



Improving the Nurse Work Environment on Medical-Surgical Units Through Technology

Technology drill down: identifying potential technological solutions to improve the nurse work environment on medical-surgical units

SUMMARY

Technology offers opportunities to streamline routine tasks and improve the amount and quality of time that nurses can spend with patients. Responses to the infusion of technology in health care settings have been mixed, however, in part because end users often have not been involved in designing technology products or in implementing their use.

Staff at the American Academy of Nursing's Workforce Commission created Technology Drill Downs, a structured process in which hospital nurses and others work together intensively for two days to identify technological solutions to workflow problems. The Workforce Commission then introduced Drill Downs in 25 acute-care hospitals across the country and disseminated results to hospitals, technology vendors and others.

Key Results

- More than 1,000 staff in some 200 adult medical-surgical units at 25 acute-care hospitals participated in 25 two-day Technology Drill Downs.
- Members of the Workforce Commission promoted the use of Technology Drill Downs through a [Technology Drill Down Facilitator's Guide](#) and other communications products.

Key Findings

- Nurses were disappointed with many existing technologies that were not user-friendly, did not provide the necessary functionality or required "work-arounds."
- Nurses believe technology can greatly reduce the workflow burden associated with documentation, medication administration, communication, orders and securing equipment and supplies. They cite the most desired features of technology as integration and interoperability across systems; bedside availability; portability; and hands-free capability, such as voice activation.

- Examples of technology to improve the practice environment include bedside entry systems that interface to medication, supply and equipment systems and “smart beds” that monitor patients’ vital signs.

Funding

The Robert Wood Johnson Foundation (RWJF) funded the project with four grants totaling \$555,729 from January 2004 to October 2009.

CONTEXT

“The shortage of registered nurses in hospitals threatens to cripple health care delivery in the next three to five years,” said Linda Burnes Bolton, Dr.P.H., R.N., F.A.A.N., vice president for nursing at Cedars-Sinai Medical Center in Los Angeles and former president of the American Academy of Nursing. See her [Grantee Profile](#).

Burnes Bolton continued, “Chaotic and complex inefficient environments contribute to nursing dissatisfaction, nursing staff turnover and diminished capacity to provide quality care. Flawed workflows result in inefficient use of personnel, delays in care and compromise of patient safety and privacy.”

Technology offers opportunities to address these problems in the workplace environment, but responses to the infusion of technology in health care have been mixed, according to the American Academy of Nursing. One reason is that end users of technology often have not been consulted about product design and implementation. The technology industry has focused more on the product’s technical aspects than on its operational aspects, efficiencies and safety and user perspectives.

RWJF’s Interest in the Problem

Over the past three decades, RWJF has invested more than \$150 million in nursing programs that address shortages and other issues related to the nursing profession. In addition to nursing education, RWJF has focused on environmental factors that affect practice and foster high-quality patient care.

Two investments of particular relevance are:

- [Transforming Care at the Bedside](#), a national program to test and spread prototypical hospital nursing strategies to improve the work environment and quality of care.
- “Study and Conference on Improving Work Environment for Nurses.” Known as the Time and Motion Study, this project explored how nurses use their time and whether workplace design affects patient care. See [Grant Results](#) for details about the study.

For more information about RWJF’s strategies in this area, click [here](#).

The American Academy of Nursing's Workforce Commission

The [American Academy of Nursing](#) (the Academy) was founded in 1973 under the aegis of the American Nursing Association. The Academy serves the public and the nursing profession by generating, synthesizing and disseminating nursing knowledge in order to advance health policy and practice.

The Academy established its [Workforce Commission](#) in 2000 to “develop models for the creation of technology-enhanced practice environments to improve nursing efficiency and effectiveness.” Linda Burnes Bolton chaired the commission from 2003 to 2007. Burnes Bolton also chaired the national advisory committee of *Transforming Care at the Bedside*.

In July 2002, RWJF provided partial support to the Academy for a conference entitled “Using Innovative Technology to Enhance Patient Delivery” (ID# 044427). Participants assessed the nursing system in light of anticipated changes in the workforce and identified opportunities to use technology to increase productivity and job satisfaction and to improve quality of care. See [Grant Results](#) for a summary of the conference and its recommendations.

THE PROJECT

Building on recommendations from the 2002 conference, the goals of the Technology Drill Down project were to reduce the demand for registered nurses in hospitals and to reduce the time nurses must spend on tasks that are not directly related to patient care.

Creating and Testing a Methodology

Burnes Bolton convened a conference in February 2004 that brought together the Workforce Commission, staff from RWJF's *Transforming Care at the Bedside* national program office, technology experts and staff from the University of Virginia Medical Center.

Participants created a process by which hospital staff could identify technological strategies to improve the appropriate use of nurse time and pilot-tested the process in adult medical-surgical units in three hospitals:

- University of Virginia Medical Center, Charlottesville
- Kaiser Permanente Orange County–Irvine Medical Center, Irvine, California
- Cedars-Sinai Medical Center, Los Angeles

“The pilot studies showed a ‘continental divide’ between technology products deployed in American hospitals and health care systems and the products’ utility,” said Carole Gassert, Ph.D., R.N., F.A.C.M.I., a member of the Workforce Commission.

The Workforce Commission and the hospitals used insights from the pilot to formalize a process they called “Technology Drill Downs,” or TD2, and to develop a template for its use.

Technology Drill Down Overview

Technology Drill Downs bring together 20 to 30 registered nurses, pharmacists, information technology specialists, social workers, facilities managers and others for two days. A facilitator guides the participants through the process.

On the first day, participants identify major work categories of concern, such as administering medication or documenting care. They then describe in detail the current and ideal workflows in each category. Participants vote for four work categories that will become the focus of the second day.

On day two, each participant chooses to focus on one of the four priority categories. Working in small groups, they “drill down” in order to describe gaps between current and ideal states more specifically. Then they identify technology solutions that would move workflow closer to the ideal.

Finally, work groups estimate the time and money it would take to implement each solution. This allows them to identify projects that could be implemented quickly at lower cost and those that would require more time and money.

Burnes Bolton offered this description of the process: “We ask them to think about, ‘What would make your perfect workday?’ Nurses identify multiple hand-offs, multiple communication gaps and waste and we ask, ‘Where do you believe technology would help?’ Then, we ask, ‘Does that technology exist today?’”

Using software developed by ePrism Solutions, a Michigan-based software consulting firm under contract to the Academy of Nursing, the facilitator maps and diagrams the discussion on an interactive “white board” that records themes and decisions as they occur. By the end of the Drill Down, participants have a precise measure of the technological gaps between their practice and their needs and in generic terms a description of technological products that could close the gaps.

More information about Technology Drill Downs is available [online](#).

Implementing Technology Drill Downs

In April 2005, Burnes Bolton convened a meeting between the Workforce Commission and representatives of seven technology vendors to review the Drill Down process and the technology ideas that emerged from the three pilot hospitals.

The Workforce Commission hoped to create a national coalition in which vendors would receive access to data and information about potential technology products in exchange for a \$50,000 membership fee that would allow the commission to continue its research and shape opportunities for new products. The vendors ultimately were unwilling to make a financial commitment that did not give them exclusive access to the findings.

As a result, the project needed to be recast. Following discussions with the Workforce Commission and staff of two other key RWJF nursing initiatives, *Transforming Care at the Bedside* and the Time and Motion Study, RWJF funded the commission to:

- Introduce Technology Drill Downs in 25 hospitals across the country, collect data about the experiences and analyze and report the results.
- Create an advisory council to develop strategies promoting the use of Drill Downs and other practice enhancements emerging from *Transforming Care at the Bedside* and the Time and Motion Study.
- Synthesize findings from the three RWJF-funded projects.

The advisory council, composed of hospital nursing officials, other hospital staff and information technology specialists, advised the Workforce Commission on ways to integrate RWJF's nursing initiatives, create linkages with technology vendors and disseminate results from the project. The committee also provided guidance for the Nurse Work Environment Innovation Summit described below.

FINDINGS

Burnes Bolton reported the following findings from the 25 Drill Downs in the *Journal of Healthcare Information Management* (vol. 22)—available [online](#)—and in an unpublished monograph.

- **Nurses were disappointed with many existing technologies that were not user-friendly, did not provide the necessary functionality or required “work-arounds.”** For example, nurses often:
 - Walk miles during their shifts to find equipment and supplies
 - Deal with a complicated combination of electronic and paper charting and order entry systems

- Use information systems that are splintered, unable to interface and require multiple log-ons
- **Nurses believe technology can greatly reduce the workflow burden associated with documentation, medication administration, communication, orders and securing equipment and supplies.** Nurses articulated their needs for information systems and devices that automate manual functions, speed the delivery of information and add incremental measures of safety.
- **To make technology faster, more convenient and easier to use, nurses emphasized the importance of:**
 - Systems to provide tracking, documentation and communication
 - Integration and interoperability across systems and vendors
 - Bedside availability, portability and hands-free features, such as voice activation
- **Nurses most frequently mentioned a need for these three types of technology:**
 - Devices they can carry into the patient’s room
 - Computerized physician order entry
 - Electronic medical records and clinical information systems
- **Building on the nurses’ descriptions of their workflow processes and their “wish lists,” the project director and colleagues described some of the technology that would improve the practice environment and patient safety.** For example:
 - Bedside entry systems that interface to medication systems, supply systems and equipment systems.
 - Radio frequency identification using radio waves to track equipment and supplies and robotic systems that deliver these to the bedside.
 - Biomedical monitoring systems, such as noninvasive blood pressure devices and wireless telemetry monitors, which monitor patient status.
 - Retinal images or fingerprinting that can authorize access to patient data and providers who use wireless systems to communicate at the point of care.
 - Smart technology that uses embedded computer chips to gather information and measure parameters established by caregivers. Examples are smart beds that monitor patients’ vital signs and bar codes at the bedside that match patients with the drugs that have been prescribed for them.

RESULTS, RECOMMENDATIONS & CONCLUSIONS

Results From the Drill Downs

Burnes Bolton and her colleagues reported the following results from the Technology Drill Down project in the *Journal of Healthcare Information Management*, available [online](#), and in reports to RWJF:

- **Some 1,000 medical staff working in 200 adult medical-surgical units in 25 acute-care hospitals participated in 25 two-day Technology Drill Downs.** Hospitals ranged in size from less than 250 beds to more than 500. About 70 percent of the hospitals were in urban areas, and 72 percent were teaching facilities.

“The training allowed participating hospitals to see the technology available to them and understand the systems within which the technology operates,” said RWJF Program Officer Denise A. Davis. “It was good for them to talk about these things with colleagues from other disciplines.”

See [Appendix 1](#) for a list of participating hospitals. For a profile of how a Drill Down worked at Seton Hospital in Austin, Texas, [click here](#).

- **The Workforce Commission promoted an expanded use of Technology Drill Downs by other hospitals through dissemination of products and the efforts of the advisory council:**
 - *The Technology Drill Down Facilitator’s Guide* describes the Drill Down process and includes sample agendas and other templates for participants. The guide is available [online](#).
 - The Technology Drill Down DVD includes video presentations by Burnes Bolton, comments from a Drill Down facilitator, the *Facilitator’s Guide*, handouts for participants and templates for recording and reporting results. The DVD is available from the American Academy of Nursing for the cost of shipping.
- A leading software manufacturer began using Technology Drill Downs to help it decide what technology to develop and how to introduce it into hospitals. According to Burnes Bolton, hospital nurses, physicians, other clinicians and informatic departments now participate in these design decisions.
- At least 67 hospitals have used the Technology Drill Down framework to identify technology needs and communicate priorities to vendors.

Recommendations From Synthesis of the Three RWJF-Funded Nursing Initiatives

More than 200 health care executives and front-line staff participated in a Nurse Work Environment Innovation Summit, held in Oakland, Calif., in January 2007, to synthesize

findings from the Technology Drill Downs, *Transforming Care at the Bedside* and the Time and Motion Study.

Ann Hendrich, M.S.N., R.N., F.A.A.N., and colleagues reported on the summit in a 2009 article in the *Journal of Nursing Administration* (vol. 39), abstract available [online](#). Hendrich is vice president of St. Louis–based Ascension Health and participated in all three projects.

- **Participants at the summit constructed a Proclamation for Change to transform the hospital patient-care environment.** Burnes Bolton called the proclamation “marching orders to the industry.” Its four principles support change through a focus on:
 - *Patient-centered design.* Both hospital design and technology design should be organized around patient needs and tailored to address unique factors and diverse patient populations.
 - *Systemwide, integrated technology.* Architects and technology vendors should work closely with nurses, physicians and other caregiving departments in all aspects of designing work spaces and technology.
 - *Seamless workplace environments.* Physical design of medical-surgical units should be fully integrated with caregiver work processes and technologies, so caregivers always have the right resources, in the right place at the right time.
 - *Vendor partnerships.* The design and operation of technology devices should be intuitive, error free and part of interoperable systems.

Staff members of the three projects made additional attempts to synthesize and integrate their data but were unable to do so because data had been collected in different forms and were not readily available.

Conclusions

Based on its experience with the Technology Drill Downs, the Workforce Commission concluded:

- **Improving the practice environment is essential to retaining nurses, providing safe patient care and increasing the amount of time nurses can spend directly with patients.**
- **Using the Drill Down process allows facilities to identify inefficient and burdensome workflow processes that can be improved with technology.**
- **Partnerships between the fields of nursing and technology are vital for designing the practice environment.** “There is an imperative to reposition nurses from passive

recipients of technology to active roles in the design, development and testing of technology,” said Burnes Bolton.

Burnes Bolton believes that the project demonstrated the need for a sea change in how technology is developed and deployed. “Technology should be ubiquitous, helpful and unobtrusive,” she said in a personal interview and published reports. “The costs associated with system inefficiencies, reduced time with patients and nursing turnover far outweigh the investments required to design and build information technology that meets the work environment needs of nurses and other patient care providers.

“If done correctly, this will increase the time nurses spend with patients, thus increasing safety, improving clinical outcomes and decreasing costs.”

LESSONS LEARNED & MOVING FORWARD

Lessons Learned

1. **Give nurses a prominent role in selecting and implementing technological solutions to workflow problems.** Although technology companies have gotten better at involving nurses, hospital executives who purchase products still need to understand the value of listening to clinicians and acting on their insights. (Project Director Linda Burnes Bolton; RWJF Senior Advisor for Nursing and Director of the RWJF Initiative on the Future of Nursing at the IOM, Susan Hassmiller)
2. **“Amplify the voices of nurses in creating a national health information technology agenda.”** This includes informing policy-makers about the role of technology in supporting safer, higher-quality health care. Nursing organizations should join together to take a lead role to further this agenda. (Project Director Burnes Bolton)
3. **Do not underestimate the resistance from corporations in responding to technology needs.** Technology vendors were reluctant to join a coalition with the Academy of Nursing that did not offer them exclusive access to insights and data. “We realized how our missions differed,” said Project Director Burnes Bolton. They also were “unwilling to play together” to make their products interoperable because it would generally mean having to share proprietary information with potential competitors.
4. **Request adequate time and resources to store and analyze data.** The Academy of Nursing had not anticipated the volume of data generated during the various phases of the project. Project Director Burnes Bolton said that the Academy should have requested support to house the data in a repository that would have made it easier to analyze and synthesize.
5. **Develop strategies to ensure that participating sites provide necessary data after a Technology Drill Down is completed.** At times, it was difficult for project staff to

get information from hospitals after a Technology Drill Down because employees were focused on other work. (Project Director Burnes Bolton)

6. **Hire a full-time project manager.** Do not assign the daily work of overseeing a project to someone who has other duties that compete for time. (Project Director Burnes Bolton)

Afterward

In 2009, the American Academy of Nursing Workforce Commission received additional funding through the Association of Nurse Executives, a subsidiary of the American Medical Association. The commission is examining whether hospitals that participated in Technology Drill Downs used that experience to develop requests for proposals to purchase technology information systems and devices.

RWJF Team: Quality/Equality

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APPENDIX 1

Hospitals Participating in Technology Drill Downs

- Allen Memorial Hospital, Waterloo, Iowa
- Appalachian Regional Health Care, Whitesburg, Ky.
- Aurora Health Care–West Allis Hospital, West Allis, Wis.
- Carolinas Medical Center—Charlotte, N.C.
- Cedars-Sinai Medical Center, Los Angeles, Calif.
- Children’s Mercy, Kansas City, Mo.
- Duke University Health System, Durham, N.C.
- Georgetown University Medical Center, Washington, D.C.
- Henry Ford Hospital, Wyandotte, Mich.
- Inova Fairfax Hospital, Fairfax, Va.
- James A. Haley Veterans Administration Hospital, Tampa, Fla.
- Kaiser Permanente West, Los Angeles, Calif.
- Loyola University Medical Center, Maywood, Ill.
- Mercy Hospital, Pittsburgh, Pa.
- North Shore Long Island Jewish Hospital, Great Neck, N.Y.
- Porter Hospital, Denver, Colo.
- Prairie Lakes Hospital, Watertown, S.D.
- St. Margaret Hospital, Pittsburgh, Pa.
- St. Mary’s Hospital, Tucson, Ariz.
- Seton Hospital Northwest, Austin, Texas
- University of California San Francisco Medical Center, San Francisco, Calif.
- University of Washington Medical Center, Seattle, Wash.
- Utah Valley Regional Medical Center, Provo, Utah
- Vanderbilt University Medical Center, Nashville, Tenn.
- Wesley Long Hospital, Greensboro, N.C.

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