Congratulations!

We are pleased to announce the following promotions:

**To Professor:**
- David Chou, M.D.
- Brad Cookson, M.D., Ph.D. (joint with Microbiology)
- Robert Hackman, M.D. (joint with Pathology)
- Brent Wood, M.D., Ph.D.

**To Associate Professor:**
- Theresa Nester, M.D.
- Harvey Schiller, M.D. (Returning)

**To Research Associate Professor:**
- Jeffrey Vieira, Ph.D.

And to welcome these new faculty members:
- Sampa Pal, Ph.D., Research Assistant Professor
  Joining the Medical Technology Program and the Microbiology Division, with teaching and service responsibilities in Clinical Microbiology and Urinalysis.
- Geoffrey Baird, M.D., Ph.D.
  Acting Assistant Professor Joining the Chemistry Division and will be Director of Clinical Chemistry at Harborview
- Noah Hoffman, M.D., Ph.D.,
  Acting Assistant Professor Joining the Informatics and Microbiology Divisions
This interview with Dr. Roger Resar focuses on understanding low reliability processes in healthcare, and provides realistic approaches to gradually improving them. The concepts discussed here are very useful to any clinical laboratory staff interested in realistic approaches to improving quality. Dr. Resar urges us to move beyond relying solely on education and vigilance as an approach to quality improvement. He is a national leader in the patient safety movement and has written and lectured extensively on realistic approaches to quality improvement. His work is informed by his 25 years of practice in internal medicine and pulmonology with a focus on critical care.

The interview was conducted by Dr. Michael Astion, Professor, Department of Laboratory Medicine, with help from Dr. James Hernandez, Assistant Professor, Laboratory Medicine, Mayo Clinic College of Medicine. It first appeared in 2007 in Laboratory Errors and Patient Safety (LEPS, Volume 3, Issue 4). Employees who are interested in viewing past issues of LEPS can do so at www.labmed.washington.edu on the “Staff Only” website under the heading “Publications”. Dr. Astion’s current interviews and articles on patient safety are now appearing quarterly in Clinical Laboratory News from AACC.

Q: Why is healthcare less reliable than other industries? Dr. Resar: The main reasons are:
• We rely too much on vigilance and hard work.
• Care providers are allowed too much autonomy, which leads to excessive variation.
• Benchmarking healthcare processes to mediocre patient outcomes gives a false sense of reliability.
• We fail to create systems specifically designed to reach realistic, well-defined goals for reliability.

Q: Can you give an example in the laboratory domain of relying too much on vigilance and hard work? Dr. Resar: We rely on a doctor’s vigilance regarding choosing the right test. For example, we expect a diabetic patient to be monitored twice annually with a hemoglobin A1C, and in many healthcare systems we rely on the doctor to be vigilant regarding accomplishing this. A better approach than vigilance would be to build multiple physician and patient reminders into the healthcare delivery system so that the diabetic is properly monitored.

Q: Shouldn’t a doctor be expected to know how frequently a diabetic should be monitored? Dr. Resar: They generally do know. The problem comes when the diabetic patient comes in a context that is different than diabetes, for example for a vaccination or emergency room visit for a sprained ankle. Every doctor cannot be expected to remember every monitoring requirement at every visit for every disease. Reminders need to be designed into the system for delivering care.

Q: Why do we design systems that rely so much on a doctor’s vigilance? Dr. Resar: This mystifies me. Vigilance and hard work are very admirable characteristics. Unfortunately, we emphasize them too much in physician training, and this has contributed to the attitude among health care leaders that vigilance and hard work are the answers to all our problems.

Q: In healthcare, process failures and patient outcomes are often not clearly connected. How does this hinder quality improvement? Dr. Resar: Lack of clear connection between a particular process failure and a patient outcome prevents us from accepting the lack of reliability in our processes, and makes us complacent about improving quality. We falsely conclude that our processes are not that bad since we are unaware of specific cases where process failures caused harm. Using the example above, it is difficult to know if a patient’s infection was specifically due to inadequate hand washing. There are many other reasons a patient could become infected including an underlying medical condition.

Q: In a recent article, you emphasize choosing the correct reliability levels for a healthcare process. Isn’t six sigma (less than 3.4 defects per million opportunities) the correct reliability level for every process? Dr. Resar: There are not sufficient resources to improve every healthcare process to six-sigma reliability. Resource limitations dictate that you prioritize your battles. This means aiming for higher reliability for processes that are more likely to have catastrophic consequences if they are defective.

Q: What are the factors to consider when determining the reliability level for a particular process, such as calling a critical value to a care provider, or properly identifying a patient and collecting their specimen? Dr. Resar: The factors to consider when determining a realistic reliability level are:
• Is the process potentially catastrophic for the patient immediately after it fails?
• If the process is potentially catastrophic, what is the likelihood of a catastrophic event if the process fails?
• What are the previous and
current levels of performance for the process?
  • What are the expectations of the users of the process?

Higher reliability levels are required if the process is catastrophic and likely to fail, and if users have high expectations for reliability. Obviously, the goal of quality improvement will be to surpass the current reliability level.

Q: Can you give examples of a catastrophic healthcare process as opposed to a noncatastrophic process?
Dr. Resar: By catastrophic, we are referring to processes that would immediately cause serious harm if the process failed. An obvious example is the process for choosing the correct bodily site for a surgery. An example in clinical pathology is choosing ABO compatible blood for a transfusion.

Q: What is an example of a noncatastrophic process?
Dr. Resar: Hand washing is a good example. Everybody would agree that it is an important component of infection control, but failure in hand washing will not immediately cause a catastrophic event, and usually will not cause a bad outcome at all because of the patient’s host defenses.

Q: By these definitions, how would you characterize laboratory-testing processes?
Dr. Resar: With some exceptions, like the ABO example above and some testing in the emergency or critical care setting, most laboratory processes are not catastrophic in that they would rarely lead to immediate harm to the patient. For example, choosing the wrong test can harm a patient, but in most settings it does not cause serious harm, and it rarely causes immediate harm.

Q: Can you give us an example of a noncatastrophic healthcare process?
Dr. Resar: By catastrophic, we are referring to processes that would immediately cause serious harm if the process failed. An obvious example is the process for choosing the correct bodily site for a surgery. An example in clinical pathology is choosing ABO compatible blood for a transfusion.

Q: Can you describe the reliability model now being used by IHI to help understand and improve low reliability, noncatastrophic processes like many of the processes involved in laboratory testing?
Dr. Resar: This model is outlined in table 1. The current state of healthcare is that we have a great number of processes at the 10^-1 or 10^-2 level of reliability, where we define 10^-1 semi-quantitatively as 1 or 2 errors per 10 attempts at the process, and 10^-2 is 1 to 5 failures per 100. This occurs because our most common approach to quality improvement is to develop a policy and procedure and then rely on staff education and vigilance for successful implementation.

Q: How do we move beyond this common and ineffective approach to quality improvement?
Dr. Resar: You have to walk before you can run. Many healthcare processes are at 10^-1 reliability. We could get a tremendous boost in healthcare quality by making a great effort to get these processes to 10^-2. This is done by designing processes that incorporate principles from the science of human factors and reliability. We call these principles “model 10^-2 change concepts”.

Q: Can you give examples of concepts that can help achieve the 10^-2 or 10^-3 level are:
  • Build reminders and other decision aids into the system.
  • Make the desired action the default.
  • Incorporate methods for identifying failures and mitigating them.
  • Design standardized systems compatible with the usual habits, patterns and abilities seen in the workplace.

Q: Can you give an example of design elements that are incompatible with the usual habits, patterns and abilities seen in the workplace?
Dr. Resar: A patient identification system that takes 10 minutes to properly identify a patient before performing phlebotomy will not work because it is too slow. Similarly, physicians who have to round on a large group of patients are not going to use an electronic medical record that has a lengthy login procedure for each patient.

Q: We have many processes in laboratory services stuck in the 10^-2 or 10^-3 range. This is especially true of processes that are not automated,

<table>
<thead>
<tr>
<th>Definition</th>
<th>Defect Rate</th>
<th>Characteristics of Process</th>
<th>Examples in laboratory services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaos</td>
<td>&gt; 2 defects out of 10 opportunities</td>
<td>Absence of any well articulated process</td>
<td></td>
</tr>
</tbody>
</table>
| 10^-1      | 1 or 2 failures per 10 | Articulated process with reliance on staff education, hard work and vigilance to achieve standardization | • Properly filling out a manual requisition  
• Identifying the current direct care provider associated with a hospitalized patient  
• Hand washing |
| 10^-2      | <5 failures per 100 (>95% success) | Articulated process implemented using some basic human factors principles | • Notifying ambulatory patients of their test results  
• Adequate specimen (quantity sufficient, not contaminated or hemolyzed)  
• Properly logging in a manual requisition into the laboratory information system |
| 10^-3      | <5 failures per 1000 (>99.5% success) | Articulated process implemented using human factors principles, and systems for failure detection and mitigation | • Patient identification and specimen labeling  
• Critical value notification |

Table 1. Overview of reliability labels used to describe many noncatastrophic healthcare processes. The examples are provided by LEPS editorial staff based on their opinions. Despite some notable exceptions, most organizations have not achieved higher reliability for these processes. The table is adapted from reference 1.
Introducing the Call Center

The Call Center, which recently moved into new space at the South Lake Union Building, is an important unit within the Reference Laboratory Services Division. They handle calls from the Department of Laboratory Medicine’s outside clients on a variety of issues including:

- requests for patient results
- testing services provided by our labs
- status of specific specimens
- transport options and necessary conditions for individual samples
- courier services and more.

The staff is comprised of 6.5 FTE Clinical Lab Technologist 2’s working 8 a.m. to 8 p.m. on weekdays and 8:30 a.m. to 1:30 p.m. on Saturdays. The following individual’s currently make up this group: Matthew Berg – part-time, Hung Du, Tony Gordon, Beverly Hurgo, Grace Matias, Laarni Mejino, and Kris Ryan. The staff also includes an Office Assistant II, Maureen Johnson. The supervisor of the call center is Carol Maeso.

Business is booming at the Call Center. Outbound calls are up from 1113 per month in 2005 to over twice that number now, while incoming calls average 3000 per month up from 1720 in June 2005. This is an increase of over 200% in three years. In addition, the unit began providing support for Research Testing Services (RTS) and processing their applications as of summer, 2007.

Technical experience plus excellent communication skills help the relatively small staff deal with the increased workload. We are very pleased to have these dedicated people on the Lab Med team and appreciate all they do for the department.

Call center personnel (from left to right): Carol Maeso, Laarni Mejino, Hung Du, Beverly Hurgo, Tucker Sparkman, Grace Matias, Kris Ryan. Not shown: Tony Gordon, Matthew Berg, Maureen Johnson.

like patient identification and specimen collection, calling critical values, and collecting technically adequate specimens. Why is it so hard for us to get beyond 10^-3?

Dr. Resar: To get to 10^-3 and beyond nearly always requires technology and advanced design. This usually means making significant resource investments.

Q: When designed and implemented carefully, automation and computerization have helped the lab achieve 10^-5 or 10^-6 reliability for some aspects of laboratory testing. For example, automated specimen processing systems can achieve this level of reliability for the aliquotting of specimens. Similarly, transmission of data from the laboratory information system to electronic medical records can achieve this level of reliability. Can you comment on this?

Dr. Resar: These examples illustrate my point. These examples are achieved through successful technology design and implementation using human factors as the guide. It is hard to get beyond 10^-3 without this technology. If technology does not exist to help you, you often have to be practical and aim at achieving at 10^-3 reliability, until a helpful technology is available.

Q: How do previous and current levels of performance for a process influence the choice of reliability level?

Dr. Resar: If you are stumbling, you first have to learn to walk, and you have to be able walk before you can learn to run. Therefore, if you have a process that is chaotic at 10^-1 reliability, it is most realistic to aim for the 10^-3 reliability level. Similarly, if you are at 10^-2, your next logical step is 10^-3.

Q: How do you balance the investment of resources needed to improve noncatastrophic healthcare processes?

Dr. Resar: You must consider the cost of failure vs. the cost of going to the next reliability level. For noncatastrophic processes – and these are the majority of healthcare processes – it often takes a fair amount of investment in technology, design, and usability testing to go from 10^-3 to 10^-4. That same amount of investment might be better spent in bringing several chaotic processes to 10^-2. Similarly, you might achieve better patient outcomes by spreading an investment to bring many 10^-2 processes to 10^-3, rather than concentrating the entire investment into driving one process to six sigma, (which equates to 10^-6 reliability in the IHI model).

Q: We would like you to apply these concepts to a specific example. Should we be pushing for six sigma reliability for patient identification and specimen collection since there is so much at stake regarding misidentifying a lab specimen?

Dr. Resar: I agree that this is an important problem but the context is important. The likelihood of a catastrophic...
Quality Ideas: Getting Realistic (cont’d)

episode occurring as a result of mislabeling is actually quite small. However, the other factors – like the reputation of the institution, the expectation of the users of the process and previous levels of performance – may push the desired reliability into the 10⁻⁴. But there is not currently a realistic solution with 10⁻⁴ reliability for proper labeling in most hospitals, the next step is to try to apply technology and advanced concepts from reliability science to get to 10⁻⁵.

Q: What is a laboratory example of putting a high level of resources toward achieving high reliability for a catastrophic process?

Dr. Resar: As I mentioned before, the transfusion of ABO compatible blood is potentially catastrophic. A significant amount of resources have gone into improving this process, and currently, the chance of death from receiving a mismatched unit of blood is about 1 in 10⁶.

Q: Can we end the interview with a take-home message?

Dr. Resar: Designing a process is not simply making a policy and asking staff to be vigilant in applying it. Process design incorporates basic principles of reliability science to increase the likelihood of success. For noncatastrophic processes, it is often wise to use available resources to bring a variety of chaotic or 10⁻¹ processes to the 10⁻² reliability level.

Q: Many thanks for some useful advice.

References
1. Resar RK. Making noncatastrophic health care processes more reliable: learning to walk before running in creating high-reliability organizations. Health Serv Res. 2006; 41:1677-1689.

Kathleen Clayson seemed cut from a Garrison Keillor sketch: a devout Lutheran raised on the Minnesota dairy farm that her grandfather had homesteaded after arriving from Sweden. She was self-effacing but extremely competent, and nurtured a hidden passion for fly-fishing. During Ms. Clayson’s teens, her mother became sick with leukemia. Watching her mother endure seven years of periodic hospital stays propelled her toward medicine, said her sister, Shelby Clayson, of Puyallup.

Her public life was in the University of Washington’s Department of Laboratory Medicine, which she helped set up in 1969 and where she stayed until she retired in 1994. Ms. Clayson gravitated toward laboratory work after getting a graduate degree from the University of Minnesota, and partnered with the late Dr. Paul Strandjord on cancer research. Strandjord recruited Ms. Clayson to Seattle after he was hired to consolidate the clinical labs that had been scattered throughout the medical school. To her colleagues, she was an artist with the enzyme test. “They really built that department together: she from the technologist side, he from the physician side,” said Dr. Thomas Strandjord, Paul’s son.

Dr. James Fine, the current chair of the UW department, said Ms. Clayson excelled at the “art” of clinical enzymology. But her legacy was the generation of undergraduate and graduate students she taught in laboratory-sciences classes, Fine said. Ms. Clayson, 79, died April 18 after a yearlong battle with leukemia. Pastor Wesley Howell, of Grace Lutheran Church in Bellevue, said Ms. Clayson was given a diagnosis of just a few weeks to live but she lasted a year.

Until the final few months, she continued to do behind-the-scenes work at her church, setting up the altar for services. “Every Sunday, I shake hands out the door. Every Sunday, she would hold my hand and say, ‘You have a good week.’ It was like her blessing me back. I came to expect it,” Howell said.

Ms. Clayson never married but was treated as family by Paul Strandjord’s wife and two sons. Thomas Strandjord said he and his brother grumbled about sailing trips on cold spring days on Puget Sound, but not Ms. Clayson. “She was never a complainer, always an incredibly hard worker,” he said. “If there were dishes to be done after dinner, it was almost painful to get in and help because she was already doing them.”

She and her sister, who also never married, discovered fly-fishing after Ms. Clayson retired. They fished rivers in Montana, Idaho, Oregon and British Columbia. “She liked to be out there and was excited if she caught fish, which she did many times, but what was most appealing was being out in nature and on the rivers and lakes, all the beauty,” Shelby Clayson said.

In addition to her sister, she is survived by many cousins. Donations may be made to the Paul E. Strandjord/Kathleen J. Clayson Endowed Professorship at the UW’s Department of Laboratory Sciences, c/o UW Medicine Development, 1325 Fourth Ave., Ste. 2000, Seattle, WA 98101, or to Grace Lutheran Church, 9625 N.E. Eighth St., Bellevue, WA 98004.

Reference
1. This piece was derived from Kathleen Clayson’s obituary, which was written by Jonathan Martin and which appeared May 9, 2008 in the Seattle Times. The version that appears here was also edited by James Fine, Michael Astion and Renee Layden. Used by permission of Mr. Martin and the Seattle Times.
In this feature, PROFILES introduces faculty member Cara Calvo, Lecturer in the Department of Laboratory Medicine.

Cara Calvo, a member of the Lumbee Tribe headquartered in Pembroke, NC, joined the UWMC Laboratory Medicine faculty in December, 2007. She received her Bachelor of Science degree in Medical Technology from the Oregon Health and Science University in Portland, Oregon, and her Master of Science degree from the University of Vermont in Burlington, Vermont. Credentialed as a generalist medical technologist, Cara is also certified as a specialist in hematology by ASCP. Currently, Ms. Calvo teaches LabM 321, Introductory Clinical Hematology; LabM 419, Clinical Coagulation; LabM 425, Clinical Hematology, and helps with LabM 427, Selected Studies in Laboratory Medicine.

Ms. Calvo brings to the department extensive experience as a medical technologist and educator, having worked for the U.S. PHS Indian Health Services, the U.S. Army, the Veterans Administration, and a number of non-government hospitals including one in Saipan. She has also served as a faculty member teaching at a number of University-based Medical Technology programs including Texas Tech University, University of Wyoming, University of Maryland, Florida Gulf Coast University and Ohio Northern University. Her international experience includes working with Pathologists Overseas in Romania and Kenya, as well as doing independent consulting in Haiti, China, and Australia.

Cara has great respect for her students and the efforts they make to reach their educational goals. Many of them must balance employment and family obligations with the rigors of the UW Medical Technology program curriculum. Additionally, they may be learning a new language while far from the support of family and the culture they grew up with. Despite these difficulties, Ms. Calvo sees her pupils making a strong commitment to the program and to the field, and following through to reach their goals.