

## Post-anesthesia Care Unit (PACU) Management

Hakimuddin Neemuchwala, BSIE

The Post-anesthesia Care Unit (PACU) Management system is a simulation tool used to predict the utilization of a post-anesthesia care unit (PACU) for a defined time period in the future. It is designed to analyze the workload impact of the Operating Room (OR) and Clinics on the PACU, and to aid the decisions involving patient schedule changes or add-on cases from the OR and clinics. It can be used by management staff, PACU managers, nurse managers and nurse coordinators to plan the work flow in the PACU.

The system was developed using Microsoft Access and uses Arena as simulation software. The system requires a minimum of effort from the user's perspective as the capturing of the data from the VISTA database is automated. The user is provided with the updated information in the schedule every 15 minutes, providing near real-time support. Figure 1 below shows the PACU grid accessible by the end user.

The OR is a major supplier of patients to the PACU and is the most critical part of the model. Patient flow begins when the patient arrives into the PACU pre-op, continues when he is moved to the OR, then concludes when the patient is moved back to PACU post-op. It

is very important to know when the patient is arriving to the PACU post-op from OR. For this reason, the OR model is built into the PACU tool to determine the patient arriving time.

Duration of the OR surgery is determined either by using OR surgery prediction distributions or scheduled durations, this allows management to know a predicted arrival time of the patients into PACU Post-op.

The PACU Grid can be used to view the patient occupancy of the beds. By clicking on a particular case, the system will bring up additional details of the case, as shown in Figure 1.

The utilization chart is used to view the utilization of PACU for five days into the future. A small control box near the chart allows the user to change the total beds available and total hours PACU is open. This box is shown in Figure 2 found on the bottom of Page 2.

*For more information about the PACU Management System, please contact him at [Hakimuddin.Neemuchwala@va.gov](mailto:Hakimuddin.Neemuchwala@va.gov).*

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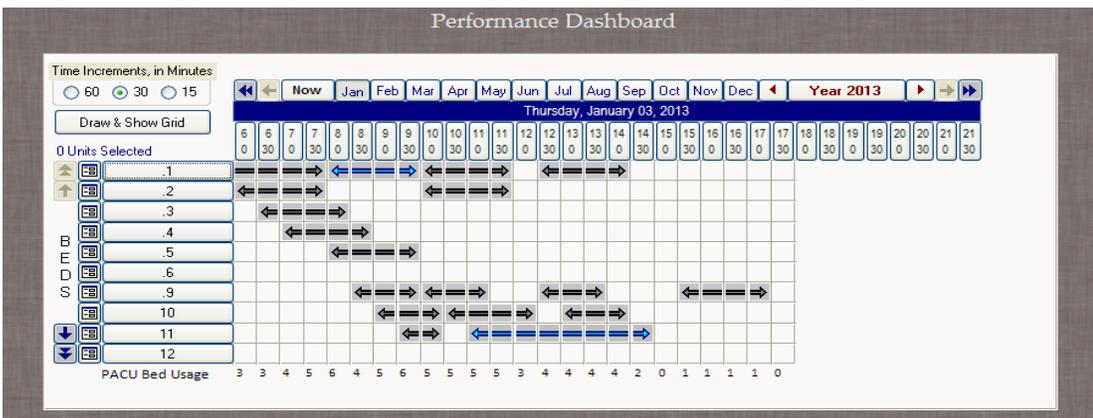


Figure 1

## Leadership Corner

### VHA Engineering Technical Assistance Program (VE-TAP)



VE-TAP has a Portfolio with four Program Lanes (Medical Equipment Services, Modeling & Simulation Services, Advanced Engineering Services, and Strategic Support Services). We currently have 41 active projects with an additional seven planned for FY14. As part of an integrated strategy to provide Veterans with timely access to quality health care services, VE-TAP is the mechanism to provide training, mentoring, facilitation, and implementation in applying OSE rapid deployment strategies and advanced OSE tools within VHA, VISN11, and National Systems Redesign Programs.

Lessons from projects are applied to future clinical and administrative systems redesign initiatives. The primary innovation incubation mechanism of VA-CASE is the VE-TAP program.

*As part of an integrated strategy to provide Veterans with timely access to quality health care services, VE-TAP is the mechanism to provide training, mentoring, facilitation, and implementation services*

VE-TAP is organized into the following functional areas:

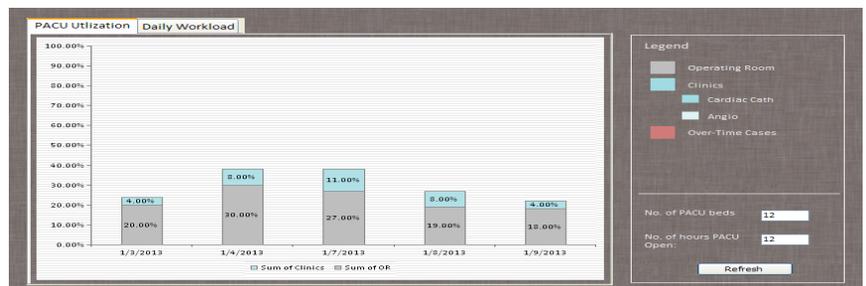
- **Modeling and Simulation Services**  
StratHub  
Near Real Time Decision Support System (NRT DSS)  
Sim Plan
- **Strategic Support Services**  
National Program Office Support  
PACT Provider Models  
Clinical Decision Support Tools  
Patient Care Support  
Wounded Warrior Analytic Support  
Decision Support Tools
- **Strategic Support Services**  
Make-Buy  
Social Work e-Discharge  
Dialysis  
ABI Model Support  
Human Computer Interaction (HCI) Lab
- **Medical Equipment Services**  
Design Evaluation  
Interactive Visual Navigator (IVN)

In this issue of the VA-CASE Quarterly Newsletter, we are proud to present a sample of the many projects that we are currently working on.

*Will Jordan is the Associate Director of VE-TAP. If you have any questions or would like to use our services, please contact Will Jordan, Associate Director at [Will.Jordan@va.gov](mailto:Will.Jordan@va.gov).*

Continued from Page 1  
Snapshot of Utilization Control Box

Figure 2



## Welcome our New Employees!

**Lillian Barrios** received a Bachelor's of Science in Community Health Education, a graduate certificate in emergency management, and a Master's of public health from Florida State University. Her previous experiences include assisting with state substance abuse prevention efforts and improving healthcare access for residents of underserved communities. She has also provided product training for visually impaired assistive technology users. She is a Program Analyst with Professional Development assisting with the creation of a developmental evaluation of the lean management implementation process.



**Paul Holtz** comes to VA-CASE after completing the VA's Interdisciplinary Patient Safety Fellowship at the Lexington, KY VAMC. A second-career nurse, he completed the University of Michigan's 2nd degree BSN program in 2007. He has staffed in UM's nursing float pool, UM's Cardiothoracic ICU and the Ann Arbor VAMC telemetry floor. More recently, while staffing with



Michigan Visiting Nurses, he was awarded a FIGs grant to develop a cognitive aid for home IV antibiotics infusion. Before nursing, Paul was an industrial engineer at Unisys in Plymouth Michigan providing manufacturing floor support and process design. While an active member of the Society of Manufacturing Engineers, he earned certifications in Flow Manufacturing, TOC, TQM and Lean as well as an MBA from Eastern Michigan University. A former ASE-certified auto mechanic, Paul still tinkers with old cars and motorcycles, but does a better job of keeping the dirt from under his fingernails now.

**Elaine McCracken** received a Bachelor of Science degree in Biology at Purdue University. She completed Medical Technology School at Loyola University Medical Center, then went back to Purdue and received a second Bachelor of Science degree in Industrial Engineering. She also attended Indiana University and received a



Masters degree in Business Administration. She has worked in various healthcare settings including large teaching hospitals, small community based hospitals and multi facility healthcare systems.

As an Industrial Engineer, she is a part of the Developmental Evaluation of Enterprise Deployment (DEED) Team.

**Joan Savage** is a program analyst and researcher. She graduated from IUPUI in May of 2012 with a Master's in Informatics – Media Arts & Science/Human-Computer Interaction (HCI). She also holds Bachelor's degrees in Communications and Psychology. Joan is a United States Navy Veteran and a small business owner, Virtual Fireflies, LLC (VF). VF designs and develops interactive simulations in health education and analyzes the effects. She received an IUPUI grant to build an interactive simulation teaching students/Veterans about suicide prevention and published, as well as presented the results, at several conferences. Joan spent the spring semester of 2012 in Beijing, China as an HCI intern for Microsoft Research Asia (MSRA). The project was accepted, published and presented in Paris, France at CHI 2013. Joan would like to pursue a PhD and continue her research to help Veterans.



**Trish Stokes-Pham** received her B.S. in Mathematics & Physics and just completed her M.S. in Mechanical Engineering from Indiana University-Purdue University (IUPUI) in December, 2012. She is currently working with the VE-TAP simulation and modeling team. Prior to joining VA she worked as a research assistant at the IUPUI Integrated Nanosystems Development Institute research laboratory where she worked on designing micro-fluidic devices to manufacture CIGS nanoparticles for use in solar cells. Her goal at VA is to learn and grow as a system engineer and analyst so she can better apply her expertise to help improve the experience our Veterans have.

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## Pathways Program Employees

**Matt Beck** is a Recent Graduate Pathways intern in Professional Development working on DEED as a program analyst. After 14 years of service in the Army and Army National Guard, Matt joined the VA in 2012 as a Program Support Assistant with Health Services Research and Development. He graduated from IUPUI in May of 2013 with a



BA in General Studies with a minor in Geography and a certificate in Geographic Information Systems (GIS).

**Kimberley Hall** is pursuing an Associates degree in Accounting at Ivy Tech Community College in Columbus, IN. Upon graduation in May she will continue her studies at Trine University working toward a BS in Accounting. She is currently working in Fiscal Services processing Beneficiary Travel Claims. It is her goal to gain as much knowledge as possible to ultimately secure a permanent position where she can utilize her experience and education.



**Thomas (TJ) Flynn** is in his fourth year at IUPUI studying Mechanical Engineering. He plans to graduate in the Spring of 2015 with a bachelors degree in Mechanical Engineering and a minor in Mathematics. He works for Engineering Service where he is assisting on various projects in design and construction phases. He also has a couple projects of his own since he received his COR certification in February. His ultimate goal with VA is to



become a project engineer and continue to help improve our facilities to better serve our Veterans.

**Monique Newman** is pursuing a degree in Interior Design at IUPUI. Her expected graduation date is May 2015. She works as an Interior Design Intern in Engineering Service. She helps coordinate furniture moves and furniture deliveries around the hospital. She also helps assist on engineering projects when needed. Her ultimate goal is to ear a PhD, and become a successful Interior Designer with her own business.

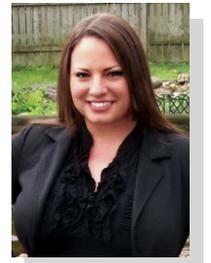


**Nicole Blair** is currently a nursing student at the IU School of Nursing at IUPUI. She plans to graduate in May 2016. She is working with the BCMA writing reports. Her ultimate goal with VA is to learn more about what goes on behind the scenes with patient care so that when she graduates from nursing school, she will be a more competent nurse. She believes that the work she does here will help her avoid mistakes

in future nursing practice, and learn how to collaborate with others to ensure patient safety. She also hopes that by the end of this internship, she will decide what specialty she would like to pursue in nursing!



**Sarah Joyner** currently attends Ferris State University, but is transferring to IUPUI at the beginning of the semester. She has an AS in Mathematics and an AAS in Accounting. She is two semesters away from graduating with a BS in Accounting and is considering putting a stronger emphasis towards statistical analysis. She is working in Voluntary Services and will be assisting in all things voluntary. She is excited about having the chance to help people and hopes to stay with VA for a long time.



**Chris Vawter** graduated from Wabash College with a bachelors degree in Political Science in 2010 and currently attends Indiana University – Robert H. McKinney School of Law in Indianapolis pursuing a JD. He expects to graduate from law school in 2017.



He works for Voluntary Service helping coordinate transportation for our Veterans. His ultimate goal with VA is to gain experience working in as many different areas of the medical center as possible, and eventually find an area where he can put his law degree to use permanently.

**Ryan Watkins** is presently a student at Ivy Tech pursuing an Associate in Science degree in the Business Administration program and will graduate in August 2015. He recently moved to Indianapolis from Tampa, Florida, transferring from Pasco-Hernando Community College. His long term educational goals are to transfer to IU to complete his undergraduate studies in economics and to continue towards a Master's degree. He works in Fiscal Service in the Travel Benefits section. His ultimate goal is to combine his educational background and experience through the Pathways Program towards a permanent position within VA.



**Courtney Alexander** has been in the medical field for 14 years as a medical assistant where she received an Associate's Degree in applied science. She has worked in various types of ambulatory medical clinic settings under the direct supervision of many physicians who give medical care to infants all the way up to geriatrics. She is currently attending Marian University where she is pursuing a BSN in Registered Nursing. She is working in Systems Redesign to gain further knowledge in clinical



applications.

**Hayley Fischer** is a student working as an Interior Design intern for engineering services. She is presently a senior in the Purdue University School of Engineering and Technology, majoring in Interior Design Technology. Prior to working for engineering services, she worked as an intern at a residential design firm, Pollert Design Associates. At the VA Medical Center, she has assisted in coordinating several moves within the hospital and its offices, and is currently working on a project to redesign and inventory the off-site furniture warehouse at Cold Springs Road. Her ultimate goal while at the VA is to help ensure that all employees and patients have a desirable experience during their time visiting or working in the hospital.



**Stephen Sargent, BSCE**, recently graduated with a bachelor's degree in Computer Engineering from IUPUI, and he plans to pursue a master's degree in Electrical and Computer Engineering at IUPUI. Previously, he worked with Dr. Matt Bair in the HSR&D to further research for projects such as CAMEO and ESCAPE. He is currently working with the Systems Redesign as a Program Analyst.



## Congratulations to our Capstone Graduates

Please congratulate Anna Langford, Gail Edwards, Josh Rose, Marcus Oliver and Bruce Vannice for completing the Capstone for FAC P/PM Mid-level. Jeff Bailey will complete his course soon. At the end of the course all graduates demonstrate that they are able to:

- Examine program and project management within the federal government
- Demonstrate leadership and interpersonal skills
- Oversee development of project/program management plans, contract management approach, solicitation and source selection and requirements management approach
- Explain the value of negotiating a baseline of performance, key features of requirements and support documentation, use of life cycle logistics in project/program management
- Examine the intersection of project/program management, leadership and interpersonal skills.



*Josh Rose, Gail Edwards, Jeff Bailey, Anna Langford, Bruce Vannice, Marcus Oliver*

### Meet the “Telephone Assessment and Skill-Building Intervention for Informal Caregivers” Study Team

In October, 2013, Dr. Virginia Daggett and her research team began recruiting caregivers of Veteran patients who have suffered a stroke and/or traumatic brain injury (TBI) for her VA-funded Nursing Research Initiative study sponsored by the Indianapolis VA CASE and Research & Development. This 4-year study will test the “TASK II” intervention, developed by Dr. Tamilyn Bakas at the IU School of Nursing, with 330 caregivers at our Richard L. Roudebush VAMC and the Michael E. DeBakey VAMC in Houston, TX. The TASK II intervention has been designed as a training and support program to assist caregivers of stroke survivors with managing care of the patient and themselves, and it has already demonstrated feasibility and initial efficacy in a randomized controlled clinical trial of 220 civilian stroke caregivers. However, in Dr. Daggett’s study, the TASK II intervention will be applied to a Veteran population. Additionally, the TASK II intervention has been modified for caregivers of Veterans with TBI. The long-term goal of this study is to implement this turnkey program for family caregivers of Veterans with stroke and TBI across VHA.

The research team for Dr. Daggett’s study consists of a Project Manager, Ms. Annie Plahitko, and a Research Assistant, Mrs. Sarah Harvey. Ms. Plahitko has been with the VA for seven years working in Health Services Research & Development (HSR&D) with the VA Stroke QUERI research program. She started as a Program Support Assistant assisting researchers with administrative tasks such as

scheduling, travel, purchasing, grant preparation, publications, and assisting with the annual report. After finishing her bachelor’s degree in Communications Studies, she worked as a Research Assistant on several stroke studies conducting patient interviews, performing detailed patient medical record reviews, as well as preparing and managing

regulatory documents for a multi-site study. Most recently, Annie became a Project Manager with the Research & Development Service.

The newest member of Dr. Daggett’s team is Mrs. Sarah Harvey. Mrs. Harvey will serve as a Research Assistant for the caregiver study. She is a military spouse who is very familiar with the Veteran demographic. She worked as both a School Liaison Officer and Work/Life Consultant for the Air

Force. Her undergraduate degree in Psychology was received from Minot State University in 2006, and she will receive her MBA in Healthcare Management this October from Western Governors University. For the past seven years, she has worked with various social service and governmental agencies. Although she is new to research, Sarah has much to offer our participants given her knowledge of military life and the social services community.



*If you would like more information regarding this study, please feel free to contact Annie or Sarah at 317-988-2258 or 317-988-3568.*

# Surgery Duration Estimation using a Bayesian Approach

Michael Lederle, MSIE; Hakim Neemuchwala, BSIE; Midh Mulpuri, MBA, MS; Ratna Chinham, PhD, WSU Professor; Alper Murat, PhD, WSU Professor

As part of the Near Real Time Decision Support System for Surgery and Sterile Processing Services, the VE-TAP team has proposed and validated a method called the Bayesian Approach to estimate the length of a surgery.

In statistics, Bayesian inference is a method of inference, named after Thomas Bayes, in which Bayes' rule is used to adjust the estimate for a hypothesis of the probability of an event as one collects more information. In other words, as more information is acquired the estimate is adjusted.

Past attempts to estimate the duration of a surgical case have had difficulties in dealing with small sample sizes --- often, a particular surgeon has rarely if ever performed the exact procedure that is scheduled. With traditional statistical methods, having such small sample sizes results in estimators with poor

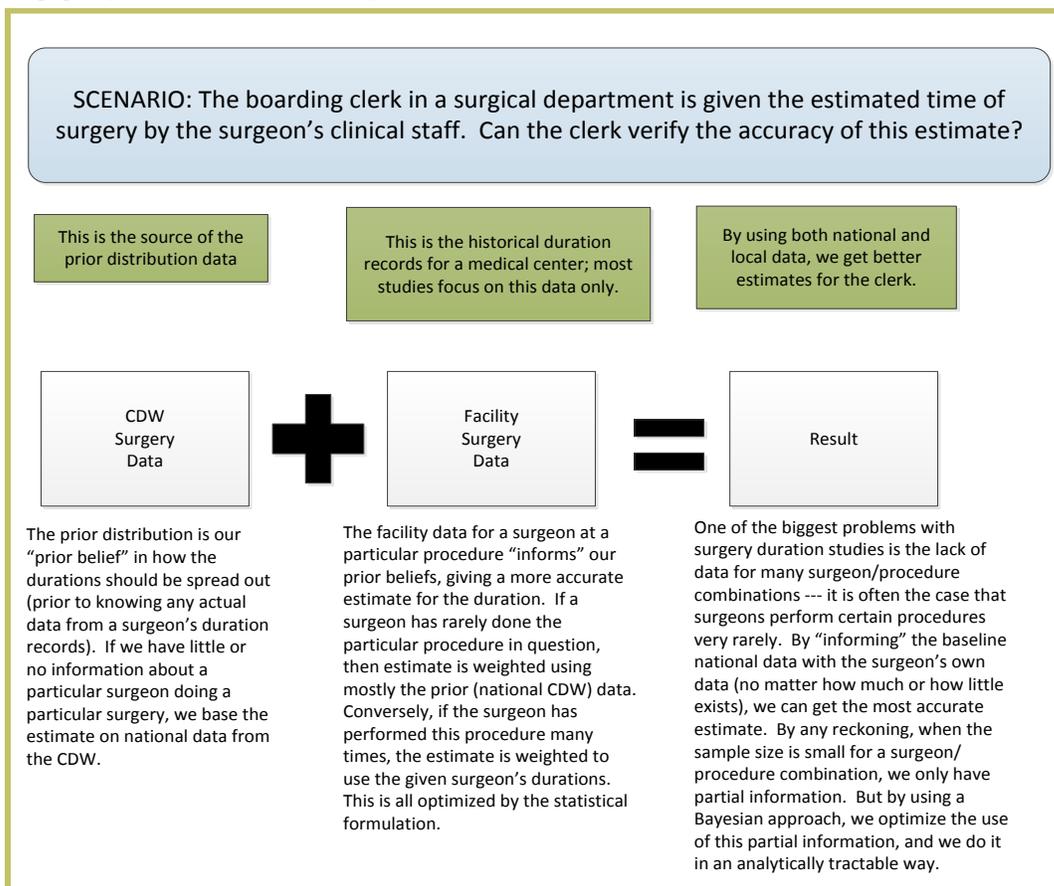
performance. In order to combat the small sample size, the team used Corporate Data Warehouse (CDW) data from across the nation as a source of prior belief in the duration of a procedure, along with Bayesian statistical methods, which provide an optimal estimate of duration for any given sample size.

Better estimates can:

- provide reduction in patient and surgeon waiting time,
- aid the decision of when a patient should be made ready for surgery,
- help in the sequencing of a list of cases, and
- benefit OR management by finding the balance between under and overutilization of OR time

*Michael Lederle is an Industrial Engineer with VA-CASE. For more information about the Surgery Duration Estimation using a Bayesian Approach contact Michael at*

## The following graphic describes the process:



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## Wounded Warrior Project

*Nikila Ravi, BSE, Hakimuddin Neemuchwala, BSIE, Will Jordan, Capt USN (Ret)*

In May of 2012, the Secretary of Department of Defense (DoD) and Secretary of Veterans Affairs (VA) established a DoD-VA Task Force on Wounded Warrior Care Coordination to establish a more stable, mature, and high performance process that can provide accurate and timely service to wounded warriors. This task force created the **Lead Coordinator Model** which is meant to bridge the gap in communication between the two agencies and provide a more seamless transition of benefits and care between DOD and VA.

The Lead Coordinator Model is centered on three main elements, the Lead Coordinator (LC), the LC Checklist, and the transfer (or handoff) of these items between DoD and VA. The LC is often a case manager or social worker. The LC Checklist is a comprehensive, itemized list of the issues that may pertain to a patient. This checklist is used to document all issues being addressed by the lead coordinator and is transferred with the patient to a new lead coordinator as the Veteran is transferred to a new facility. This transfer of information and checklists between lead coordinators should be accompanied by a phone call, and when successful, is known as a "warm handoff". The purpose of this process is to have all information transferred to the receiving facility to eliminate loss of information, repeated work, and confusion for both the staff and patients.

For this project, VE-TAP is providing data analytic support to evaluate the effectiveness and success of the model. In addition,

the model is being monitored to ensure that there is minimal added workload due to the newly implemented use of the LC Checklist. VE-TAP developed a standardized data entry template to collect data relating to the measures of effectiveness of the project. To minimize workload from data collection, four main data elements were targeted: case load, touch time for checklist, issues identified and resolved, and frequency of checklist use. Each week, a report of descriptive statistics, touch time control charts, and pivot charts are generated based on the data reported by each facility. This report is presented on a weekly call which includes LCs, supervisors, representatives from VACO, representatives from DoD, and the VA-DoD co-chairs of the project. During this call, the data is discussed and an open forum discussion is held to raise issues and discuss potential solutions and improvements.

VE-TAP continues to provide data analytic support to monitor and evaluate the newly implemented Lead Coordinator Model and assist the DoD and VA team in performance management and improvement.

*Nikila Ravi is an Industrial Engineer for VA-CASE. For more information on the Wounded Warrior Project contact her at [Nikila.Ravi@va.gov](mailto:Nikila.Ravi@va.gov).*

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## VA PAIRS Project

*James Hundt, MBA, MSSW*

The Department of Veterans Affairs (VA) National Chaplain Center seeks to integrate, sustain, and expand the Practical Application of Intimate Relationship Skills (PAIRS) model. PAIRS is an educational tool utilizing couples counseling retreats to teach communication skills. In recent years the VA PAIRS program was funded through Office of Patient Centered Care grants. However, at the close of fiscal year 2013 additional grant funding was no longer available. The VA PAIRS program meets the President's Executive Order and VA Major Initiatives vital to the health care of Veterans, so the Office of Patient Centered Care has asked the National Chaplain Center to focus on expanding the VA PAIRS program nationally and making it sustainable.

VA-CASE has performed an evaluation of the current program to document business processes, track key metrics through the implementation and develop a national-level sustainment plan for the PAIRS program. This is complimentary to the extensive evaluation of the VA PAIRS process being conducted by the Center for Health Services Research in Primary Care and VA Mental Health and Chaplaincy program at the Durham VA Medical Center.



The combination of the present sustainment plan and the long-term assessment in progress by the Durham VAMC evaluation team will provide information that

## VA PAIRS Project (continued)

will aid in examining the potential for implementing a national VA PAIRS program and on-going funding.

The developed report:

- Documents processes employed in local VA PAIRS programs.
- Assesses the ability for the National Chaplain Center to solicit outside financial support for VA PAIRS.
- Provides a roadmap for establishing and sustaining a VA PAIRS program nationally.
- Provides the framework to establish VA PAIRS as a Program of Record.

This report also makes the following recommendations for long term growth:

- Establish VA PAIRS as an educational service under the rubric of Mental Health
- Work with Mental Health Services to establish VA PAIRS retreats as a metric for Mental Health Professional's performance
- Utilize the evidence-based research of the Durham VAMC evaluation team to request line-item funding for VA PAIRS under the VA Strategic Initiative for Mental Health.

For more information on the PAIRS Project contact James at [James.Hundt@va.gov](mailto:James.Hundt@va.gov)

## Improving Emergency Department Patient Flow

**Wayne State University:** Shenzhen Qiu, BS, MS; Ratna Babu Chinnam, PhD; Alper Murat, PhD; Evrim Dalkiran, PhD

**Detroit VAMC:** Qingyu Yang, PhD; Bassam Batarse, MD

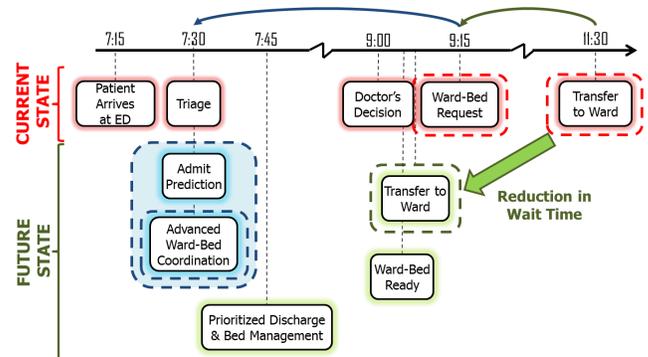
**VA CASE:** Hakimuddin Neemuchwala, BSIE; Mike Lederle, MSIE; Will Jordan

An integral part of VHA defining healthcare delivery excellence in the 21<sup>st</sup> century for patient satisfaction and managing costs is "Access to VA Care", which can be partially achieved through improved patient flow within VA hospitals. A critical factor adversely impacting the patient flow in emergency departments (ED) is timely access to inpatient ward-beds for admitted patients, i.e., boarding delays. In most cases, the availability information of beds for ED patients is usually subject to asymmetric information sharing. This results in the transfer of patients from ED to the target ward to be wastefully delayed, leading to patient dissatisfaction as well as negative health outcomes.

Prediction of patient admissions at the time of the triage process generates actionable information that the ED staff can proactively exchange with the target inpatient wards and other hospital departments. Timely and accurate predictions coupled with a cost-sensitive optimal ward-bed reservation management system help reduce the ED boarding times, improve patient flow, and reduce overcrowding.

The *Improving Emergency Department Patient Flow* project aims to improve the patient flow and reduce patient boarding times in ED through near real-time forecasting of both planned and unplanned admissions for all of the inpatient wards as well as developing an advanced bed preparation coordinating policy based on admission predictions. Figure 1 illustrates the objective of this project, developing modeling and decision support tools to improve ED patient flow. The tools provide

forecast information regarding discharge times for individual patients as well as aggregate predictions.



**Modeling & Decision-Support Models Allow Proactive Planning**

Figure 1. Vision of modeling & decision-support models to improve ED patient flow

The project addresses these issues through the following four tasks:

1. Predict admission probability, identify target inpatient ward, and estimate ER length of stay (LOS) during triage for individual patients.
2. Develop bed demand profiles by aggregating the predicted information for individual patients.
3. Develop an advanced bed preparation coordinating profile to improve ER patient flow.
4. Construct a prototype toolset that incorporates models in 1, 2, & 3; install and validate the tools at VISN 11 VAMCs.

Once validated for accuracy and reliability, the tools will be expanded through a follow-on project to account for other sources of admissions as well as bed supply. Future efforts will also aim to develop a decision support module for

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## Improving ED Patient Flow (continued)

incorporation into the near real-time (NRT) decision support system (DSS) currently under development for OR and SPD, built on optimization methods, for operational planning and management of the beds through adaptive bed allocation and prioritization models. If successful, the tools/processes resulting from the project should help further strengthen the VHA's leadership in defining healthcare delivery excellence in the 21<sup>st</sup> century.

A number of popular and powerful statistical/data mining techniques and analytical methods have been used to-date in developing a variety of models for this project:

- Naïve Bayes classifier, a popular probabilistic classifier that exploits the Bayes' theorem with strong (naive) independence assumptions, has been used to estimate the patient's inpatient ward admission probability prediction right during the triage process.
- Term Frequency–Inverse Document Frequency weighting scheme (TF-IDF), a text-mining technique that reflects how important a word is to a document in a collection or corpus, has been applied to classify the free language patient complaint text to standardized complaint codes.
- Support Vector Machine (SVM) classification method was used to predict the likely target admission ward for ED patients predicted to be admitted.
- Three parameter Weibull distributions have been implemented to estimate the ED length-of-stay and goodness-of-fit of the estimations were evaluated using a Chi-square test. Two types of survival (hazard rate) models, semi-parametric proportional hazard models and parametric hazard models are currently under investigation for improving accuracy.
- A G/G/M queuing model based approach is employed to estimate the lead-time for obtaining a requested ward-bed.
- The policy for optimizing ward-bed reservation slot time for ED patients likely to be admitted is based on a modified version of the classic Newsvendor model from the inventory management literature.

The developed models are being validated and tested using the historical data of the Detroit VAMC. Records of 25,464 patients that visited Detroit VAMC from October 1, 2011 to September 30, 2012 in ED Integration Software (EDIS) as well as the data from a FY 2012 report of Detroit VAMC for the highly busy inpatient ward, medicine ward, were analyzed in

our experiments. The following information in the databases was used to build the prediction models and develop the optimal reservation policies:

- Basic information of ED patients: gender, age, patient complaint, acuity level (ESI index), and physician's final disposition.
- Time stamps for each ED patient: time in, time out, triage, admission decision, and ward admission delay.
- Inpatient wards information: ward utilization, ward bed capacity, average ward length of stays.

Figure 2 illustrates some information about patient complaints in our data. Figure 2(a) shows top ten most frequently stated patient complaints whereas Figure 2 (b) identifies the top ten complaints that lead to inpatient ward admissions. Our patient admission prediction models exploit this other patient related information for improved accuracy.

Complaint	Assigned (%)	Admission Rate (%)	Admission Distribution (%)
other pains	19.9	3.3	0.06
acs	8.5	28.4	0.20
others	7.2	15.9	0.10
medicine refill	6.9	0.5	0.00
back pain	6.1	2.1	0.01
abdominal pain	5.4	12.2	0.06
cough	4.6	3.5	0.01
swelling	4.2	9.2	0.03
shortness of breath	4.0	25.0	0.09
foot pain	2.5	3.2	0.01

Figure 2(a) Complaints with highest frequencies

Complaint	Assigned (%)	Admission Rate (%)	Admission Distribution (%)
pancreatitis	0.0	100.0	0.00
anemia	0.1	83.3	0.01
hemoglobin	0.2	81.8	0.01
suicidal	1.4	72.2	0.09
ascites	0.0	66.7	0.00
platelet	0.0	66.7	0.00
mental	1.2	59.6	0.06
detox	1.1	58.6	0.05
renal failure	0.0	50.0	0.00
stroke	0.0	50.0	0.00

Figure 2(b) Complaints with highest admission rates

Table 1 below illustrates the patient information available during triage (shaded in yellow) as well as the outputs of the planned decision support system (shaded in blue) to improve the coordination with target wards, and hence, the ED patient flow.

Improving ED Patient Flow (continued)

Patient ID	Complaint Code	Acuity	ED Arrival Time	Gender	Age	Estimated Admission Probability	Predicted Target Ward	Estimated Ward-Bed Lead Time (minutes)	Est. ED Length-of-Stay (minutes)	Recommended Bed Reservation Slot Time (minutes from triage)
1001	Suicidal Ideation	2	Medium crowding hours	M	65	0.82	Psychiatry	30	80	No Reservation (Ward Lead Time is Low)
1002	Peg Tube Re-insert	4	Low crowding hours	M	83	0.76	Surgery	50	100	80
1003	Back Pain	4	High crowding hours	M	45	0.23	Medicine	210	130	No Reservation (Admission Probability is Low)
1004	Chest Pain	2	Medium crowding hours	F	61	0.87	Medicine	100	90	100
1005	Alcohol Withdrawal	3	High crowding hours	M	30	0.65	Medicine	180	120	180

Table 1. Illustration of triage information and outputs of our decision support model

The various costs associated with advanced ward-bed reservations and our cost-sensitive optimal approach is illustrated in Figure 3.

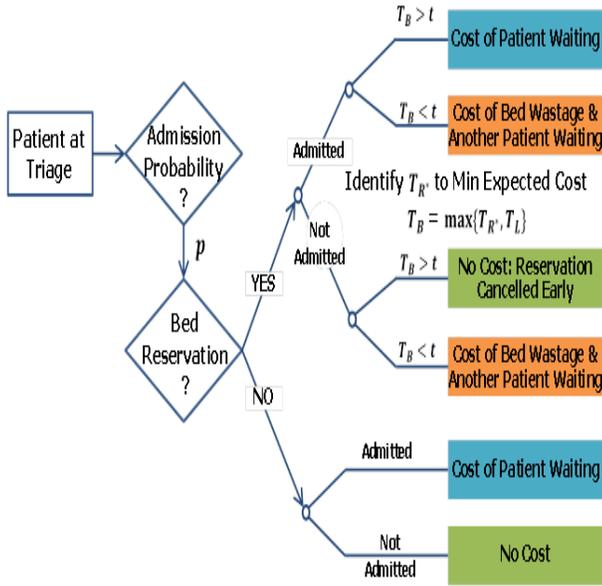


Figure 3. Costs associated with ward-bed reservation decisions and associated decision tree.

We started investigating the potential impact of employing the proposed ward-bed reservation approach under the following two scenarios:

- Scenario #1: Assume that ward predictions are perfect, i.e., the triage nurses accurately know which ward a patient is going to be admitted to.
- Scenario #2: Employ an SVM model in making the target-ward predictions, instead of assuming it to be known perfectly.

The numbers of advanced ward bed reservations proposed by the models and average reduction in patient boarding times under these two scenarios are shown in Table 2 below. It is evident that preliminary test results are very promising and suggest significant opportunity for reduced ED patient boarding times when using the proposed models. We are at the earliest stages in executing the project and further refinement of the models and improved use of readily available data should lead to further improvement in the performance of these models.

		Count	Average Reduction in Boarding Time per Patient (minutes)
Scenario #1	Proposed Reservations	253	22
	Proposed reservations which led to reduced boarding times	124	70
Scenario #2	Proposed Reservations	57	6
	Proposed reservations which led to reduced boarding times	10	56

Table 2. Impact of employing the proposed ward-bed reservation on historical data

Dr. Ratna Chinnam is an Associate Professor in the Industrial & Manufacturing Engineering Department at Wayne State University. For further information on the Improving ED Patient Flow project, contact Dr. Chinnam at Ratna.Chinnam@wayne.edu or 313-577-4846.



**VA Make or Buy (continued)**

method of identifying data was successful because it provided default values that had documented support and allowed users to modify the values to fit their location.

The realization that providing default data is necessary and that an understanding of VA data and how to retrieve it was important motivated our team to further investigate. Requests were made for access to protected health information (PHI) and personal identification information (PII). Once granted, efforts were made to learn about Decision Support System (DSS) and VSSC reports and how to use the ProClarity® analysis system to isolate specific data.

This preparation enabled VA-CASE to revise the 'buy' cost associated with dialysis treatment when national contracts with 23 vendors were announced for FY 2014. The top 25 vendors, the number of treatments applied and the disbursed amount for FY 2013 were collected from VSSC reports for each facility. Program Manager Kathy Carlson determined if each vendor is under a contract and indicated the new contracted cost. The average cost per treatment for FY 2014 was determined for those vendors with a contract and those not under contract. The percent of treatments provided by vendors with a contract was calculated as was the percent provided by vendors not under contract. The overall 'buy' cost was calculated by multiplying the percent under contract by the average contracted cost and adding it to the product of the percent not under contract and the non-contract cost. The average 'buy' cost expected for the VAMC in Togus, Maine, is \$291.96, which is a reduction of \$36.06 from the pre-contract average cost of \$315.66. The calculation summary for Togus is shown below.

B4 contract cost:	\$315.66
Amount contract saves:	\$36.06
Percent contract saves:	11.42%

Line Items	Percent	Amount	Overall diff.	
Overall:	\$889,167	2,732	\$291.96	3,415
Contracted:	\$279.60	2,616	95.75%	3,270
Non-Contracted:	\$546.56	116	4.43%	\$ 117,927.21

Calculations for expected FY 2014 savings for VISN 1-Togus, Maine

These calculations were performed for each VAMC location, resulting in an expected savings of \$31,832,023 for FY 2014 as a result of the national contracts. Seventy-six percent of the vendors used in FY2013 are now covered by a contract. The table below includes calculations for VISN 1 projected change in 'buy' costs by facility. Note that savings are expected at all facilities except for Providence, which has a cost increase of \$38 per treatment. The revised 'buy' costs were incorporated into the VA-CASE dialysis make or buy tool.

Determination of 'buy' cost changes resulting from national dialysis contracts beginning FY14

FY13 - as of June 30, 2013	Contracted		Non-Contract		Overall Buy Rate	Cost b4 contract	Per trt change	% change	Projected # Trts	Projected Change
	Cost	Percent	Cost	Percent						
402-Togus, ME	\$280	96%	\$547	4%	\$292	\$316	\$36	11%	3,270	\$117,916
405-White River Junction, VT	\$286	64%	\$493	56%	\$458	\$321	\$35	11%	5,340	\$185,939
518-Bedford, MA	\$281	100%	\$0	0%	\$281	\$315	\$34	11%	860	\$29,550
523-VA Boston HCS, MA	\$279	85%	\$228	15%	\$271	\$313	\$34	11%	7,520	\$258,011
608-Manchester, NH	\$286	89%	\$314	11%	\$289	\$300	\$14	5%	7,155	\$99,311
631-VA Central Western Massachusetts HCS	\$283	95%	\$211	5%	\$279	\$316	\$33	10%	4,533	\$149,210
650-Providence, RI	\$281	100%	\$0	0%	\$281	\$243	-\$38	-16%	1,783	-\$67,521
689-VA Connecticut HCS, CT	\$275	92%	\$319	8%	\$278	\$308	\$33	11%	2,638	\$86,711

**Projected FY 2014 total savings for VISN 1: \$859,127**

The home dialysis make or buy tool required data from other VSSC and DSS reports to provide underlying numbers to guide facility expansion decisions. Phase I of that tool allows facilities with in-house dialysis treatment capability to consider providing monthly exams, labs, supplies and pharmaceuticals to Veterans already receiving care for their home dialysis outside the VA system. In order for locations to have confidence in tool recommendations, it's imperative that the data on which the decision is based are as accurate as possible. As shown in the table below, the Togus facility fee'd out 16 home dialysis patients and treated 24 hemodialysis patients in-house, but no home dialysis patients. The only facility treating home patients is 689-West Haven with four on peritoneal dialysis.

**Site specific data used in Home Dialysis Make or Buy tool**

Potential Dialysis Site	FY 13 Total # of Fee Home Dialysis Patients (VSSC NonVA Care Cube, Unique Patients) CPT code = 90999, Place of Service = Home (12,13,31,32,33,55,56, 61)	Num. Dialysis Patients (not Home-based)	Num Home CAPD (stop codes: 606 & 608)	Num Home Hemo (stop code 604)	Expected Buy Costs	Locality Pay Increase - Remain at 2012 levels*
(V01) (402) Togus	16	24			\$291.93	0.1416
(V01) (405) White River Jct	13	6			\$458.31	0.1416
(V01) (518) Bedford	0				\$280.93	0.2480
(V01) (523) VA Boston HCS- Jamaica Plain	0	88			\$270.90	0.2480
(V01) (523A) VA Boston HCS- Brockton					\$270.90	1.2480
(V01) (523C) West Roxbury, MA (Boston, MA)					\$270.90	2.2480
(V01) (608) Manchester	1				\$289.23	0.2480
(V01) (631) Northampton	0				\$279.36	0.2582
(V01) (650) Providence	0	42			\$280.82	0.2582
(V01) (689) West Haven	1	47	4		\$278.38	0.2872
(V01) (689A) Newington, CT (Hartford, CT)					\$278.38	1.2872

Results of the tool, based on Centers for Medicare and Medicaid (CMS) payment policies, indicate that bringing 14 of the 16 home dialysis patient exams in-house should result in at least \$10,000 savings a week. The next step in tool development is to verify contract costs for home dialysis since that figure seems extreme.

# VA-CASE Quarterly Newsletter

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## *VA Make or Buy (continued)*

VA-CASE has developed make or buy tools since 2010, but the dialysis and stroke tools are the only ones used for operational decisions so far. Part of the difficulty in use of the tool is the lack of adequate 'buy' costs. VA-CASE will continue to investigate those costs for GI and Polysomnography studies to present more complete analysis for those procedures.

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## VA Use of Cloud Computing in Dialysis Pilot

*Nancy Lightner, PhD, Kathy Carlson, BA*

VA currently has 72 medical centers that provide chronic dialysis treatments for approximately 6,500 Veterans. The Centers for Medicare and Medicaid (CMS) requires all dialysis service vendors to submit detailed patient data monthly for reimbursement. This allows for an evaluation of the care received (based on patient outcomes), which is used to determine the amount reimbursed to the vendor. Although VHA does not receive reimbursement from CMS, VHA Directive 2007-032 mandates that VA Medical Centers (VAMCs) are to send the same data for comparison purposes. Beginning June 2013, CMS stopped accepting data through the mail and switched to an electronic-only interface called CROWNWeb (Consolidated Renal Operations in a Web-Enabled Network), available in batch and manual mode.

Those using the manual mode of CROWNWeb report that it takes 45 minutes per patient per month on average due to the intermittent response rate of CROWNWeb. The US Renal Data System 2013 Annual Report (available at <http://www.usrds.org/adr.aspx>) indicates that as of December 31, 2011, there were 615,899 people on dialysis in the United States. Over 70 percent are covered by Medicare, requiring monthly reporting to CMS for reimbursement. Due to the volume alone, CROWNWeb has admittedly experienced technical difficulties, resulting in several upgrades. Version 4.1.6 was implemented September 10, 2013. The Pittsburgh VAMC has approximately 110 dialysis patients, requiring around 80 hours a month for manual CROWNWeb submission. The amount of manual effort provides the motivation for automatic submission for all 72 VAMCs that provide dialysis treatments.

Because they already use a commercial software package to collect and store dialysis data, Pittsburgh was selected to pilot the monthly batch electronic transfer to CROWNWeb, through that package. VA-CASE agreed to oversee the pilot project, which consisted of investigating the requirements for contracting and security approval, identifying proper VA personnel, and diligently monitoring status. Unknown to the project team at onset, this is

the first time electronic transmission of patient data outside of the VA network is documented.

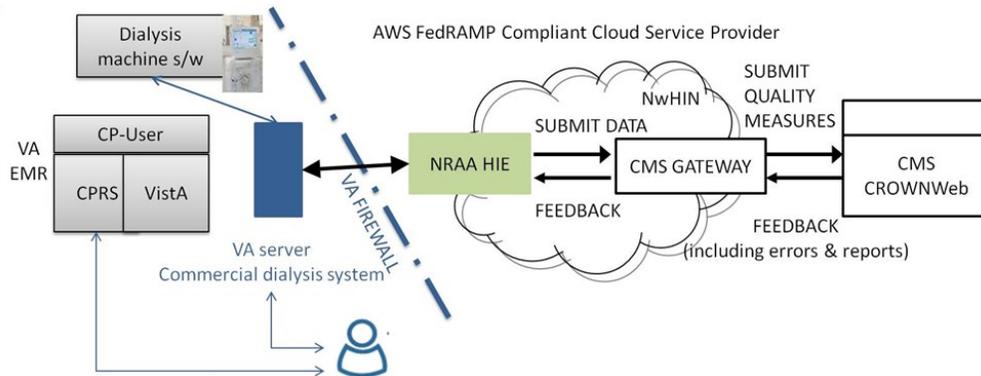
The pilot began in February, 2013. Since then we have conducted status meetings every Friday with representatives from the National Kidney Program Office and Pittsburgh VAMC dialysis, contracting and information security personnel. As of this publication, we believe we have identified the proper VA personnel to write an Authority to Operate (ATO) letter to submit to the Enterprise Security Solution Services ESCCB (Enterprise Security Change Control Board) System for approval to transmit VA patient data outside of the VA firewall. Contracting and implementation of the solution are pending this approval. The overall process is shown in the diagram on Page 15.

NRAA Health Information Exchange (HIE) uses the Nationwide Health Information Network (NwHIN) set of standards to allow electronic exchange of health information. NRAA contracts with Amazon, Inc. to use their Amazon Web Services (AWS) cloud for the data transmission. AWS is a Federal Risk and Authorization Management Program (FedRAMP) Compliant Cloud Service Provider (CSP). This allows their use by any federal, state and local government. FedRAMP is a GSA program that addresses security, authorization and monitoring of cloud products and services. VA-CASE determined that a FedRAMP-compliant designation is required prior to contracting with a third-party vendor for transmission of VA patient data.

The purpose of VA dialysis data submission to CMS is to allow for clinical comparison to non-VA facilities. Once the Pittsburgh pilot transmission is operational, VA will decide whether to pursue a national implementation. Pittsburgh is the only VAMC that uses a separate software package to collect and store dialysis data. Some use alternate electronic forms in Excel® while others keep their data on paper. A national implementation will involve a competitive bid and award for the software package for each facility, which is a lengthy process. NRAA has indicated that they will extend the initial contract to all VA sites when needed. Although the Dialysis Project ended September 30, VA-CASE will continue to support this effort through success of the pilot.

*For more information on the use of Cloud Computing, contact Nancy at [Nancy.Lightner@va.gov](mailto:Nancy.Lightner@va.gov)*

VA Cloud Computing (continued)



## IT-Discharge Project

Nancy Lightner, PhD, Kathy Carlson, BA, Midh Mulpuri, MBA, MS

In February 2013, VA-CASE received funding from VHA Care Management and Social Work Services (CM/SWS), Offices of Patient Care Services, to evaluate the benefits of implementing an automated discharge referral tool to transition Veterans from acute care to post-acute care facilities. In support of CM/SWS discharge systems redesign efforts, a VA Medical Center (VAMC) in the northeast is conducting a pilot implementation of an automated discharge solution to understand the Return on Investment (ROI) of a Web-based referral service and assess the user satisfaction of the automated case management tool. CM/SWS will evaluate the results of the pilot for the potential for broader implementation. VA-CASE tasking includes performing an evaluation of the pilot effort, consisting of documenting business processes, identification and tracking of key outcome metrics prior to and after implementation, conducting a Return On Investment (ROI) analysis, computing ROI, selecting a user satisfaction questionnaire analyzing the results, and assisting in the development of a final report.

The service considered for the selected VAMC is external to VA, so Social Workers there will access it online instead of it residing on a VA server. One consideration for the contract award is the number of facilities that are utilizing the particular service in the selected VAMC's patient service area. The Social Work team anticipates significant gains in efficiency with the service as they feel that they have lost beds due to using faxing and phone calls to communicate instead of more instantaneous

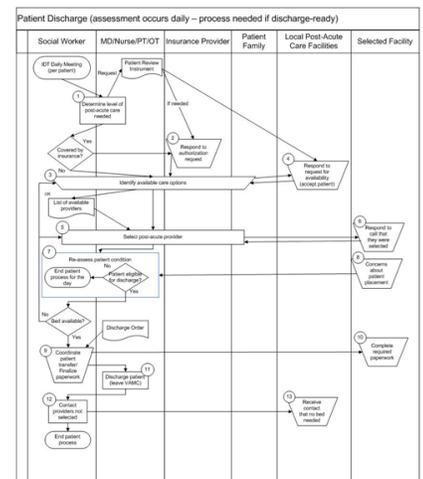
electronic means.

When the project began, we first documented the current process flow. This occurred iteratively,

with consensus reached in July on the depiction in the swim lane diagram below. The process consists of 13 steps involving up to six different entities (the VAMC medical professionals are consolidated into one group) and a period of time ranging from one day to two weeks. Every morning,

a meeting is held to determine which patients are eligible for discharge, prompting the interdisciplinary team to finalize the placement. They begin discussing placement with the patient and their family once it is suspected that their medical condition warrants transfer to another facility.

VA-CASE developed a Process Observation Worksheet in Excel® to collect data on each patient who requires post-acute care upon discharge from the selected VAMC. The Social Work team began collecting data at the end of July. An example is shown below.



Swim lane diagram of patient discharge process at selected VAMC

# VA-CASE Quarterly Newsletter

## IT-Discharge (continued)

Current Process Observation Worksheet										
Process: Patient discharge process when additional care is needed upon discharge.										
Observer Name: _____										
Resources Used _____										
Observation Date(s) _____										
Patient Identifier: B8310 _____										
Type of Post-acute Care Needed: SAR _____										
Time _____ Date of Discharge On: 7/25/2013 _____										
Date of admission: 7/19/2013 _____ Name of NH Facility: Maglar _____										
Date Patient Review Instrument (PRI) requested: 7/22/2013 _____ Date of Patient Place: 7/25/2013 _____										
Date & Time of PRI completed (by Nurse): 7/22/2013 _____ Contact (Y/N): Y _____										
Date & Time of PRI received (by Social Worker): 7/23/2013 _____ 9:00 AM Referred to LISVH?: N _____ Accepted?: _____										
Scenario: Facility selected from previous admission. _____										
Comment _____										
Step #	Description	Person(s)	Communication/Documentation Method	Physio-logical Distanc	Date	Clock Time	Task Time	Wait Time	Other Resources	Observations
1	Determine level of post-acute care needed	MD/Nurse/PT/OT	Discussion, CPFRS		7/22/2013	9:30-11:30 am	15	2 hrs		IDT meeting, requested PRI
Decision: does patient insurance require pre-authorization? N/A										
3	Identify available care options	Social Worker			7/23/2013	9:00-9:35 am	20	15	22 pages faxed	faxed PRI
Contact local facilities										
4	Respond to request for availability	Local post-acute care facility	Printer/Fax		7/22/2013	4:00-4:15 pm	15	0		
Phone calls - 2										
5	Select post-acute provider	Social Worker, MD/Nurse, Patient Family	Phone call		7/24/2013	3:00-3:10 pm	10	0		Called facility
Selected post-acute facility										
6	Respond to request for availability	Selected post-acute facility	Printer/Fax		7/24/2013	3:30-3:35 pm	5	0	faxed 2 pages	Facility accepted Veteran
Social Worker, MD										
7	Re-assess patient condition	Social Worker, MD			7/25/2013	9:30-9:50 am	5	20		IDT rounds
Concerns about patient placement										
8	is patient eligible for discharge? Yes	Social Worker	Phone call		7/25/2013	10:30-10:45 am	15	0		Call to family
Decision: is a bed available? Yes										
9	Coordinate patient transfer/finalize paperwork	Social Worker	Printer/Fax		7/25/2013	1:00-1:30 pm	5	25	faxed 10 pages	Send discharge summary

Completed Process Observation Worksheet from the selected VANC Discharge pilot site

The purpose of the Process Observation Worksheet is to determine the time and resources required to place a Veteran in a post-acute care facility. The complaint most frequently heard from the Social Workers is that repeated phone calls to facilities are required to coordinate the exchange of information in preparation of patient transfer. The second complaint is that faxing the same information to multiple facilities is inconvenient and time consuming as the fax machine is unreliable. Around 20 pages of discharge-related patient information are faxed to each facility considering accepting each patient. In order to calculate resource cost, the Process Observation Worksheet includes the amount of time (task and wait time) spent on each step as well as the number of pages of paper printed and faxed.

While Social Worker time and resources are a consideration, the largest expense resulting from a delay in placement is the cost of care each day a patient remains in the VAMC. According to a report from [DSS](#), the cost of a bed day of care (BDOC) at the selected facility in fiscal year (FY) 2013 through August (the latest data available) for general acute care was \$2,292. In addition, those BDOC are not available to other Veterans who may require acute care.

A group that is independent from the Social Workers, Quality

Management/Utilization Review, records the reason a patient remains in the VAMC, when they are medically eligible for discharge. VHA Directive 2010-021 established a policy for the Utilization Management (UM) Program with the purpose of ensuring quality and operational efficiency by conducting continued-stay reviews of all acute inpatient care. The directive indicates that continued-stay reviews are “performed daily, or no later than the first business day following other than normal

duty hours, throughout the patient’s hospitalization.” UM Reviewers are trained, licensed healthcare professionals who participate in daily meetings that determine patient eligibility to remain hospitalized and record continued-stay reasons in the National Utilization Management Integration (NUMI) Web-based application.

In this daily meeting, healthcare professionals determine whether a patient meets the National Utilization Management Instrument (NUMI) approved criteria to remain hospitalized. If they are eligible for discharge but remain in the facility, a code is entered into NUMI. The continued-stay codes in the Post-Acute Transition range (18.71-18.75) are relevant to this project. We contacted the National NUMI Trainer who explained the nine codes in that range and when they are used. In order to detail whether the stay extension is due to a reason potentially reduced by a Web-based referral service, we requested specific comments under certain scenarios as shown below. The trainer visited the selected facility in August and provided training specific to project codes.

No.	Scenario (preface with "IDT identifies as not meeting requirements and ...")	Suggested		Process Flow Step	Comment
		Code	NUMI Comment (custom box - 25 chars)		
1	PRI requested - not complete	18.712	PRI requested mm/dd/yyyy	1	Medicare or Medicaid pending but facility will not accept patient; application for Medicaid or Medicare not initiated; <b>completion of paperwork delayed.</b>
2	Insurance authorization not yet received	18.711	Waiting for insurance	2	Insurance company has not indicated which facilities they will cover
3	Facilities have not responded with bed availability.	18.741 or 18.742	Waiting for facilities	4	Code depends on funding source, but is not related to a delay in funding.
4	Admitted to bed, but delay in transfer because it's not available until later (a few days potentially).	18.741 or 18.742	Bed available mm/dd/yyyy	6	Code depends on funding source, but is not related to a delay in funding.
5	Required paperwork not finalized internally.	18.712	Internal paperwork delay	9	Delay in discharge order, etc.
6*	Required paperwork not finalized internally.	18.741 or 18.742	Waiting for facility	10	Code depends on funding source, but is not related to a delay in funding.

\*It is unclear whether a response is expected from the selected facility as part of Step 10 processing. If it is, this scenario is relevant. If no response is expected, this scenario will not apply.

NUMI comments suggested under circumstances relevant to IT--Discharge project

**IT-Discharge (continued)**

As shown in the table below, the number of BDOCs attributed to codes in 18.7 greatly increased after the training. The percent of patient cases reviewed increased from an average of 34 percent to 56 percent in September. We will continue to collaborate with the facility UM

Agency for Healthcare Research and Quality ([www.ahrq.gov](http://www.ahrq.gov)) Web site. It consists of four sections: Section 1 includes questions related to overall satisfaction, Section 2 on system quality including ease of use, reliability and security, Section 3 asks about information quality and Section 4 concerns service quality, including training and support.

ROI calculations compare results of resource use to determine the cost effectiveness of the Web-based referral service. The spreadsheet below was circulated to the team to demonstrate ROI calculations. Once ROI is determined, VA-CASE will assist in writing a final report to describe the entire pilot process and results. Ultimately, CM/SWS would like to publish findings from this project in professional journals and present any recommendations to the VHA Flow Inpatient Improvement Initiative (FIX) Subcommittee and the Office of Patient Care Services to garner widespread

support, should the project produce meaningful outcomes. The Memorandum of Understanding (MOU) signed by the CM/SWS provides support through April, 2014. With the timely contract award, VA-CASE is on track to deliver the final report within schedule.

Continued Stay Review Results	June-13	July-13	August-13	Sept 2013 to date (9/16)	Total
18.711 Financial	0	0	5	3	8
18.712 Administrative	0	8	26	19	53
18.714 Behavioral	0	0	2	0	2
18.72 Awaiting CLC Acceptance	4	6	3	1	14
18.73 Awaiting CLC Bed	0	3	10	3	16
18.741 VA paid	0	3	22	0	25
18.742 Non-VA paid	8	7	65	66	146
18.75 Ineffective discharge planning/process	0	2	4	10	16
Total post Acute Transition	12	29	137	102	
Total not Met	173	150	252	185	

**NUMI results for selected VAMC from June to mid-November 2013**

Reviewers to confirm their results. Pre-implementation data collection using the Process Observation Worksheets and UM reviews will continue until the Web-based referral service is implemented. The contract was awarded at the end of September, 2013, but an implementation is not yet confirmed. Post-implementation data collection will begin once the Social Workers are trained and comfortable using the new service. It will include Process Observation Worksheets and UM reviews as well as an assessment of Social Worker satisfaction. We will assess satisfaction by administering an adaptation of a Voice of the Customer questionnaire found on the

Financial Return on Investment (ROI) Calculations*										*values are estimates for display and discussion only	
Discharge Processing Cost										Num. Discharges per Month: 25	
Implementation Timing	Number of Observations	Per Discharge Average Resource Use								Yearly Diff.	
		FTEE Time (minutes)		Pages of Paper		Printer Sheets		Fax Sheets			BDOC
		Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost
Before	50	120	\$ 109.54	50	\$ 2.50	45	\$ 0.95	212	\$ 3.18	0.45	\$ 1,031
After	63	70	\$ 63.90	3	\$ 0.15	3	\$ 0.06	2	\$ 0.03	0.05	\$ 115
<b>Difference</b>	<b>26%</b>	<b>50</b>	<b>\$ 45.64</b>	<b>47</b>	<b>\$ 2.35</b>	<b>42</b>	<b>\$ 0.88</b>	<b>210</b>	<b>\$ 3.15</b>	<b>0.4</b>	<b>\$ 917</b>
<b>Annual Implementation Cost</b>											
Year	Subscription	Training	FTEE Time	FTEE Cost	TOTAL						
1	\$ 40,000	\$ -	50	\$ 2,738	\$ 42,738						
2	\$ 35,000	\$ -	20	\$ 1,095	\$ 36,095						
3	\$ 35,000	\$ -	20	\$ 1,095	\$ 36,095						
4	\$ 35,000	\$ -	20	\$ 1,095	\$ 36,095						
5											
<b>ROI = (Gain from investment - Cost of investment)/Cost of investment</b>											
A positive return on investment (ROI) indicates that the investment is worthwhile. The number represents an annual percent gain (or loss).											
Year	Gain from investment	Cost of investment	ROI								
1	\$ 290,647	\$ 42,738	580%								
2	\$ 290,647	\$ 36,095	705%								
3	\$ 290,647	\$ 36,095	705%								
4	\$ 290,647	\$ 36,095	705%								
5											

**Proposed Excel®-based ROI calculations for selected VAMC pilot implementation**

## Make Buy Personnel

**Nancy J. Lightner, PhD**, is an Industrial Engineer developing and supporting tools to assist in the decision to provide specific care to Veterans (dialysis, gastroenterology services, polysomnography, and stroke care) or to outsource the care to non-VA facilities. Prior to joining VA in September 2011, Dr. Lightner holds a BS degree in Computer Science from the Indiana University of Pennsylvania and an MBA from Pennsylvania State University. She also earned an MS in the Human Factors area of Industrial Engineering and a PhD in Management Information Systems from Purdue University.



*Lauren Ausra, Nancy Lightner, Kathy Carlson*

**Kathy Carlson, BA**, is a certified clinical research coordinator with over 20 years of experience in clinical trials and investigator initiated studies in Radiology, Cardiology and Evidence-based Practice. Recently, she was the administrative program manager of a Freestanding Dialysis Center project.

**Lauren Ausra, BS**, received her bachelor's degree from Indiana University in May of 2011 from the school of Informatics with a cognate in Health Science. Lauren started as a student at the Roudebush VA Medical Center in November 2009 working with BCMA in the Clinical Informatics side of Systems Redesign. In the spring of 2011, she transferred to VA-CASE as a Program Analyst.

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## Other VE-TAP Personnel

**Midh Mulpuri, MBA, MS**, is the Tech Lead for Modeling and Simulation (M&S) in VE-TAP. He has over a decade of experience in Modeling and Simulation (M&S) and has applied M&S to a diverse set of problems in Defense, Homeland Security, Education and Healthcare. Midh is passionate about informing decision-making by utilizing the right simulation methods, engaging user interfaces, and advanced computing technologies. He graduated from Purdue University, West Lafayette, IN with a Bachelor's in Computer Engineering in May 2002 and from Arizona State University, Tempe, AZ with a Master's in Business Administration in 2010. He comes to VA-CASE from the Regenstrief Institute where he was an Implementation Lead in Clinical Informatics. Previously, he was the Tech Lead for Modeling and Simulation (M&S) at Simulex Inc.

**Hakimuddin Neemuchwala, BSIE**, is the Deputy Associate Director of Operations for VA-CASE and serves as technical lead for Veterans Engineering – Technology Assistance Program (VE-TAP). Hakimuddin has over seven years of professional experience in manufacturing and healthcare. He is currently involved with Near Real Time Decision Support System; Wounded Warrior Project in collaboration with DOD, Supply/Demand Alignment Toolkit, and ED Inpatient Flow Management.

He was also involved in Patient Panel Size Model for Patient Aligned Care Phase 1 and 2, deployment and sustainment of IVN, Cancer Care Collaborative, Pharmacy Pending Order Reduction, Hemodialysis, and Reusable Medical Equipment projects at Detroit VAMC. Hakimuddin has experience in simulation, operation research, process analysis, and optimization. He has also helped teams and organizations with developing and implementation of processes and provides expertise in lean six sigma principles. Hakimuddin graduated with a Bachelor's degree in Industrial Engineering from Wayne State University in 2008 and currently he is pursuing his Master's in Lean Operations from Wayne State University. He is a Six Sigma Green Belt Certified, Lean Black Belt Certified and is a member of the Institute of Industrial Engineering.

**Jarrold Otter, BS**, is an Industrial Engineer working with VA-CASE and is currently assisting with the implementation of the IVN system in selected VHA facilities, conducting validation checks of the Work Instruction Modules (WIM), and assisting the WIM Librarian. Jarrold also collaborated in the gathering of information and the creation of the SRD Website. Jarrold graduated from IUPUI with a BS in Mechanical Engineering Technology and a Motorsports Engineering Technology Certificate.

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## Social Media — It's all what you make of it!

*Cyrus Hillsman, PhD*

Communication is a key function of any organization. To connect employees, various methods are employed including e-mail, newsletters, and brochures. Face-to-face communication is often best, but in large and disperse organizations it may be difficult and costly to get everyone together as frequently as desired. At VA-CASE we have multiple organizations, each with a specific function, and those functions may not participate or collaborate with each other frequently. Each of the five programs work independently and members do not often know what is being produced in the other programs.



Bringing together wide-spread organizations is one reason that social media technology is being applied to organizations' internal communication. In Healthcare, social media is already being used at VA, Mayo Clinic, Denver Health, Virginia Mason, Thedacare, Baptist Health, Seattle Children's Hospital, Allina Health and a host of others. In fact social media in healthcare has achieved sufficient support that there was a full day seminar at the recent Institute for Healthcare Improvement conference in Orlando regarding this topic.

Although we already have communication channels such as brochures, email and newsletters, we still need social media. Because unlike traditional communication, social media is inherently a multiple channel communication method between the user and many others at VA. Practically speaking with social media, if there is something the reader doesn't understand they can ask the writer or other users for clarification or can add comments to start a discussion.

Social media is also adaptable and works with content and methods of delivery that are customizable providing for continuous improvement. Using social media metrics, we can monitor user activity level, types of discussion topics, etc., and adapt content and methods of interaction to the user's needs. For example, doctors and nurses may be interested in interacting using social media in a way that is different than how hospital administrators do. The tools available through social media make it easier to pinpoint users' interests and to tailor a particular site to a specific interest.

Social media can mean different things to different people. One distinct advantage of social media is that people can interact in the way they would like. Some will be active posters and others active readers. Some may only participate in those groups that are more closely associated with their interests, while others will prefer to participate with a wider audience that they would not normally associate with. In other words, the individual user has control over the level and method of interaction.

What do we mean by "media?" If we consider that it is about communication, then social media provides ways to convey ideas through various formats and environments. These include text (blog), video, pictures, graphics, documents and various combinations that convey information quickly and clearly.

As those who have already used Yammer, Jive, Facebook, LinkedIn, Twitter or various other platforms have found, users at VA include doctors, nurses, SPS chiefs, administrators, OIT personnel and many others. Most are happy to share what they know, collaborating and learning from each other.

At VA one of the most common types of social media is Yammer. Although there are differences, Yammer is similar to a personal Facebook page except Yammer at VA is only available to those with a VA email account. As of this writing there are 16,565 users of Yammer at Veterans Affairs and growing every day. Example groups on Yammer include Social Media, Tech Talk, Geek Jokes, Knowledge Management, and many others. One of the most active groups in the process improvement field is the Lean Alliance which has 409 members. This group is very active and uses Yammer to communicate with each other on several programs and projects of interest. These range from general communication to those topics specific to something they are currently working on. Most recently Carlos Garcia, Eric James, and I created the VA-CASE group on Yammer specifically for members of VA-CASE to interact both with each other and with the network of Yammer users at large.

Also in the works for future development are several blogs for communication within VA. Blogs are a combination of social media and content management. Through the use of pages, categories, and tags, topics, documents, and conversations can be segregated into finite units for later use. The blogs are like a rolling list of ideas and topics that is temporarily displayed but archived for possible later use.

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## *Social Media (continued)*

Specifically there are three areas that are targeted in the proposed VA-CASE blogs, each with a specific purpose.

The first one is the VA-CASE blog which will be accessible to anyone who has a VA email address. It is a technology blog related to process improvement. The intent is to go deeper into topics than one normally would on a group on Yammer. Content would include computer programming topics, simulation, data mining, knowledge management, metrics, educational technologies, or any other topic that is of interest to VA employees. Everyone would be encouraged to submit their own articles or topics to this blog.

The second blog will be for our partners both academic and other government agencies. The purpose of this blog is to share ideas for the development of projects or programs that are specific in nature.

The third blog would only be open to VA-CASE members. The intent is that members can get very specific with respect to programs or projects because this space is restricted and would not be subject to possible piracy of ideas by vendors or other groups.

VA-CASE is about process improvement and communication. Social media is one method of communication that is all about the user and their interactions with VA-CASE members and the VA at large.

So what will you make of it?

*For more information or to contribute to the VA-CASE blogs, Contact Cyrus at [Cyrus.Hillsman@va.gov](mailto:Cyrus.Hillsman@va.gov)*

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## IVN 2.4.1 Upgrade Features

*Serge Yee, BSE, JD*

The Interactive Visual Navigator (IVN) is a Web Application designed to assist technicians with reprocessing flexible endoscopes and Sterile Processing Service (SPS) service chiefs with managing competencies, scope inventories and reprocessing records. The IVN team is currently implementing an update from version 2.3.1 to 2.4.1. The application's 2.4.1 release will feature expanded configurability, workflow support, document control, and accessibility by the end user, in addition to a collection of more specific feature requests originating from our stakeholders.



Document control with IVN has risen in priority. IVN displays instructions from SOPs and manufacturer manuals in Work Instruction Modules (WIMs). The new WIM Library is being implemented to provide an interface for the management of work instructions by the end user. The WIM Library is designed to foster access to work instructions at a VISN level, allowing SPS chiefs to collaborate on instructions for shared workflows. WIM access may be enabled by each facility, with the default set to preexisting facility practice to ensure continuity of operations.

Paired with the Library is the WIM Editor. The WIM Editor

enables a facility's chief of SPS or a delegate to edit WIM content to reflect updates to their processes or OEM reprocessing manuals. Content may be edited not just for verbal instructions but also pictures, which may be uploaded from the manager's computer into the IVN database.

The WIM Editor and Library combine to provide a document control solution which complements IVN's preexisting document presentation, competency tracking, and records generation & control capabilities. This document control incorporates principles of ISO 9001 document control. For example a WIM that has been edited by one individual must be approved by a different individual. Revisions of a WIM are tracked and correlated with a particular author as well as an approver. Records generated by IVN use are themselves correlated with a particular revision, helping to identify which processes generated which results.

WIMs may also be downloaded in printable format. Upon selecting a set of work instructions, IVN converts the file's contents into a PDF displaying approver and release date information, per ISO 9001. This may be used either as part of an SPS department's routine record keeping procedures, or in response to a planned or unplanned inspection.

WIM formatting capability has expanded to capture requirements at an increasing number of facilities. Local policies at each facility differ with respect to SOP requirements, including numbering, bulleting, fonts, and other formatting.

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### **IVN 2.4.1 Upgrade Features (continued)**

Facilities tend to prefer these requirements reflected in IVN's presentation of work instructions. Formatting support is now provided not only in the front end interface presented to technicians, but also to WIM editing by SPS management.

With the 2.4.1 upgrade, SPS managers also have greater ability to directly configure their facility's build. For reasons of usability and management control, several new features have been consolidated in a configuration menu. For example, toggling barcode or serial # entry for scope selection, and traditional or PIN based login allows SPS management to adjust IVN access method on the fly, without the need for IVN team support. Extending this level of configurability will allow the IVN team's ability to sustain sites to scale up as the program diffuses throughout VHA.

IVN has gained location awareness as part of the 2.4.1 upgrade. Previous versions of IVN records correlated scope cleaning sessions to users. Subsequent correlation to a particular location had to be done by another application, or manually. With customer requests for location identification still outstanding, the IVN team devised a method for identifying scope cleaning sessions to a particular location. The first time a user logs in to a machine, IVN requests the user to identify their location. Once identified, IVN logs the device's location and all sessions performed on that device are tagged. This in turn enables further improvements, such as the association of a scope cleaning event with its location.

In addition to these comprehensive improvements, the 2.4.1 upgrade includes a collection of specific GUI enhancements. Among them is a moveable timer, to replace the static fixed timer in the previous version. Another timer improvement includes automatic start and progression per the facility's established workflows. IVN, which has used branch logic to capture the workflows at the original pilot sites, now also

employs process looping and jumping to accommodate a growing diversity of workflows encountered in a growing number of sites. For example, failed Ruhof ATP testing may require a technician to repeat steps in the scope cleaning procedure.

Application testing must keep pace with the growing number of new features and features being updated. Prior to deployment of an update or new build to a facility, a candidate build is generated using the latest code release. Testing scripts guide quality control efforts when generating a build for a new deployment, or updating a build on an established deployment. Each case requires different standards for testing. Generating a build for a new deployment requires greater focus on testing the new features, if any, required by the new site. In comparison, deploying an updated build to an established user of IVN requires greater emphasis on regression testing of the work instructions and scope reprocessing records.

Testing will remain an essential component in maintaining the current trajectory of development. Upcoming features beyond version 2.4.1 are projected to include a Workflow Editor, expanded ISO support, and further improvements to the WIM Library to improve capability for collaboration on document generation and control. Use case definitions will be structured according to agile stories, guiding application development and communicating front line requirements to back end program support. Closing the customer-developer loop is essential for the IVN team to match customer requests to application deliverables.

*Serge Yee is an Industrial Engineer with VA-CASE. For more information on the 2.4.1 upgrade to IVN, contact him at [Serge.Yee@va.gov](mailto:Serge.Yee@va.gov)*

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## **IVN 2.4 How We Adapt to Each Facility**

*Jarrod Otter, BS*

When the Interactive Visual Navigator (IVN), is implemented into a facility, it does not change the facility's workflow, but incorporates their particular workflow into its work instruction modules (WIMs). Examples of recent implementations illustrate this point.

While mapping the flow process of their work at the VA in Amarillo, TX, the IVN team discovered the facility was placing touch screen devices not only in their reprocessing area but also in the surgery room where the scopes would be stored.

A scope is scanned into IVN prior to a procedure and after the procedure IVN displays pre-clean instructions. Five timers time sections of the pre-cleaning allowing the technician to focus on the pre-cleaning process without having to watch a clock. The scope then goes to the reprocessing area. During this step, the decontamination procedure also uses a timer system. Next, IVN displays instructions for the high level



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## *Adapting IVN (continued)*

disinfection (HLD). Once the scope is cleaned, it is recorded in IVN with the location where the scope will be stored until the next procedure. This development allows jumping forward screens as well as backwards, depending on which path the user takes. There is also a new feature that allows cancellation of a WIM that quits the current section of the WIM instead of going back to the beginning. This allows better tracking of the work flow within the reprocessing of an instrument. All of these steps allow the IVN team to develop a full circle work flow for the WIM to match the facility's work flow. This was achieved by IVN team member Rob Morgan in collaboration with Wayne State University, making code changes to the program.

At the Illiana VA, the IVN process differs in that a scope delivered to the Sterile Processing Service (SPS) is already pre-cleaned. The technician's work begins at the decontamination process followed by the HLD process. The scope is then prepped for storage and returned to its respective department.

While making changes to the content of Illiana WIMs, it was discussed how to streamline this process. To achieve this the IVN team and Wayne State University personnel created a content editor. This will allow for the content of a WIM to be

changed and stored without having to wait on the IVN team to make the changes and update IVN.

At the Louisville, KY VA the IVN team mapped the flow process and created WIMs to match. The SPS department requested the ability to highlight sections of text or change the color of certain words to stand out more. The highlighting and color changing is key to the technicians at Louisville to help alert them to warnings or certain steps of the reprocessing feature that need attention. Now SPS can highlight, change the color of text, and make format changes such as bold, italics, underline, size or font changes through the content editor.

IVN has a core design that allows each facility to have a similar program but also allows for it to incorporate the facilities workflow. This allows for standardization across the facilities while not altering their workflow.

*Jarrod Otter is an Industrial Engineer with the VE-TAP Program assigned to the IVN Project. For further information, contact Jarrod at Jarrod.Otter@va.gov*

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## IVN Technical Architecture

*Robert Morgan, BS*

Interactive Visual Navigator (IVN), as its name implies is a tool to provide work instructions for medical equipment reprocessing at the worksite in a way that the person doing the work can easily interact with the tool. What follows is a brief technical overview of IVN architecture and infrastructure.

Starting with the main component of the tool, there is a medical grade touch screen computer physically mounted on a wall or ceiling where the worker performs their job. This keeps the work instructions just a button press away at all times in a component of IVN called iNav. This touch screen computer is connected to the facilities network where a dedicated server is running with the primary purpose of providing data to, and recording data from iNav. Workers that have logged in to iNav can preview work instructions to prepare for competency testing, send alerts and comments to supervisors via email, view upcoming training expirations, and record data about a reprocessing session currently in progress.

The backbone of IVN is its server application suite which allows facility management personnel, OI&T personnel, and IVN Team members to configure all necessary components for proper

use. The suite includes a centralized library of work instructions, administration web application, reporting web application, and SQL database hosted on a server chosen by facility or VISN officials.

Connecting these IVN components together using either WiFi or Ethernet network connections are both good options and provide flexibility based on facility needs. The touch screen computers can have a keyboard, mouse, barcode scanner, or any combination of these peripherals attached for use by workers as needed.

This brief overview of IVN lists all existing components, and we have several components in development such as a workflow designer to help SPS staff create their own interactive work instructions and a dashboard for reviewing IVN collected data.

*Rob Morgan is an Industrial Engineer with the VE-TAP Program assigned to the IVN Project. For further information, contact Rob at Robert.Morgan@va.gov*

## Professional Development

**Professional Development Materials Handlers** Paul Moore and Pedro Figueroa have been very busy since January.

Since January 9, 2013 they have:

- Prepared 1,800 binders for 60 classes
- Put together 1,800 pencil packs
- Assembled 50 Cootie Kits
- Made 376,400 copies
- Used 8 cyan toner cartridges
- Used 7 yellow toner cartridges
- Used 6 magenta toner cartridges
- Used 5 black toner cartridges
- Used 8 printer drums



*Pedro Figueroa, Paul Moore, Jamie Workman-Germann*

The **Professional Development Lean Faculty** participated in 261 events in FY13 as compared to 123 events in FY12.

Class	FY 12	FY 13
<b>Yellow Belt</b>	50	25
<b>Green Belt</b>	22	28
<b>Black Belt</b>	13	10
<b>RPIW</b>	4	14
<b>SEE/LOI</b>	22	11
<b>CPAC YB</b>	5	17
<b>CPAC GB</b>	3	17
<b>CPAC BB</b>	0	8
<b>CPAC RPIW</b>	2	14
<b>CPAC SEE</b>	2	0
<b>CPAC ROI</b>	0	7
<b>CPAC LSS BB</b>	0	16
<b>CPAC misc. workshops</b>	0	6
<b>LMS events</b>	0	88

## Transactional Systems Program (TSP)

- The Chief Business Office Purchased Care (CBOPC) collaborated with VA-CASE on the **Non-VA Medical Care National Standardization (NVNS)** initiative which is a two year project aimed at the standardization of business processes associated with the execution, management, and oversight of Non-VA Medical Care Programs. The scope of the initiative includes 11 Non-VA Medical Care Programs. The NVNS team completed site visits to seven high performing consolidated and non-consolidated Non-VA Medical Care Program Offices to identify strong practices which are being incorporated into a national standard. Business processes already established through two prior CBOPC/VA-CASE collaborations (Non-VA Medical Care Coordination and Fee Basis Claims System Optimization) are being leveraged by the team to establish the standard. The standardized processes will undergo a rigorous vetting process through CBOPC over the next several months and then alpha and beta testing will be completed prior to national deployment.
- As of September 30, 2013, the **Fee Basis Claims System (FBCS) Optimization** team completed deployment of the FBCS optimized processes to 18 VISNs and their associated Non-VA Medical Care Program Offices within approximately 120 VAMCs. In addition to providing training and ongoing support to each VAMC/VISN, the engineering team developed and implemented an automated dashboard with standardized metrics that provide CBO and VISN/VAMC leadership visibility into the performance and progress of each VISN/VAMC. Four of the VISNs have completed three or more months of post-implementation of the processes. When comparing the throughput rates between the baseline and post-implementation periods for these four VISNs, an average 12% improvement was realized in the total claims processed per month.
- Jeff Bailey, VA-CASE Program Analyst/Developer, completed the development and implementation for CBO of an innovative web-based application to monitor and track the status of **Health Benefits Appeals (HBA)** and automate reporting functions that support management in assessing the timeliness and quality of their HBA processes. The development of the application was accomplished with a high level of customer satisfaction resulting in their request for ongoing assistance in FY14 to enhance the application's functionality.

## Strategic Programs and Data Engineering Resources (SPDER)

- **New workpool resource and deliverable tracking tools** were created which aligned with the VA-CASE FY14 Strategic Dashboard, Budget Spreadsheets, and emerging AO Toolkits Database.
- Joshua Rose and Jeff Bailey successfully presented and closed out **TBI mobile application project** efforts.
- **The Utilization Management SLA Team** received strong collaboration support from facilities nationwide for participation in the facility UM best practice interviews.
- Anna Maria D'Ambrosio was delegated as the **Usability Analytics Program Manager** for FY14, replacing Bryant Headley who moved to the Bay Pines VAMC as an OIT Project Manager.
- **Toolkit teams** continue to work with national Systems Redesign leaders on optimizing Toolkit and Knowledge Management System sharing of best practices.
- **The PrMIRS/PMIS team** concluded work on its minimally viable product version of a Program Management Information System (PMIS) SharePoint tool. The PMIS is currently being utilized by SPDER, is in an alpha iteration phase through February 2014, and already has a national program office customer for later Q2-Q3 development. Joshua Rose is the delegated program manager for the service level agreement.
- **The Beneficiary Travel Consult Team** successfully closed out FY13 SLA work on October 21, 2013. Three new consults were developed, then merged into one consult, to support efforts to better track and review Beneficiary Travel.

## Clinical Partnerships in Healthcare Transformation (CPHT)

- Balmatee Bidassie will be presenting *Leadership VA PACT: How to Build the Goldmine: Tools and Resources for Practice Redesign* at the **PACT Leadership Virtual Conference Series VeHU**. The presentation discusses the fact that changing processes and practices for PACT is hard work, but there are tools that can help. She will familiarize leaders with those resources and show them how to use them to guide their teams to success. This session will review the resources that are available and give real-life examples of how they can be used to create high functioning teams.

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