grant evaluation rating is based on the ratings for the individual research projects contained in the grant.

This performance review report contains the outcome of the review for the grant as a whole (outstanding, favorable, or unfavorable), strengths and weaknesses of each research project, as well as recommendations for future improvement.

The following criteria were applied to information submitted by research grant recipients:

- **Criterion 1 - How well did the project meet its stated objectives? If objectives were not completely met, was reasonable progress made?**
  - Did the project meet the stated objectives?
  - Were the research design and methods adequate in light of the project objectives?
  - Consider these questions about data and empirical results: Were the data developed sufficiently to answer the research questions posed? Were the data developed in line with the original research protocol?
  - If changes were made to the research protocol, was an explanation given, and, if so, is it reasonable?
  - Consider (only for clinical research projects) the extent of laboratory and clinical activities initiated and completed and the number of subjects relative to the target goal.
  - Were sufficient data and information provided to indicate or support the fact that the project met its objectives or made acceptable progress?
  - Were the data and information provided applicable to the project objectives listed in the strategic research plan?

- **Criterion 2 - What is the likely beneficial impact of this project? If the likely beneficial impact is small, is it judged reasonable in light of the dollars budgeted?**
  o What is the significance of this project for improving health?
  o Consider the value of the research completed towards eventual improvement in health outcomes.
  o Consider any changes in risk factors, services provided, incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of impact and effectiveness of the research being conducted.
  o Consider any major discoveries, new drugs and new approaches for prevention, diagnosis and treatment, which are attributable to the completed research project.
  o What are the future plans for this research project?

- **Criterion 3 - Did the project leverage additional funds or were any additional grant applications submitted as a result of this project?**
  o If leveraging of funds were expected, did these materialize?
  o Are the researchers planning to apply for additional funding in the future to continue or expand the research?

- **Criterion 4 - Did the project result in any peer-reviewed publications, licenses, patents, or commercial development opportunities? Were any of these submitted/filed?**
  o If any of the above listed were expected, did these materialize?
  o Are the researchers planning to submit articles to peer-reviewed publications, file for any licenses, or patents or begin any commercial development opportunities in the future?
  o Consider the number/quality of each.

- **Criterion 5 - Did the project enhance the quality and capacity for research at the grantee's institution?**
  o Were there improvements made to infrastructure?
  o Were any new investigators added or were any researchers brought into the institution to help carry out this research?
  o Were funds used to pay for research performed by pre- or post-doctoral students?

- **Criterion 6 - Did the project lead to collaboration with research partners outside the institution, or new involvement with the community?**
  o Are the researchers planning to begin any collaborations as a result of the research?
  o For clinical research only: consider the number of hospitals and health care professionals involved and the extent of penetration of the studies throughout the region or the Commonwealth.

Overall Evaluation Rating

An overall evaluation rating is assigned to each research project. The rating reflects the overall progress the project attained in meeting the stated goals and objectives. The rating is based on a scale of 1–3, with 1 being the highest. An average rating is obtained from all the reviews (minimum of 3) of each project and is the basis for the determination of the final overall rating for each project as follows:

1.00 – 1.33 = *Outstanding*
1.34 – 2.66 = *Favorable*
2.67 – 3.00 = *Unfavorable*

The grant level rating is an average rating from all projects as above. The numerical rating appears in parentheses for the grant and each project in the ***Overall Grant Performance Review Rating*** section of the report.

Overall Grant Performance Review Rating

Grant Rating: Favorable (2.00)

Project Rating:

Project	Title	Average Score
1084901	Rare Genetic Variants in Patients with Abdominal Aortic Aneurysm	Favorable (1.67)
1084902	The Natural History and Comparative Effectiveness of Electronic Alerts in Geisinger Health System's Electronic Health Record	Favorable (2.33)

Section A. Project Evaluation Criteria

Criterion 1 - How well did the project meet its stated objectives? If objectives were not completely met, was reasonable progress made?

STRENGTHS AND WEAKNESSES

Reviewer 1:
A strength is that the project appears to have met its stated three objectives, although it is not clear based on documentation provided what the target number of subjects to sequence was at the outset. The PI switched the protocol from whole exome to whole genome sequencing for the last 8 subjects after exome sequencing 12 subjects. The justification for this switch was a decreasing differential cost between the two options. The whole genome sequencing work was subcontracted out to Complete Genomics. This switch did lead to some delays in generating and analyzing the second set of sequencing data and invariably decreased the overall sample size that could have been examined through exome sequencing alone. The value of producing whole genome sequence data is questionable at this point in time for complex traits despite decreasing costs. A strength is that the approach to data acquisition and analysis used is the standard approach being applied to sequence data. The scoring system for variants discovered through exome sequencing is adequately described as is the summary scoring statistics of the variants uncovered. A weakness is that details on the results of the pathway mapping of variants (using Ingenuity Systems or other software) were not provided. These data in general support the notion that the project made acceptable progress.

A major challenge to this type of research is that the utility/validity of these variant prioritization algorithms has not been established for mutations at the whole genome level for complex traits. The utility has not even been established at the whole exome level for complex traits.   Thus, while it may be tempting to just sequence the entire genome, the result is thousands of rare variants of unclear significance.   Furthermore, recent evidence suggests that many mutations presumed to be 100% penetrant for Mendelian diseases may actually be present to an appreciable frequency in the populations with no obvious expression of disease.

Reviewer 2:
Strengths: In general, this project has been completed and met the objectives designed in the proposal. This project has three specific aims: 1) to carry out whole exome sequence analysis of individuals with abdominal aortic aneurysms (AAA); 2) to categorize variants by type and potential functional consequences; and 3) to compare variants in individuals with AAA with normal controls. A total of 206 AAA cases (19%) with positive family history from 1,100 validated AAA cases were eligible to participate in the family DNA sequencing study. The next

generation DNA sequence analysis of samples from individuals with AAA was performed. An average of 58 x 10$_6$ sequence reads per individual sample was mapped to the human reference genome, version 37.1. Initial analysis identified 658,287 variants, mostly single nucleotide polymorphisms, when the mapped sequence reads were compared to the dbSNP database. Application of the scoring algorithm produced 96 variants with an annotation score > 300. Variants with the highest scores had the following characteristics: 53% were in the 19q AAA linkage region, 86% were novel variants, 31% were essential splice variants, and 90% were conserved across species. In the second phase, an additional set of 8 DNA samples were subject to whole genome DNA sequence analysis. This work is important, which provides a large pool of genetic information on AAA with functional linkage. It has generated several peer-reviewed papers in the field of AAA research.

Weaknesses: The main weakness is that at some points this project faced several technical challenges and has limited clinical associations. The progress has been considerably good, but no breakthrough was made. The DNA sequencing work relied on the contract with a company, which sometimes was not highly efficient. For instance, as stated in their report, the turn-around time for sequence analysis was several months.

Reviewer 3:
Upon the completion of the project, the PI has sequenced eight early-onset AAA-affected individuals using the exome sequencing technology and eight additional AAA cases using the whole genome sequencing technology. The sequenced variants have been further categorized into different types (e.g., non-synonymous variants) and have been prioritized for their potential role in AAA. Because of the large amount of the sequencing data (i.e., up to several terabytes), the comparision of the genetic variants in affected individuals with healthy individuals is still ongoing. Nevertheless, a majority of the goals of the project has been accomplished. The completion of this project generated a large amount of genetic variants for the future association analysis of AAA and created a list of genetic variants that may have a functional role in AAA.

Criterion 2 - What is the likely beneficial impact of this project? If the likely beneficial impact is small, is it judged reasonable in light of the dollars budgeted?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The likely beneficial impact of this project on its own is small, because the power to detect firm associations between rare mutations and disease is small in such a small sample. However, the PI was well aware of this limitation and stated it outright in his original research plan. The value of the research is in the experience gained by the PI and his team in producing sequence data for a complex trait such as AAA using next generation sequencing platform and in attempting to prioritize the mutations discovered using existing public databases and tools that assess potential pathogenecity of these variants. This benefit is reasonable in light of the dollars budgeted. The future plans include additional sequencing and evaluation of utility of genomic data to impact population screening for AAA.

Reviewer 2:

Strengths: AAA is a life-threatening disease triggered by an interplay between genetic and environmental factors. The current study is significant in both basic and clinical sciences; in particular, identification of functional genetic defects may provide new clues for diagnosis, prevention and treatment. This project did not impact the incidence, diagnosis or treatment of disease directly; it was a key precursor to new research in which translation to medical care is a major goal.

Weaknesses: AAA often develops as a complication of aortic atherosclerosis. The pathogenic factors for atherosclerosis should be considered in this study, including hyperlipidemia, hypertension, smoking and diabetes, etc. The linkage studies should be performed.

Reviewer 3:

Despite the recent success of genome-wide association studies (GWAS), a large proportion of genetic variants contributing to complex diseases, such as AAA, remain uncovered. With the advance of the next generation sequencing technology, we can now investigate the entire spectrum of sequencing variants, including both common and rare variants, for their functional role in complex diseases. The project used exome sequencing and whole genome sequencing technologies to generate a large number of common and rare variants, which provided a great data resource for the genetic association study of AAA. The ongoing statistical analysis of these sequencing data may lead to the identification of new genetic variants, including rare variants, associated with AAA, which could yield novel insights about underlying AAA pathophysiological and etiological processes. Moreover, the genetic variants identified from this project can be further investigated for their potential role in AAA early prediction and prevention via a separate project funded by a PA-CURE grant.

Criterion 3 - Did the project leverage additional funds or were any additional grant applications submitted as a result of this project?

STRENGTHS AND WEAKNESSES

Reviewer 1:

A strength is that the project provided preliminary data included in a PA-CURE non-formula grant on translational genomics that was funded and initiated in June 2012. The researchers state that they do plan on submitting additional grant applications to build on this project, but a weakness is that no concrete details are provided. They need to complete the analysis of the whole genome sequence data. A weakness is that a delay in the analysis resulted from the switch to whole genome sequencing from whole exome sequencing.

Reviewer 2:

The investigators were not able to apply for and/or obtain funding from other sources to continue or expand the research.

Reviewer 3:
The PI plans to apply for additional funds for statistical analysis of the collected sequencing data, identifying new rare variants associated with AAA. The data generated from this project will also benefit a project funded via a PA-CURE grant, which will further evaluate the role of the sequenced genetic variants for population screen of AAA.

Criterion 4 - Did the project result in any peer-reviewed publications, licenses, patents, or commercial development opportunities? Were any of these submitted / filed?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The sample size was too small to establish firm associations between genetic variants and AAA. Furthermore, associations themselves are not patentable. A weakness is that no peer-reviewed publications have resulted from this research, although there are plans to submit a paper describing the scoring system used to prioritize variants.

Reviewer 2:
There are peer-reviewed publications derived from this project, but no patents or licenses were filed on the basis of the current research project.

Reviewer 3:
The PI plans to submit a manuscript based on the ongoing statistical analysis of the sequencing data. The manuscript submission will depend on whether there is sufficient power to detect new AAA-associated genetic variants. This project is primarily focused on generating sequencing data for AAA samples, and therefore no patents/innovation will immediately result from this project.

Criterion 5 - Did the project enhance the quality and capacity for research at the grantee's institution?

STRENGTHS AND WEAKNESSES

Reviewer 1:
A strength is that the researchers developed an analytic pipeline to prioritize the pathogenicity of rare variants uncovered through next-generation sequencing, although details on the hardware and software installed to develop this pipeline are not provided. A weakness is that no new investigators were brought into the institution to carry out the research and funds were not used to pay pre- or post-doctoral students.

Reviewer 2:
This project improves the research capacity and quality and promotes translational medical studies. The next generation of DNA sequencing technology has been applied and new software or programs have been established in the institution.
Weakness: Having a subcontract with a company for data analysis may not be an efficient approach.

Reviewer 3:
Through this project the PI initiated collaborations with investigators within and outside the institution. This could help the PI assemble a research team for future AAA genetic epidemiology research. The research experience gained from this project can also be useful for other sequencing studies that are currently being conducted in the institution. The project also partially funded a post-doctoral researcher and a research assistant.

Criterion 6 - Did the project lead to collaboration with research partners outside of the institution or new involvement with the community?

STRENGTHS AND WEAKNESSES

Reviewer 1:
A strength is that the preliminary data produced by this research has led to new formal research collaborations with investigators at University of Pittsburgh and Temple University. They are applying their expertise to other sequencing projects involving other phenotypes, including children with severe and undiagnosed disorders. The PI also consulted with a well-established human geneticist for complex traits at the University of Michigan to help established the analytic pipeline.

Reviewer 2:
This project has been a part of the research network in AAA genetics and translational research. Collaboration with outside institutions has been established.

Through this research the PI collaborated with two external for-profit providers of next generation DNA sequencing, Perkin Elmer Genomic Services, and Complete Genomics. These relationships are critical, because Geisinger Clinic is developing new research projects that utilize next generation sequence data, but the Clinic is not investing in the creation of an internal capacity for high throughput DNA sequencing. They also collaborated with Dr. Kristin Willer at the University of Michigan. She is an expert in analysis of genetic variant data and helped develop the data analysis pipeline and variant prioritization algorithm. Follow-up studies that are ongoing involve collaborators at the University of Pittsburgh, who are assisting in statistical genetic and predictive risk modeling analyses, and with Temple University School of Medicine, where the investigators are working with investigators to enroll additional patients for genomic studies of AAA, including patients from minority populations.

Reviewer 3:
The PI partnered with two sequencing service providers, Perkin Elmer Genomic Services and Complete Genomics, to generate the sequencing data. The research project also led to the collaboration with Dr. Kristin Willer at the University of Michigan, who developed the data analysis plan and variant prioritization algorithm.

Section B. Recommendations

SPECIFIC WEAKNESSES AMD RECOMMENDATIONS

Reviewer 1:
1. Recent experience through large-scale exome sequencing projects and targeting sequencing projects suggests that less common variants with very strong effects are not as common as one would hope. Identifying rare variants that associate with disease requires the study of tens of thousands of subjects, especially if the goal is to identify a profile of variants for risk prediction. Firmer plans of collaborations with other groups with large sample sets related to AAA and interested in sequencing should be pursued and described. The collaboration with deCODE noted in the PI's relevant recent publication is a great start and includes many other groups with large sample sets. Has this collaboration persisted and could it be leveraged for the next step?

2. The identification of pathogenic variants through large-scale whole genome sequencing remains cost prohibitive. It may be more worthwhile to pursue large-scale targeted resequencing of linkage and GWAS susceptibility loci for AAA (e.g., 9p21) among cases of AAA and suitable controls in addition to whole exome sequencing until there is a more dramatic price drop in whole genome sequencing.

Reviewer 2:
1. Establish investigator data analysis program.

2. Recruit new, outstanding young investigators or students into this program.

Reviewer 3:
None.

Project Number: 1084902
Project Title: The Natural History and Comparative Effectiveness of
Electronic Alerts in Geisinger Health System's Electronic Health Record
Investigator: Stewart, Walter

Section A. Project Evaluation Criteria

Criterion 1 - How well did the project meet its stated objectives? If objectives were not completely met, was reasonable progress made?

STRENGTHS AND WEAKNESSES

Reviewer 1:
Reasonable progress was made on Aims 1 and 2, but not Aim 3.

Aim 1 was most successful, with a database being developed with automated alerts through 2009. But it is not clear why they have no data between 2010 and the present.

Aim 2 describes some "natural history" of alerts, although the analysis is quite limited in its scope. Without greater detail, this analysis is not useful to informing system evaluation or change. The figures are identical to those in the prior progress report. Figure 2 appears to be a typo and is identical to Figure 1. Figures 3 and 4 would be easier to interpret if merged.

Aim 3 was not successfully completed. In the investigators' initial proposal they specified that the effectiveness of the alerts would be assessed by evaluating the association of alerts with clinical actions. This analysis was not done and no explanation is provided. Rather, an analysis is provided of the number of times an alert was triggered before being cleared by a practitioner. It is unlikely that this metric reflects effectiveness. It would be helpful for the investigators to explain why the analysis plan was altered. The proposed analysis does seem ambitious and probably would require resources beyond the scope of this award, but this would be a valuable future analysis. Some comment about feasibility or a future plan would be helpful.

Reviewer 2:
This project met the first aim to build a database of all alerts used at Geisinger from 2002-2009. The final report indicates that this is a seven-year period; however without the exact dates it appears to be eight years.

The second aim to identify all of the various types of alerts that have been fired was also completed. In the final report, Figures 1 and 2 appear to be the same. Figure 2 does not appear to provide the information that corresponds with its title "Average number of BPAs fired per patient from 2002-2009." Figure 2 reflects the number of alerts over time just as in Figure 1 and not the average. The average number of alerts per patient is not even provided in the text.

The third aim appears to be partially complete and still in progress. The purpose of Aim 3 is to determine the factors associated with effective alerts. A regression analysis is still needed to examine how alerts were impacted by factors at the clinic, provider and patient levels. This is mentioned in future work for the project.

Reviewer 3:
The project did not meet its stated objectives. Aim 1 appears to have been completed with a database of "more than 27 million" alerts from 2002-2009 assembled. No description of the database was given. What attributes of the alerts are included? How were the alerts captured? What is the database schema? Is there relational structure to the database, or is it a simple rectangle of attributes where each row represents an alert? Without such detail, it is difficult for a reviewer to assess the value of the work that was done.

Aim 2 called for description of the natural history of the alert usage over time. A single figure shows the breakdown of the Best Practice Alerts (BPAs) by nurse/physician, time period and type of BPA. (Other alerts were not analyzed, and no tabular presentation was provided of alert type.) It appears that of the 27 million alerts, perhaps 4 million were BPAs presented in the natural history figure. The remaining alerts were not described. The strategic plan indicated that statistical tests would be conducted on comparing rates of various alerts. No statistical tests were presented in annual or final reports.

Aim 3 concerned determining effectiveness of various kinds of alerts on health outcomes. The only data presented was the number of alerts fired per episode prior to action by a caretaker. No attempt was made to associate alerts with health outcomes. No statistical analyses were presented.

Criterion 2 - What is the likely beneficial impact of this project? If the likely beneficial impact is small, is it judged reasonable in light of the dollars budgeted?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The main impact of the project is creation of the database for Aim 1. Aim 2 and 3 as performed are unlikely to have any impact. The proposed Aim 3 that was not successfully completed would have been potentially impactful and hopefully will be pursued in the future.

Reviewer 2:
The database that has been developed will be of great value for continued and future research activities. Understanding what can make an alert effective has tremendous value for improving health.

It seems that much work remains to be done with respect to identifying the characteristics associated with effective alerts. Additional information regarding "alert closure" is needed simply because the term was not used in the proposal but is used in the final report, and a connection is needed. Were there other variables besides the number of times an alert fired before closure that were examined for determining if an alert was effective? Is the number of

alert firings a factor of an effective alert or an effective provider? Are there mediators or moderators to be considered? Are there workarounds that are occurring?

Reviewer 3:
The project is unlikely to have any impact on either Geisinger Clinic or the larger world of health care. Insufficient analysis of the data was performed to characterize the natural history of the alerts, and no results were obtained regarding the relationship of alerts to health outcomes.

Criterion 3 - Did the project leverage additional funds or were any additional grant applications submitted as a result of this project?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The project did not leverage additional funds or submit any additional grant applications as a result of this project.

Reviewer 2:
Leveraging funds were not expected. There are plans to seek internal and industry funding.

Reviewer 3:
Institutional funds were leveraged to pay PI and co-PI salaries. There was no indication that the researchers were planning to apply for additional funds.

Criterion 4 - Did the project result in any peer-reviewed publications, licenses, patents, or commercial development opportunities? Were any of these submitted / filed?

STRENGTHS AND WEAKNESSES

Reviewer 1:
There was a conference presentation at Academy Health 2011 Annual Research Meeting, but there were no publications.

Reviewer 2:
A publication is planned on how alerts were impacted by other factors at the clinic, provider and patient levels.

Reviewer 3:
The work did not result in any peer-reviewed publications, licenses, patents, or commercial developments.

Criterion 5 - Did the project enhance the quality and capacity for research at the grantee's institution?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The existence of the database developed for Aim 1 could be a helpful resource. However it was only developed using data through 2009, without explanation of this limitation.

Reviewer 2:
The database that has been developed will be of great value for continued and future research activities.

Reviewer 3:
Improvements were made to the infrastructure in that Geisinger Clinic now has an alert database including information on 27 million alerts covering the period 2002-2009. No indication was made if the database would be kept up to date. No new investigators were added. No pre- or post-doctoral students were employed in this research.

Criterion 6 - Did the project lead to collaboration with research partners outside of the institution or new involvement with the community?

STRENGTHS AND WEAKNESSES

Reviewer 1:
The project did not lead to collaboration with research partners outside of the institution or new involvement with the community.

Reviewer 2:
The project did not lead to collaboration with research partners outside of the institution or new involvement with the community. The database is of great value for continued research within Geisinger Clinic. The knowledge gained can be applied to other health care organizations.

Reviewer 3:
No collaborations outside the institution were generated as a result of this research.

Section B. Recommendations

SPECIFIC WEAKNESSES AND RECOMMENDATIONS

Reviewer 1:
1. Figure 2 appears to be a typo; it is a duplicate of Figure 1 and should be replaced with the correct figure.

2. Figures 3 and 4 should be merged for clarity.

3. Reasons for not completing Aim 3 as planned, which arguably is the analytic centerpiece of the proposal, should be provided. The planned analysis was ambitious to begin with and probably unrealistic in a small grant project like this one, and this should be better identified in the future. It would have been reasonable just to develop the database and validate it for this grant. The investigators may have been overly ambitious in the proposal, and as a result the proposed deliverables were not completed.

4. Explain why results were only provided through 2009.

5. Propose a plan in the future to complete Aim 3 as initially proposed, to show the effectiveness of alerts. No clear plan is presented, and there is a high risk that this analysis will not be picked up in the future under a different mechanism. If it is not moved forward, the development of the database under Aim 1 will have been a futile effort.

Reviewer 2:
1. Provide the average number of alerts fired per patient as indicated in Aim 2 but not reported.

2. Continue to define "alert effectiveness" and "alert closure."

3. Complete the regression analysis to examine how alerts were impacted by factors at the clinic, provider and patient levels. Publish these important results.

Reviewer 3:
1. The project failed to provide a natural history of the use of alerts at Geisinger Clinic for the time period 2002-2009. The project failed to associate alerts usage with health outcomes. No data was presented on health outcomes. No data was provided on consequences of the research

2. Additional details regarding the alerts database should be provided. Statistical analysis should be conducted to characterize the natural history of the alerts over time at Geisinger (Aim 2) and presented in a peer-reviewed publication. There are many interesting questions that can be explored using the dataset assembled in Aim 1. Why did alerts drop for physicians in 2008? Do nurses and physicians respond differently to alerts? How? What do all the alerts look like (not just BPAs)?

3. Significant additional statistical analyses should be conducted to determine the relationship of alerts to health outcomes. When are alerts effective? When are they ineffective? These are fundamental questions that Geisinger Clinic may be in a position to address. Additional statistical expertise should be brought to bear on the data to formulate specific questions and conduct analyses.

4. Results from the study should be published in a peer-reviewed journal.

5. Results of the study should be used to alter the deployment of alerts at Geisinger Clinic. Once the natural history is well characterized and specific findings regarding alerts related to improving health outcomes have been determined, the institution should use those results to improve its deployment of alerts and hence its ability to deliver quality health care.

Recommendations for Geisinger Clinic – Weis Center for Research

Reviewer 3:
Geisinger Clinic is in a good position to conduct this research. It has significant data resources that can be examined to characterize alert usage and to determine the effectiveness of alerts with respect to health outcomes. The institution might consider partnering with an academic institution with a strong statistics group to create a collaboration regarding characterizing the alert database and analyzing alert effectiveness.