



# Pittsburgh Regional Healthcare Initiative *White Paper Series #2*



## **The Grand Experiment Begins**

PRHI Cardiac Working Group  
August 2003

# Pittsburgh Regional Healthcare Initiative

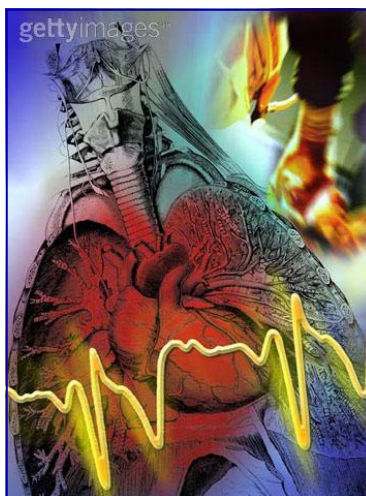
**A**t a recent focus group meeting of the PRHI Cardiac Working Group's Patient Care and Data Coordination Representatives Dennis Schilling encouraged teams to share their successes and any particular challenges. We are at the very early stages of a registry for regional learning following Coronary Artery Bypass Graft (CABG) surgery, and teams are still building infrastructure and the capacity for local learning from the regional collaborative. Work goes on at the twelve cardiac centers and conversations are starting to center around development of individual hypotheses associated with processes of care and the outcomes they produce.

One such story was shared by the representatives of the UPMC Shadyside team who also served as the host for the focus meeting and luncheon. As a result of one of the processes of care highlighted by PRHI and added as a performance measure by the UPMC Institute for Performance Improvement, UPMC Shadyside is calculating each patient's risk of hemodilution prior to initiating the cardiopulmonary bypass pump (CBP) also known as a heart – lung machine, and they are closely tracking the hematocrit while on the pump. Meeting the performance measure of no patients with a nadir hematocrit less than twenty-one while on pump was improving with the increased scrutiny, but the team wanted to try more.

Perfusionists worked with cardiovascular surgeons to reinstitute a process called **Retrograde Autologous Priming (RAP)** in an effort to reduce hemodilutional anemia when the pump circuit was first started. As a result the hemodilution measure was greatly improved. The story had all of the elements of success, but some of the details were not available at the meeting.

We planned a phone conference with members of UPMC Shadyside's team including a representative of the Perfusion Department with PRHI staff members to discuss their effort in more detail. On the call were Darlene Anderson, and Renee McElheny, Informatics, Peg Barnyk, Patient Care, and Steve Stewart, Perfusion of Shadyside and Naida Grunden with Dennis Schilling of PRHI.

As a preamble we discussed some of the data presented at the PRHI Cardiac Forum in April. Regional data showed 15% of the patients' (n = 251/2,069) hematocrit dipped below 21% while on CBP. The raw mortality rates were 1.8% for those patients who had their hematocrit maintained at or above 21 compared to a 6% rate for those patients whose hematocrit dipped below 21. The observed (raw mortality rate) to expected (risk adjusted mortality rate) ratio was 2.09 for those patients on CBP whose hematocrit dipped below 21. These data support the findings of the Northern New England (NNE) Cardiovascular Disease Study Group. The NNE has a 16 year history in improving regional outcomes following advanced cardiac procedures.



The UPMC Shadyside team related their story. About three months ago the team convened at a monthly CV Surgery division meeting attended by representatives of CV surgeons, anesthesiology, patient care, perfusion and process improvement. At the meeting there was a discussion over the PRHI highlighted processes of care.

- Uniform use of the internal mammary artery as a harvest site
- Use of Pre-operative aspirin
- Sufficient Beta Blockade Pre-op (Pulse rate less than 80 BPM at induction of surgery)

# Grand Experiment: Cardiac Working Group

- Avoidance of anemia due to blood dilution on coronary bypass (nadir hematocrit not below 21)

It was agreed the largest potential for improvement would be the pre-op heart rate and the hematocrit not below 21 on CBP. Anesthesiology would consider the pre-op heart rate, and perfusion would embrace the same process measure of hematocrit not below 21. Previously perfusion indicators carefully tracked the total fluid gain of patients with a goal gain to be less than 1,500 milliliters – a volume equivalent to  $\frac{3}{4}$  of a 2 liter bottle of soda pop. All perfusion services routinely track transfusion of blood products during CABG surgery. The long standing goal of perfusionists was to maximize the perfusion of the patient's tissues with oxygen while minimizing any unnecessary blood transfusions.

The actual pump mechanism in a CBP must be pre-filled with a physiologically compatible solution to avoid the possibility of introducing an air bubble to the circulation that could critically obstruct blood flow. In the 80's and 90's these pumps would require up to 2,500 milliliters of electrolyte solution to be primed for use. When a patient's blood circulation was connected to these pumps there was an immediate possibility of excessive dilution of the blood. As a protection the RAP procedure was developed and withdraws some of the patient's own blood displacing the electrolyte solution before the circuit is connected. The standards of pumps have evolved over the years, and currently less than 1,200 milliliters are required to prime the pump. As technology has improved the use of the RAP process decreased.

Perfusion professional literature has indicated some adverse outcomes frequently associated with CBP may be related to hemodilution. Recent presentations of the perfusionists from the Cleveland Clinic at the perfusion society meeting have also warned hemodilution may be problematic. When some of the perfusionists of St. Francis Hospital relocated to UPMC Shadyside they encouraged the reconsideration of the RAP procedure for those smaller and anemic patients at a calculated risk of hemodilution. It was only after close internal study of

aligned process measures that the perfusion department suggested the hypothesis that hemodilution may be a better marker of adverse patient outcomes than transfusion and fluid gain alone. RAP has now been adopted as the standard of care for patients at risk of hemodilution where the surgeon agrees it can safely be done. Anesthesiology has also been critically examining the fluid load for any patients going on to CABP. Since these process changes the percentage of patients on CBP who have their hematocrit maintained at 21 or greater has risen from 71.7 to 93.9% at Shadyside. Although there is no statistically proven difference in the patient outcomes at this time, the team is encouraged in what they are seeing. Patients are being well perfused with oxygen while on CBP, and hemodilution is being avoided. Clinically the patients appear to be doing better at the time the CBP is removed and the patient's own heart and lungs begin to function as the surgery is ending.

What is the grand experiment of the CWG? It is every discipline learning about processes and outcomes from every patient every day. It will be a long time-consuming process to prove any hypothesis of change from local experience, but by forming a learning regional community small ripples are made obvious in the larger pool of data. This story of the partners of UPMC Shadyside is not intended to prescribe or promote any particular type of procedure. As a story it is purely descriptive. It is, however, a powerful story of a team working together to understand things that they can change and things that they cannot, and choosing to develop and work to prove a hypothesis that a change they have made is providing better outcomes for their patients. Small changes or major procedural shifts such as this provide learning opportunities for all of the partners of the CWG. If your team has a story you wish to share, please contact Dennis Schilling at [dschilling@prhi.org](mailto:dschilling@prhi.org) so we may be able to share it with other partners. What we choose to do as we learn from each other advances the grand experiment of regional improvement every day. ☺

## *PRHI Board of Directors*

Ronnie Bryant  
President & COO  
Pittsburgh Regional Alliance

Charles Cohen  
Chairman  
Cohen and Grigsby

Roy Dorrance  
Vice-Chairman & COO  
US Steel

Karen Wolk Feinstein  
President  
Jewish Healthcare Foundation

Alan Guttman  
CEO  
Guttman Group

Timothy Merrill  
President  
NRG Energy Pittsburgh

Paul O'Neill  
Former Secretary  
United States Treasury Department

Mark Schmidhofer, MD  
Director  
UPMC Institute for Performance  
Improvement

Kenneth Segel (ex officio)  
Director  
Pittsburgh Regional Healthcare Ini-  
tiative

Richard Shannon, MD  
Professor & Chairman, Department  
of Medicine  
Allegheny General Hospital

Donald Wolff  
Managing Director  
Guyasuta Investment Advisors

The Pittsburgh Regional Healthcare Initiative is a collaborative of the institutions and individuals that provide, purchase, insure and support healthcare services in the 12-county region of Southwestern Pennsylvania. Together we are working to achieve:

- The world's best patient outcomes
- Through superior health system performance
- By identifying and solving problems at the point of patient care

Governed by a Board of Directors, PRHI is a committee-driven organization in which multidisciplinary teams representing PRHI's diverse partners assume responsibility for various facets of the effort.

### **Cardiac Working Group**

PRHI partner physicians and other cardiac care experts constructed the PRHI Cardiac Care Improvement Registry to measure key processes of care and how they link to patient outcome. Currently 12 of the region's 13 cardiac centers participate in the Registry and the quarterly Cardiac Forums, held to discuss the results.

PRHI staff directing this effort include:

- **Geoff Webster**, Associate Director, Working Group/Registries Team Leader, 412-456-0973 [websterchc@stargate.net](mailto:websterchc@stargate.net)
- **Jon Lloyd, MD**, Medical Advisor, 412-535-0292, ext 115, [jlloyd@prhi.org](mailto:jlloyd@prhi.org)
- **Dennis Schilling, PharmD**, Clinical Coordinator, 412-535-0292, ext 116, [dschilling@prhi.org](mailto:dschilling@prhi.org)



## Pittsburgh Regional Healthcare Initiative

Centre City Tower  
650 Smithfield Street, Suite 2150  
Pittsburgh, PA 15222

Phone: 412-535-0292  
Fax: 412-535-0295  
Website: [www.prhi.org](http://www.prhi.org)