Cardiovascular surgical (CVS) settings encompass shared physical spaces that are accessible to patients, physicians, nurses, residents, and other members of the healthcare team. Dynamic, fluid interactions are constantly occurring among various members of the team at any point in time. Within these interactions, each member seeks to meet unique information and communication needs. For example, patients require information and support for learning and application of new self-care behavior skills, residents and students require mentorship to guide practice, and nurses and physicians require up-to-date empirical and theoretical information to revise and evaluate existing care endeavors. Traditionally, separate resources have been designed and administered for each member of the healthcare team; however, a single intervention that addresses the needs of each member of a multidisciplinary team has not been designed or evaluated. We developed an interactive, multidisciplinary, collaborative Web site as an intervention designed to address the needs of all members of the healthcare team, including patients. The Web site addresses the needs of postoperative patients, cardiovascular medical residents, nursing students, and other trainees, as well as nurses and physicians. In doing so, the site mimics the collective functioning of the existing healthcare teams within a shared physical space. The Web site can be accessed by different members of the healthcare team anywhere there is a wireless connection, and so it does not depend on shared physical space. Furthermore, it allows for interactive discussion through online chat rooms and open forums. As a result of this Web site, we anticipate an increase in the quality of patient care that is delivered within the CVS setting.

**CARDIOVASCULAR SURGERY: EDUCATION AND INFORMATION NEEDS**

Across the healthcare setting, an average of 134,900 individuals undergo a CVS procedure every year to repair diseased heart tissue and/or surrounding structures of the circulatory system. Procedures that include replacement of damaged valves, rewiring of cardiac electrical impulses, rerouting of blood throughout the circulatory system, and heart transplantation are commonly performed. Following these procedures, patients typically experience a number of symptoms, including shortness of breath, fluid retention, pain, lack of appetite, difficulty sleeping, constipation, mood swings, and swelling in extremities. As a result, patients are required to engage in a number of self-care behaviors and self-monitor for signs and symptoms of complications during their recovery. Many patients have little contact with a healthcare provider after hospital discharge, because they do not meet the requirements for receiving nursing care at home. This can result in inadequate performance of
self-care behaviors and failure to recognize key signs and symptoms of infection and other complications. Consequently, patients may experience exacerbation of existing health conditions, delayed recovery, increased visits to family physician clinics and emergency rooms, and even rehospitalization.

Educational booklets provided to patients during hospital stays appear effective in producing short-term (24–48 hours after hospital discharge) self-care behavioral changes. However, educational booklets may be ineffective in producing changes over a longer period (up to 3 months following hospital discharge). Additional findings suggest that educational booklets may contain much irrelevant information, as individual learning needs constantly change to reflect the overall health situation. Ideally, educational materials should reflect patients' specific learning needs.

Nursing students and medical residents also contribute to CVS care, and their engagement in the clinical environment can influence patient outcomes. These students seek to refine their clinical skills while enhancing their knowledge of research and translation. Mentoring from senior members of the healthcare team often facilitates this learning process. Mentors use up-to-date clinical and research materials, research experiences, and clinical learning experiences in their interaction with students and residents.

Clinical staff in the CVS setting includes staff nurses, nurse practitioners, surgeons, and staff physicians; most of their contact with patients occurs within the first week following surgery. As direct patient care providers, clinical staff continuously seek out and integrate empirical evidence into their practice with the aim of enhancing quality. Clinical staff commonly use self-study practice guides and online databases in order to access, critique, and integrate empirical evidence into clinical practice.

A WEB SITE FOR PATIENTS, STUDENTS, AND CLINICAL PERSONNEL

In an effort to reduce redundancy in resources that are designed, evaluated, and supported within a CVS setting, we are developing a single Web site to meet the education and information needs of patients, students, residents, mentors, and clinical staff. Different views of the Web site are presented to meet needs corresponding to specific roles on the multidisciplinary team. We contend that this resource can influence patient outcomes. These students seek to refine their clinical skills while enhancing their knowledge of research and translation. Mentoring from senior members of the healthcare team often facilitates this learning process. Mentors use up-to-date clinical and research materials, research experiences, and clinical learning experiences in their interaction with students and residents.

The Web site can be accessed by any member of the CVS team. The site is composed of the following sections: Research, Patient Information, Opportunities, and Clinical Application. The section titled Research provides direct access to current research studies in nursing, medicine, rehabilitation, occupational therapy, and physiotherapy. The design of the Research section includes each article's abstract, followed by hyperlinks to the full manuscripts. A university-based librarian is responsible for the maintenance of this page, which is updated on a weekly basis. It is anticipated the Research section will be beneficial to clinical staff, students, residents, and patients.

In addition to the Research section, a Patient Information section provides information to patients who have had coronary artery bypass graft, valve replacement, or heart transplant. The section contains content related to specific behaviors patients are expected to engage in during the first year of recovery following heart surgery (eg, activity performance, management of complications and medication, nutrition, and symptom management). The information contained within this link has been described and evaluated extensively in various randomized controlled trial–based studies and has demonstrated effectiveness in promoting self-care behavior performance while reducing the rate of symptoms, complications, and hospital readmissions.

The Patient Information section allows patients to review and select specific topics at any point in time during the home discharge period. Patients can easily select specific content to meet individual learning needs each time they visit the Web site (see Figure 1 for images of preoperative and postoperative patient education screens). When the patient accesses the Patient Information section, a list of education topics populates the screen. The patient is prompted to rate each topic area using a five-point Likert scale anchored with the labels “not important to learn about” and “extremely important to learn about.” The Web site presents content based on each patient's ratings.

The section titled Opportunities provides an overview of the various opportunities that are available for patients, students, clinicians, researchers, and other users. These opportunities include study participation, research assistant positions, graduate student thesis supervision, research mentorship for scientists, and other collaboration. Finally, a Clinical Application section presents innovative approaches and strategies for promoting translation of research evidence. These approaches include methods for integrating technology into patient care activities, approaches for engaging the healthcare provider as a catalyst for change, and strategies for involving patients in the design and implementation of care activities. Discussion boards and blogs embedded within the Web site facilitate both multidisciplinary and patient-provider interaction.

We experienced a challenge in posting published empirical and theoretical articles to the Web site. We designed the Web site using the principle of green open-access publishing or self-archiving. This type of open-access publishing is a means through which authors and researchers can make their materials publicly available. However, we must post the author's preprint version so as to not violate copyright. The publisher's version cannot be posted. We addressed this challenge by contacting the corresponding author.
Patient Information

This webpage contains information for individuals who either are about to have heart surgery (pre-operative information) or are in the early recovery phase (post-operative information) following surgery.

Individuals will have open access to this tab to obtain information which will guide them in their performance of various self-care behaviors they are expected to engage in as they prepare for their surgery or are in their early stages (6 months following surgery) of recovery. Both the pre-operative (Fredericks, 2009; Fredericks & Quintana, 2011; Fredericks, Sisak, Vahadi, & Minekichi, 2012) and post-operative (Shutham, Fleming, Goodman, 2002; Guo, 2015) information contained on this webpage has been described and evaluated extensively using RCT designs and demonstrated effectiveness in promoting self-care behavioral performance, while reducing the rate of symptoms, complications, and hospital readmissions.

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**Pre-operative Patient Information**

The information contained within this section is meant to assist you as you prepare for your upcoming heart surgery. Click the button below to access the Pre-operative Patient Information session. Information will be presented to you based on your identified learning needs. No personal information will be requested.

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**Post-operative Patient Information**

The information contained within this section is meant to help you to be able to perform your routine activities during your home recovery following your heart surgery. Click the button below to begin the Post-operative Patient Information session. Information will be presented to you based on your identified learning needs. No personal information will be requested.

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**Ask an RN**

If you still have questions after reviewing the Pre or Post-operative information and would like to chat online directly with a nurse you may click the button below. A Registered Nurse will be available during the following dates and times listed below. This feature should only be used for non-emergency informational purposes. If you have an emergency situation please seek immediate medical assistance from an appropriate healthcare provider or call 911.

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**Learning Needs Assessment:**

Please rate how important each topic is for you to know about as you prepare for your heart surgery. You can use the following rating scale:

1 - not important
2 - slightly important
3 - moderately important
4 - very important
5 - extremely important

**Topic 1:** Anxiety - Is it normal for me to feel this way?
How important is it for you to have more information about this topic?

not important: 1 2 3 4 5 extremely important

**Topic 2:** Can I still perform all of my usual activities while I wait for surgery?
How important is it for you to have more information about this topic?

not important: 1 2 3 4 5 extremely important

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**FIGURE 1.** Screenshots from the interactive multidisciplinary collaborative online intervention.
directly for a preprint version or creating a link to manuscripts hosted in institutional open-access repositories.

**EVALUATION**

It is important that the Web site's content is concise and clearly structured for ease of navigation. Every attempt has been made to ensure that it is visually attractive and primarily presents new and/or compelling information. Our design considerations included simple language, headings, color, photographs and images, readable font, and adequate use of white space, intended to enhance readability and navigation. As we implement this Web site, we are conducting a thorough evaluation, and feedback will be solicited from users on an ongoing basis. In a pilot study, we will measure the number of times the Web site and pages were accessed. With other measurement approaches, we will evaluate usability.

**CONCLUSION**

A single Web site that meets the needs of both patients and a multidisciplinary healthcare team is cost-effective and acts as a virtual shared space for patients, students and residents, and healthcare providers. Specific elements of this shared space may be used differently according to role, but the site reduces overall redundancy and facilitates improved multidisciplinary and patient-provider interaction. The Web site may also be helpful for engaging patients as participants in clinical trials and other studies and/or provide them with the opportunity to function as knowledge users on knowledge utilization projects. We designed a Web site to provide patient education, mentorship and training opportunities for residents and students, and up-to-date empirical and theoretical information to support the practice of nurses and physicians. Once implemented, this Web site will be evaluated for its effectiveness in reducing CVS patient readmission rates and postoperative complications.

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