

# Final Progress Report

## 1. TITLE PAGE

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## 2. STRUCTURED ABSTRACT

*Purpose:* This three-year project aimed at developing and disseminating a Safety Risk Assessment (SRA) tool for proactively identifying and eliminating healthcare built environment latent conditions that impact patient and worker safety.

*Scope:* The SRA tool covers six safety areas – infection control, medication safety, falls, patient handling, behavioral health, and security – as required by the 2014 FGI *Guidelines for Design and Construction of Hospitals and Outpatient Facilities*.

*Methods:* The tool content was developed through a Delphi process and Nominal Group Technique, including literature review, surveys, and a workgroup seminar with over 100 experts. An Excel format was developed and tested with expert workgroups and at three hospitals. The tool was optimized to include a supporting user guide based on testing and was disseminated through a one-day seminar (an education module including presentations, panel discussion, and workgroup sessions) at the Planning Design & Construction Summit, educational sessions, webinars, articles, and other venues.

*Results:* The SRA toolkit includes a Safe Design Roadmap, risk data, and design considerations for six safety areas as well as research references. Design considerations are supported by rationale statements that include

research citations and various tags for sorting and filtering. A user guide provides background and recommendations for toolkit implementation. Feedback from attendees indicated success of all three seminars in tool development and dissemination.

*Keywords:* Safety, Risk assessment, Healthcare design, Healthcare-associated infections, Patient falls, Medication safety, Patient handling, Behavioral health/psychiatric injury, Security

### 3. PURPOSE

This project's aim over the course of three years was to develop and disseminate a proactive patient safety risk assessment (PSRA) toolkit, which was expanded to cover staff safety after feedback from industry experts. The SRA toolkit serves as a supplement to the FGI *Guidelines for Design and Construction of Hospitals and Outpatient Facilities* to significantly strengthen the focus on patient safety, as well as staff safety, in the design of healthcare environments. The four aims for the three-year project and the corresponding specific aims for each year are listed in the table below.

Overall aims for three-year period 2012-2015	Aims for the first year 2012-2013	Aims for the second year 2013-2014	Aims for the third year 2014-2015
<ul style="list-style-type: none"> <li>• Develop an online SRA toolkit that can be used to conduct a proactive patient safety risk assessment during the healthcare facility design process</li> </ul>	<ul style="list-style-type: none"> <li>• Develop the structure and format for the SRA tool, including consensus on key hazards and latent conditions to be considered and the degree of risk associated with different environmental design features</li> </ul>	<ul style="list-style-type: none"> <li>• Test and refine the SRA tool</li> <li>• Pilot test the SRA or relevant parts of it with three healthcare organizations</li> </ul>	<ul style="list-style-type: none"> <li>• Develop online SRA tool</li> <li>• Develop a framework for measuring SRA tool impacts on design and healthcare outcomes</li> </ul>
<ul style="list-style-type: none"> <li>• Develop white papers and guidelines to support the use of the SRA and to detail the process for implementing it across the facility life cycle</li> </ul>		<ul style="list-style-type: none"> <li>• Develop information to guide use of the SRA and integrate components into an SRA toolbox</li> </ul>	<ul style="list-style-type: none"> <li>• Develop supporting guides and white papers</li> <li>• Develop education and training modules for SRA</li> </ul>
<ul style="list-style-type: none"> <li>• Further develop a Safe Design Roadmap for healthcare CEOs and integrate with the SRA toolkit</li> </ul>		<ul style="list-style-type: none"> <li>• Further develop the Safe Design Roadmap to provide the overarching structure for conducting the SRA throughout the design process</li> </ul>	
<ul style="list-style-type: none"> <li>• Create an education platform to promulgate successful SRA activities</li> </ul>			<ul style="list-style-type: none"> <li>• Develop case study documentation from SRA pilot tests</li> </ul>

One aim, creating an online tool, was modified over the course of the project. A decision was made to develop the SRA in Excel and PDF formats (accessible online) based on high cost estimates from similar online tool development projects. The functionality suggested by testers to render a functional tool incorporates complexity in programming and implementation and requires resources beyond the seminar grant award.

In the first year (2012-2013), appropriate content, structure, and format of the tool were developed through literature reviews, surveys, and focus groups; additional feedback was gathered from the expert attendees at the face-to-face seminar in Washington, DC, on June 5-6, 2013.

In the second year (2013-2014), an Excel tool format was developed to effectively integrate various parts of the toolkit, such as the Safe Design Roadmap and the SRA risk components. The SRA tool was pilot tested at three

healthcare organizations as well as by workgroup experts at the face-to-face seminar at Kaiser Permanente's Garfield Innovation Center in San Leandro, CA. The feedback from these different sources was invaluable to the team in modifying the tool and developing a suggested process for using the tool during the healthcare facility design process.

In the third year (2014-2015), the SRA tool in Excel and PDF format was further improved based on pilot testing results and feedback. A user guide was developed in PowerPoint to serve as guidance along with a training module that can be accessed via an on-demand webinar. The finalized toolkit, supporting user guide, and lessons learned from testers were disseminated through national conference workshops and other venues.

#### **4. SCOPE**

Improving safety is one of the most urgent issues facing healthcare. As one key component of the healthcare system, the physical environment interacts with other factors (e.g., organizational culture, operation) in complex ways, impacting the risk of adverse events. However, although the body of relevant research is growing, safety considerations often are not adequately addressed during the healthcare facility design process. The lack of easy-to-use methodologies and tools integrating safety considerations into the healthcare design process is a major barrier in applying relevant research in safe design practice.

An umbrella safety risk assessment (SRA) has been included as a requirement in the 2014 FGI *Guidelines for Design and Construction of Hospitals and Outpatient Facilities*. However, the Guidelines are not prescriptive as to the method for implementing the SRA in practice. To make the safety considerations more acceptable, actionable, and easily incorporated in practice, efforts focused on developing a reliable and well-designed SRA tool with supporting implementation materials and training modules. The proactive SRA tool covers six key safety areas: infection control, medication safety, falls, patient handling, behavioral health, and security as defined by the FGI Guidelines. It will be a significant step forward in enhancing patient and staff safety through reducing adverse physical environment latent conditions that are built into facilities during the planning, design, and construction of healthcare facilities.

The three-year project has made significant progress and accomplished these goals:

- 1) Final Excel and PDF SRA tool after multiple rounds of testing and revision;
- 2) General consensus on the SRA content and format, achieved through multiple rounds of surveys, Delphi process, pilot testing, and national seminars;
- 3) Continuous engagement of more than 100 industry experts, as well as national organizations, who may help with the dissemination and implementation of the tool in practice;
- 4) Generation of interest among healthcare organizations in using the tool in actual design projects; and
- 5) Creation of an education module for implementation of the SRA process.

#### **5. METHODS**

##### *Advisory council*

An 11-member advisory committee was organized at the beginning of the project to provide advice and feedback through periodic conference calls (see Appendix for a list of committee members).

##### *Content development*

Consensus around safety risk assessment items included in the six topic areas of the proactive SRA tool was achieved through a series of steps in a Delphi process and modified Nominal Group Technique using literature analysis, surveys, and the Year 1 seminar.

##### Literature review

A narrative literature review was conducted as the first step of the Delphi process to explore all physical environment design elements relevant to six safety issues, in healthcare settings, especially in acute care settings (i.e., healthcare-associated infections, patient falls and immobility, medication errors, patient handling and movement, behavioral health, and security). Relevant sources were found through searching CHD's Knowledge Repository database as well as other databases, such as PubMed and Google Scholar. Additionally, reference lists of articles as well as other data sources, such as industry reports, were reviewed. A detailed literature analysis table was created for each safety topic area, including environmental variables, safety outcomes, metrics, study design, samples, and research findings. Latent conditions were identified based on each research article. A mind-map was then created for each topic area to better understand the conceptual relationships between the variables and outcomes and to help develop built environment latent condition questions. Next, the FGI Guidelines were

cross-referenced with the latent condition questions to determine what was required and what was suggested in appendix language of the Guidelines. Additions and revisions were made to the list of latent condition questions based on industry standards (e.g., guidelines, standards, reports) as well as expert opinion. The result of the literature review was a draft list of safety-related latent condition questions and associated rationale organized in six topic areas with the sources and Guidelines relationship marked as research, consensus, opinion, and FGI Guidelines – body or appendix.

### Surveys

At the same time, six groups of industry experts were recruited and led by designated workgroup leaders. Each workgroup included 10-20 individuals who were knowledgeable in a particular topic area (e.g., medication safety) but with diverse backgrounds (e.g., representatives from design, nursing, facility management, human factors, etc.). A Delphi process was established for gathering data. As described in Hsu and Sanford's 2007 paper, *The Delphi technique: Making sense of consensus*, the technique is widely used and accepted and aims to reach a consensus of expert opinion on specific real-world issues through multiple iterations of questionnaires. The workgroup members were informed about the purpose of the project and the Delphi process. The first iteration included initial content development from the literature reviews. This was followed by two online surveys for each workgroup to achieve consensus on the latent condition questions to be included in the SRA tool for a specific topic area. Both surveys were conducted through the online tool, Survey Monkey. The initial invitation and follow-up reminders were sent through email.

In survey #1, workgroup members were asked to:

- evaluate each latent condition (LC) question;
- indicate whether it should be included as an item in the SRA tool;
- decide whether the wording of the question was acceptable; and
- provide suggestions regarding the wording of the question.

Reminder emails were sent to ensure that members responded to the survey. Based on survey results, the LC questions with at least 70% consensus on both inclusion and wording (i.e., “yes” answers) were considered approved and not to be included in subsequent survey and seminar discussion. The LC questions with less than 70% consensus on inclusion and/or wording were revised and included in the second survey. Several questions were removed from further consideration, because more than 70% respondents indicated that the questions should not be included.

In survey #2, respondents were asked to evaluate each revised question and vote on its inclusion in the SRA tool and its wording. The results of survey #2 were analyzed in the same way as survey #1. The LC questions with less than 70% consensus on inclusion and/or wording were revised and included in the seminar discussion. The numbers of approved questions after the two surveys are listed in the Results section of this report.

### Year 1 seminar: Consensus

To further build consensus around SRA items and other aspects of the SRA tool, a “Designing for Safety Seminar” was held in Washington, DC, on June 5-6, 2013. A total of nearly 70 industry experts and other professionals participated in the seminar, which included presentations by safety experts, a panel discussion, and workgroup discussions.

During workgroup discussions, participants in each group reviewed the remaining LC questions (those without consensus on inclusion and/or wording after two surveys) and, one by one, made comments and revisions using a round robin process and cast votes for inclusion and/or wording. The comments, suggestions, and revised questions as well as voting results were recorded on flip charts and 22” x 34” spreadsheets. The results were also revisited at the end of the second day to make final adjustments.

In another brainstorming session, participants were re-organized into six groups (each with representatives from different workgroups) to discuss how the SRA tool might be used in the healthcare design process (e.g., process of adoption, implementation, and impact on workflow [see figures below for results from this discussion]). As a result of the seminar discussion, consensus was reached on almost all the LC questions, although a small number of questions still needed further revision and evaluation.

A post-seminar online survey was conducted to evaluate the perceived effectiveness of the seminar.

### *Refine the tool content*

The research team finalized the SRA content developed in 2013-2014 through additional workgroup calls, survey results, and cross-examination of design considerations in the six individual safety topic areas.

- Cross-examination of latent conditions (i.e., design considerations). Because the six workgroups worked separately on the design considerations during the Delphi process in Year 1, there was potential for duplicates or conflicts between design considerations in different topic areas. To address this issue, a master spreadsheet was created of all design considerations in the six areas. The design considerations were listed on both the top row and the left column. Using this matrix, each design consideration was evaluated in relationship to all other design considerations in the SRA. The design considerations were evaluated for inter-relationships, duplication, or conflicts. A few duplicates and conflicts were identified and addressed.
- Completion of HAI-related latent conditions (i.e., design considerations). As the result of the 2013 seminar, all design considerations were approved, except for 13 HAI-related questions. (The Year 1 progress report provides additional detail.) After the seminar, the research team worked with HAI workgroup leaders to find a solution for these considerations. The workgroup leaders proposed to 1) combine eight heating, ventilation, and air conditioning (HVAC) design considerations into one question, 2) revise the wording of two design considerations, and 3) delete three design considerations. Following the Delphi process, the proposed revisions were included in a third survey for workgroup approval. The workgroup reached consensus (70% threshold) in the survey. The HAI considerations were then finalized.

### *Tool format development*

Initially, the tool was envisioned as an online tool that could be accessed and used via an internet browser. Later, it was determined that an alternative platform would be used to avoid the high cost of web design associated with the full level of functionality desired as well as data security issues expressed by several healthcare provider organizations. Various formats were tested (Word, fillable [interactive] PDF, and an Excel spreadsheet); after conducting a survey with workgroup members and informally polling individuals who attended a presentation at the PDC Summit in 2014, the research team decided to use the Excel spreadsheet format. The Excel format allows for additional sorting functions and more user-friendly hyperlinking to move through different parts of the tool.

### *On-site pilot test for the SRA tool*

Three pilot tests were planned to evaluate the tool interface and content in real-world settings. The original plan was to include individual projects in the earliest design phases from 1) a large national system, 2) a regional system, and 3) a community-based facility. However, following attempts to recruit project sites, a convenience sample was chosen, primarily based on personal relationships between potential project contacts and the research team members. Although they represent regional diversity – the Midwest, West Coast, and East Coast – they all represent more advanced/academic systems, which may reflect the ability of a larger organization to absorb a “lesser-known” process into the project.

The projects represented three different design phases: master planning following a “test fit” exercise (pilot 2), schematic design (pilot 3), and design development (pilot 1). Interestingly, each project had a program related to oncology – an area of high-risk and vulnerability due to the medical condition and treatment of patients. Two of the three projects (pilots 2 and 3) represented renovations, reflecting constraints posed by the existing infrastructure.

The first two pilot tests allowed the project team to “drive” the Excel-based tool. Although this was straightforward in pilot site 1, where most design decisions had already been made, it was less effective in site 2, where very few decisions had been established and the team was not fully conversant in the considerations included in the tool. Pilot 3 incorporated a facilitated discussion by a CHD team researcher to guide the team as an alternative approach.

### *Year 2 seminar: Usability*

#### Development of the content and process of the seminar

The second Designing for Safety Seminar was held on May 13-14, 2014, at Kaiser Permanente’s (KP’s) Garfield Innovation Center in San Leandro, CA. The Garfield Center is a 37,000-square-foot “living laboratory” warehouse with simulated spaces for testing that include an entire medical-surgical unit complex, various patient rooms, an operating room, emergency bay, family waiting room, interventional radiology suite, and more. Here, the entire care process can be analyzed, questioned, tested, and refined under one roof. The Garfield Center was the

location for the Year 2 Designing for Safety Seminar, given the focus on testing and validating the SRA tool in the context of a facility design project.

The main purpose of the seminar was to further test use of the tool under a variety of simulated design conditions (i.e., A – typical office meeting room discussion, B – simulated high-fidelity mock-up, and C – low-fidelity mock-up) and construction project scenarios (i.e., A – retrofit of an existing inpatient unit, B – LDR unit expansion/oncology unit renovation, C – ED renovation). A second goal of the seminar was to brainstorm strategies for disseminating the SRA.

Several KP staff actively participated in the seminar planning process, which lasted from September 2013 to May 2014. Onsite and virtual visits to the Garfield Center and multiple conference calls were conducted for coordination on the agenda and logistics of the seminar. The existing high-fidelity mock-up patient rooms and labor and delivery and recovery rooms (LDR) at Garfield were used to serve as the setting for the high-fidelity mock-up scenarios. Two low-fidelity ED rooms were constructed using wood panels with support structures, equipment temporarily borrowed from other spaces, and cardboard boxes with pictures of typical ED furniture, fixtures, and equipment.

### Seminar agenda & approach

Participants from the Year 1 seminar and additional experts were invited via email to attend the Year 2 seminar. Six workgroups were created. Each workgroup consisted of seven to eight individuals from multiple subject matter areas. For example, individuals with expertise in patient handling were paired with individuals with expertise in falls. Each workgroup was assigned to one of three pairs of SRA topic area sections (e.g., Falls/Patient handling, Behavior health/Security, HAI/Medication safety). Thus, there were two workgroups working on a pair of SRA topic areas. The meeting attendees were invited to attend a 30-minute call prior to the onsite seminar to orient them to the intent and structure of the meeting. The simulated scenarios that the groups would work through were also provided to attendees prior to the meeting.

The seminar began with informative presentations by industry experts in the Garfield Center's central meeting space, followed by simulation workshop sessions in various locations (e.g., meeting spaces, mock-ups) in the Garfield Center. Six workgroups rotated through five 90-minute workshop sessions: three use scenarios (A, B, C, as described earlier), one brainstorming session about education and dissemination tactics/ideas (D), and one session for cumulative debriefing back in the central meeting space. Because of the limited mock-up spaces, the sequences of scenarios/brainstorming session varied across different groups. Each group focused on the same two SRA components across the three scenarios to help evaluate usage of the same tool at different design conditions and project scenarios.

Group	SRA components	Session 1	Session 2	Session 3	Session 4	Session 5
1	Falls/ Pt handling	A	B	D	C	Debrief
2	Falls/ Pt handling	A	B	D	C	Debrief
3	Psych/ Security	A	C	B	D	Debrief
4	Psych/ Security	A	C	B	D	Debrief
5	HAI/ Med safety	A	D	C	B	Debrief
6	HAI/ Med safety	A	D	C	B	Debrief

Note: A. Board room— Unit renovation; B. High fidelity — Oncology unit/LDR; C. Low fidelity — EDrenovation (two identical spaces); D. Brainstorm education and marketing tactics/ideas

The workgroup sessions were facilitated by a professional moderator and seven KP staff members trained in meeting moderation. A CHD staff member was assigned to each of the different scenarios as observer and note taker. In each use scenario session, participants spent the first five minutes reviewing the project scenario, a five- to seven-page description that included context, task, and general information of the construction project, location, demographics, floor plans, and safety risk data. They then went through the considerations and rationale for two assigned SRA components (each for 35 minutes) and decided whether to incorporate the considerations (i.e., yes, no, maybe, or not applicable [NA]) in the assigned scenario project. Following the exercise, a round robin process was used in which every group member was encouraged to provide opinions and feedback about the process. One group member in each group was elected to “own” the work product for each session and record the decisions and discussion notes on pre-printed sheets. After the completion of two SRA components, the group was asked to complete an online survey on their mobile devices about the tool usability. Paper surveys were provided as an option but were not chosen by participants. The session was then summarized with a 10-

minute group debrief, during which participants provided feedback about the format and content of the SRA tool. CHD members documented the discussion points throughout the session.

The brainstorming session was conducted using a modified nominal group technique. Participants first were asked to respond to specific questions by writing down ideas on Post-it notes without discussion. They then presented ideas and grouped them into logical categories or themes on flip charts, discussed the ideas, and finally distilled their ideas to form several key conclusions/recommendations.

The 30-minute cumulative debrief was held after a “gallery walk” of the flip chart sheets, showing results of previous sessions. Representatives from workgroups shared the common views of group members regarding the best practices for using the tool and the ways of informing people about the existence and proper use of the SRA tool.

### *Safe Design Roadmap*

The Safe Design Roadmap was envisioned as a tool that would enable CEOs and leadership teams implement key strategies to ensure that their facility design project was strongly focused on patient safety. The tool would help ensure that an organization’s safety and quality improvement efforts were integrated with the facility design process. The first version of the tool was shared with experts at the Designing for Safety seminar conducted at Virtua Health in 2011 with funding from AHRQ (Grant 1R13HS020322-01A1). Although the tool was well received at the time, attendees felt that it was too detailed for C-suite decisionmakers and that it had inadequate detail for architects and other design team members. Further, attendees indicated that they would like the tool to be more actionable.

Using this feedback, an effort was made to further develop the Safe Design Roadmap as a high-level tool to support the more detailed considerations of the six risk areas. Interviews were conducted with C-suite decision makers at three different healthcare organizations to obtain their feedback on the tool’s relevance and usability. The individuals interviewed were:

- Barry Rabner, President and Chief Executive Officer at Princeton Healthcare System;
- Tejas Gandhi, Chief Administrative Officer at The Medical Center of Central Georgia (now Navicent Health); and
- Gerald Bracht, Chief Administrative Officer at Palomar Medical Center.

Some key themes from the conversation included:

- Important to make the message more clear upfront – how a brick-and-mortar strategy could impact patient, staff, and organizational outcomes;
- Provide examples of how healthcare organizations have used the tool;
- Provide examples of return on investment;
- Make the tool actionable (reference was made to the American Hospital Association’s *Second Curve Road Map for Health Care* tool as a possible model); and
- Make the language simpler and remove unfamiliar jargon (e.g., latent conditions).

As a result, the tool was simplified and restructured. The new Safe Design Roadmap was modeled on the AHA’s *Second Curve Road Map for Health Care*, such that it could potentially be included as a module in the AHA tool in the future. The tool is designed as a self-evaluation tool that a decisionmaker could use to evaluate how ready they were to undertake a facility design project focused on safety. The Safe Design Roadmap self-assessment tool is organized around four broad phases of the facility life cycle. The user is asked to indicate their level of agreement (0 = no agreement to 4 = complete agreement) with the statements under each phase. The four phases of the facility life cycle and number of statements under each phase are as follows:

- Strategic & Operational Planning (15 statements). This phase reflects the organization’s high-priority strategies, supported by a concept of operation achieved through the creation of operational planning and performance improvement projects to realize patient and staff safety goals.
- Programming & Design (9 statements). During the program and design phase, the concept of operations is translated into the amount of space required and then the design of the facility itself. Designs are submitted in an iterative fashion, beginning with more general designs, such as block adjacency drawings (e.g., radiology is located next to the emergency department), to the specific, such as hardware specifications and furnishing material selection.

- Construction & Commissioning (8 statements). Construction, which sometimes begins before the design is finished, includes the clearing of the site and all activities involved in actually building the facility, including the placement of some built-in equipment and furniture. During the commissioning phase, the building is outfitted with all additional equipment, furniture, medical and administrative supplies, and other essential healthcare materials.
- Sustainment (7 statements). This phase begins with occupancy of the building and includes all the routine maintenance and repair activities necessary to keep the building in good working order over the life of the building.

The Safe Design Roadmap is integrated into the SRA toolbox, and users have the option of using the roadmap prior to using the SRA components or proceeding directly to the specific SRA components.

#### *Content and format finalization*

The research team made the following revisions to the design considerations and rationale in the six individual safety topic areas based on feedback and lessons learned from pilot testing at three design projects and the workgroup testing at the Year 2 seminar (i.e., the Garfield Center).

- Reduce duplication and clarify similarities among design considerations. During pilot testing, it was found that a small amount of duplication existed among design considerations both within one safety area and across different areas. Similar design considerations were combined. As a result, the total number of design considerations was reduced from 210 to 191 (see table below). We believe that this may improve the usability of the toolkit.
- Provide a hyperlink among design considerations in different safety areas that are relevant to each other (e.g., two design considerations in “falls” and “patient handling” sections but both addressing patient handling equipment). This was intended to explicitly indicate connections among design considerations included in different safety areas.
- Provide research citations and clarify linkage between rationale and design considerations. The rationale statement for each design consideration was revised to indicate the level of research support for the design considerations with citations (so that users might optionally further examine the relevant literature to make informed decisions) and to clarify the thought process behind the design considerations.
- Indicate multiple building categories for one design consideration. If one design consideration was related to multiple building categories (e.g., relevant to unit layout and room layout), it was tagged with one building category (e.g., unit layout) with a note that it was also relevant to the other categories (e.g., room layout).

In addition, multiple revisions were made to streamline the tool format.

- One copyright page and one page acknowledging the contribution of all team members and volunteers were added.
- Based on feedback from pilot testing, the columns in the checklist were rearranged to facilitate decision making. For example, the rationale column was removed, and the rationale was included as comments automatically shown when users moved their mouse on the design consideration cells in the Excel tool.
- Users were asked to record their evaluation about each design consideration (i.e., estimated risk, priority, and cost magnitude). Decision on whether to implement a particular design consideration (e.g., yes, maybe, no), which was included in the earlier versions, was removed in the final version.
- The “underlying conditions” included in the previous versions of the tool were replaced by “building categories” that were universal to all six safety areas. This was because the “underlying conditions” were not universally termed and defined in different topic areas, and this inconsistency might cause confusion.
- A list of research references in supporting design considerations was included.

In addition to the Excel SRA tool, a hyperlinked PDF version (including same content but limited sorting and other functions) was also created for easy access by some users. Both formats are accessed through the CHD website ([www.healthdesign.org](http://www.healthdesign.org)), with the PDF version also accessible through the FGI website ([www.fguidelines.org](http://www.fguidelines.org)).

#### *Develop a user guide*

A user guide was developed by the CHD team based on recommendations from pilot sites and industry experts around the use of the SRA tool. PowerPoint was chosen as the format to keep the guide as concise and easy-to-follow as possible. Visual materials were included to meet the preferences of the main users of the tool.

#### *Organize a national seminar for tool dissemination and education*



A one-day Designing for Safety Seminar was held on March 15, 2015, at Henry B. Gonzales Convention Center in San Antonio, TX, in conjunction with the Healthcare Facility Planning, Design, and Construction Summit (PDC Summit) as one of the pre-conference workshops. The purpose of the seminar was to educate facility design stakeholders on the purpose, uses, and benefits of the SRA and provide training to facilitate adoption and implementation.

Development of the content and process of the seminar

The PDC Summit was selected for tool dissemination, because the annual conference has been a major healthcare design and construction event, attracting around 3,000 healthcare facilities administrators, designers, and building contractors. The project team worked closely with the conference organizer to set up the logistics of the seminar, created content (e.g., presentations, plans, and other materials for the hypothetical building project), and invited workshop participants and pilot testers to serve on the faculty for the seminar.

A total of 31 individuals with no previous exposure to the SRA tool registered and attended for a fee regularly charged by the conference for pre-conference workshops. In addition, 23 participants, who included project team members and industry experts returning from the Year 1 and 2 seminars and pilot test sites, were allowed to attend at no charge. This was the first time that the Year 1 and 2 participants were able to see the toolkit as a whole. The 54 session attendees included 15 building contractors (30%), 16 healthcare administrators (32%), 14 designers (28%), and five government representatives (10%) from federal and state health departments.

A pre-seminar survey was sent to all registered attendees in order for the team to better understand the specific expectations, interests, and goals of attendees. Twenty-two attendees (71%) responded to the survey. The survey results were used to make adjustments, including seating arrangements to ensure that each group (table) represented multidisciplinary stakeholders with various interests and goals. A 17-page SRA scenario description was developed for seminar attendees to practice using the SRA tool. The scenario description included general project background, budget, existing floor plans, demographics, outcome measures, and space requirements. These were printed for use during seminar group discussion. Attendees were also invited to bring their own building projects to the seminar.

Seminar agenda & approach

Both lecture-style presentations and hands-on interactive approaches were used in the Year 3 seminar. The seminar began with an overview of the SRA tool development, including the background, process, structure, and usability of the tool. This was followed by a panel discussion in which representatives from the three pilot testing sites shared their experiences and insights around using the tool. The attendees were then divided into five groups to work with faculty members as teams to go through the process of using the SRA tool on a hypothetical construction project. The participants were instructed to first read the scenario description and floor plans, identify two to three SRA components to evaluate for the hypothetical project, and then use the printed copies of the SRA tool as well as the Excel format to address safety considerations during design and construction decision-making processes. The seminar concluded with a debrief, with attendees sharing their opinions and the project team describing next steps in tool dissemination. After the seminar, an online satisfaction survey was sent to all participants, including attendees and faculty members.

An online survey was conducted immediately after the seminar to gauge the effectiveness of the workshop in meeting expectations and to obtain feedback from participants. The survey included 12 questions that covered different aspects of the workshop. Respondents were asked to give either a “yes/no” answer or a rating on a Likert scale from 1 (very poor) to 5 (very good). Respondents were also instructed to provide feedback in an open comment box. Results are available in the Year 3 report.

**6. RESULTS**

*Delphi process result (including Year 1 seminar)*

As a result of the Delphi process, consensus was reached on most of the Latent Conditions questions (see the table below). A small number of questions still required further revision and evaluation.

Topic area	First draft	Survey #1 result	Survey #2 result	Seminar result
HAI	49 questions	<ul style="list-style-type: none"> <li>• 13 respondents</li> <li>• 11 questions with 70% agreement on inclusion and wording</li> <li>• 20 questions with agreement on inclusion but not on wording → Survey #2</li> </ul>	<ul style="list-style-type: none"> <li>• 12 respondents</li> <li>• 9 more questions with 70% agreement on inclusion and wording</li> <li>• 12 questions with agreement on inclusion but not on wording →</li> </ul>	<ul style="list-style-type: none"> <li>• 8 participants</li> <li>• 12 more questions with consensus on inclusion and wording</li> <li>• 13 questions to be further revised, some will be</li> </ul>

		<ul style="list-style-type: none"> <li>• 16 with 30-70% agreement on inclusion → Survey #2</li> <li>• 2 questions deleted</li> <li>• 1 question combined with another</li> </ul>	Seminar <ul style="list-style-type: none"> <li>• 13 with 30-70% agreement on inclusion → Seminar</li> <li>• 1 question deleted</li> </ul>	combined <ul style="list-style-type: none"> <li>• Total 32 questions with 12 more to be revised</li> </ul>
Patient handling & movement	22 questions	<ul style="list-style-type: none"> <li>• 13 respondents</li> <li>• 9 questions with 70% agreement on inclusion and wording</li> <li>• 12 questions with agreement on inclusion but not on wording → Survey #2</li> <li>• 1 with 30-70% agreement on inclusion → Survey #2</li> <li>• 1 added based on comments</li> </ul>	<ul style="list-style-type: none"> <li>• 14 respondents</li> <li>• 8 more questions with 70% agreement on inclusion and wording</li> <li>• 5 questions with agreement on inclusion but not on wording → Seminar</li> <li>• 1 question deleted</li> </ul>	<ul style="list-style-type: none"> <li>• 8 participants</li> <li>• 4 more questions with consensus on inclusion and wording</li> <li>• 1 deleted</li> <li>• Total 21 questions</li> </ul>
Medication safety	31 questions	<ul style="list-style-type: none"> <li>• 15 respondents</li> <li>• 12 questions with 70% agreement on inclusion and wording</li> <li>• 13 questions with agreement on inclusion but not on wording → Survey #2</li> <li>• 6 with 30-70% agreement on inclusion → Survey #2</li> <li>• 1 added based on comments</li> </ul>	<ul style="list-style-type: none"> <li>• 13 respondents</li> <li>• 11 more questions with 70% agreement on inclusion and wording</li> <li>• 4 questions with agreement on inclusion but not on wording → Seminar</li> <li>• 4 with 30-70% agreement on inclusion → Seminar</li> <li>• 1 question added</li> </ul>	<ul style="list-style-type: none"> <li>• 8 participants</li> <li>• 7 more questions with 70% agreement on inclusion and wording</li> <li>• 3 deleted</li> <li>• Total 30 questions</li> </ul>
Security	50 questions	<ul style="list-style-type: none"> <li>• 9 respondents</li> <li>• 44 questions with 70% agreement on inclusion and wording</li> <li>• 5 questions with agreement on inclusion but not on wording → Survey #2</li> <li>• 1 with 30-70% agreement on inclusion → Survey #2</li> <li>• 1 added based on comments</li> </ul>	<ul style="list-style-type: none"> <li>• 10 respondents</li> <li>• 3 more questions with 70% agreement on inclusion and wording</li> <li>• 2 questions with agreement on inclusion but not on wording → Seminar</li> <li>• 1 with 30-70% agreement on inclusion → Seminar</li> </ul>	<ul style="list-style-type: none"> <li>• 6 participants</li> <li>• 2 questions to be further revised</li> <li>• 1 deleted</li> <li>• Total 47 questions with 2 more to be revised</li> </ul>
Falls & immobility	36 questions	<ul style="list-style-type: none"> <li>• 12 respondents</li> <li>• 20 questions with 70% agreement on inclusion and wording</li> <li>• 10 questions with agreement on inclusion but not on wording → Survey #2</li> <li>• 6 with 30-70% agreement on inclusion → Survey #2</li> </ul>	<ul style="list-style-type: none"> <li>• 15 respondents</li> <li>• 4 more questions with 70% agreement on inclusion and wording</li> <li>• 6 questions with agreement on inclusion but not on wording → Seminar</li> <li>• 3 with 30-70% agreement on inclusion → Seminar</li> </ul>	<ul style="list-style-type: none"> <li>• 8 participants</li> <li>• 8 more questions with 70% agreement on inclusion and wording</li> <li>• 1 deleted</li> <li>• Total 32 questions</li> </ul>
Behavioral health	59 questions	<ul style="list-style-type: none"> <li>• 9 respondents</li> <li>• 21 questions with 70% agreement on inclusion and wording</li> <li>• 24 questions with agreement on inclusion but not on wording → Survey #2</li> <li>• 10 with 30-70% agreement on inclusion → Survey #2</li> <li>• 3 questions deleted</li> </ul>	<ul style="list-style-type: none"> <li>• 11 respondents</li> <li>• 19 more questions with 70% agreement on inclusion and wording</li> <li>• 7 questions with agreement on inclusion but not on wording → Seminar</li> <li>• 9 with 30-70% agreement on inclusion → Seminar</li> <li>• 1 deleted</li> </ul>	<ul style="list-style-type: none"> <li>• 5 participants</li> <li>• 14 more questions with 70% agreement on inclusion and wording</li> <li>• 2 deleted</li> <li>• Total 54 questions</li> </ul>

*Pilot testing results*

**SRA Pilot Site Case Study #1 – Barnes Jewish Healthcare (March 2014)**

**Project/Site:** Washington University Medical Center Campus Renewal Project  
New oncology inpatient unit – relocation from existing tower

**Design Phase:** Design development

**Participating Architect:** HOK (San Francisco office)

**Participant Roles:** Architecture, Human Factors, Nursing, Ergonomics, Pharmacy (medication safety only), Capital Planning, Infection Control (left early); the organization had limited capacity to invite all experts and for all participants to attend the full session.

**Familiarity with Project:** Two participants involved in content development (falls)

**Format and Timing:** User-led from Excel tool on screen, design drawings available on table (3 hours); onsite orientation (30 minutes); observation of use (105 minutes); survey and feedback session (45 minutes); no official break

- Modules Attempted:**
1. Infection Control
  2. Falls
  3. Patient Handling
  4. Medication Safety
  5. Security (partial)
- Time Use:** The group self-selected a target of approximately 25 minutes per module and completed 4-1/3 sections; each consideration was read aloud by the scribe with notes entered in the Excel file during the subsequent discussion.
- Lessons Learned:**
1. The group quickly learned how to navigate in the Excel file.
  2. It was difficult to get the text large enough on the screen; the group felt that they needed the consideration and notes on the screen together and hid the rationale column (which was adjacent to the consideration). *Post-Pilot – this was moved to allow the consideration and notes to be adjacent to one another.*
  3. The group proceeded through the items sequentially without any orientation to specific topics within the section; they appreciated being able to see what was being typed in the notes (e.g., to catch “that’s not what I meant”).
  4. The Excel row numbers and item numbers were confusing, as they did not match, and there needed to be clarification about the topic of discussion. *Post-Pilot – the Excel headings were hidden.*
  5. The risk estimate was unclear, and the group alternated between risk and priority – more often evaluating priority for the team. *Post-Pilot and Post-Seminar – priority and cost magnitude columns were added (high, medium, low).*
  6. Rationale was rarely used but, when referenced (requiring the column to be unhidden), it did not clarify the question.
  7. During design development, this became more of a checklist validating decisions, although there were still a number of interesting discussions retrospectively considering their choices.
  8. The group discussed how the tool would have been an asset during master planning and could have been used during their lean process flow work with user groups.
  9. It was difficult for the group to maintain focus at the same level for the entire session; a suggestion included doing one section at a time with the relevant expertise and two people (planning and architect) providing the continuity across sections and bringing any potential conflicts back to the group.
  10. Several considerations were noted as duplicates; however, many times, the group was not reading the detail in the question to clarify the difference between one statement and another. The duplications were not always considered sequentially in the order presented (sorted by underlying condition). *Post-Pilot/Post-Seminar – these were reorganized to be aligned with a general area of design (e.g., layout, HVAC), with similar considerations closer to one another. The most obvious duplicates (as determined during the seminar) were hidden.*

**SRA Pilot Site Case Study #2 – UC (University of California) Health (June 2014)**

- Project/Site:** UC Irvine Medical Center (Orange, CA)  
Inpatient Unit Renovation – change from neuro-psych to oncology; structure and HVAC shafts to remain, all other interiors to be removed
- Design Phase:** Master Planning (test fit only to date)
- Participating Architect:** Taylor Architects
- Participant Poles:** Architecture, Interior Design, Sociology, Capital Planning, Infection Control, Health & Safety, Pharmacy, Nursing (Unit Manager), Regulatory Compliance
- Familiarity with Project:** One participant involved in content development (infection control)
- Format and Timing:** SRA orientation conducted prior to onsite session; 4 hours onsite: user-led from Excel tool on screen, design drawings available on table: tool and project orientation (25 minutes); observation of use (170 minutes); survey and feedback session (45 minutes); a working lunch was planned
- Modules Attempted:**
1. Infection Control
  2. Medication Safety

- Time Use:** The group did not select a target time for completion of a module, and the goal was to see how far they could get, given the early design phase. Additional time was needed during discussions to incorporate larger-scale design and strategic issues. Although the first module (infection control) had not been completed after 70 minutes, the group self-selected to move to a second module (medication safety) for the balance of the time – 100 minutes. The discussion for both topics was much more organic than merely following a list, and the group did not always use the tool sequentially.
- Lessons Learned:**
1. It was difficult to get the text large enough on the screen; the only two visible columns were the consideration and notes (i.e., no item number, rationale). This was still too small for some.
  2. Even though they were re-ordered after the first pilot and seminar, the considerations were not reviewed sequentially due to the nature of an early design phase discussion, with many larger-scale issues to consider. As a more organic design discussion, notes were often taken in any available cell, and time was needed to determine if there was a related consideration that should be taken into account.
  3. Although priority and cost magnitude columns were added to facilitate the decision making, these columns were not used; the risk estimate was not referenced.
  4. The rationale was rarely used by the group but, when referenced (requiring the column to be unhidden), it did not clarify the question. (The scribe regularly checked the rationale.)
  5. There were many important discussions pertaining to strategic decisions that arose from the SRA. These included the appropriateness of the unit type, the number and location of isolation rooms as balanced with workflow and policy issues, the desire for single or multiple medication rooms, and the visibility of medication preparation.
  6. With a sociologist present, there were several discussions about the need to conduct workflow observations and work with front-line staff. There were numerous references to behavior-based considerations.
  7. The group felt that they could have spent more time in a single sitting without losing focus. They felt that there was benefit to the diversity of the participants being present for the full session.
  8. There was a perceived return on investment for the time committed (expense) to the process by nearly a dozen people.
  9. The group agreed that they would have been more effective had the session been facilitated to organize broad categories of consideration, perhaps with an introduction of the five top areas of concern. *Post-Pilot: Pilot site 3 should follow a facilitation model.*
  10. The group wished that they had been able to spend time with the tool before use but, even without prior review, they felt it was a good way to establish a focus and ensure nothing was overlooked. It also served to confirm any assumptions that were being made but may not have been overtly stated.

Pilot site #3 is scheduled for August 12, 2014, and will be conducted as a facilitated workshop. Preliminary details are included below.

**SRA Pilot Site Case Study #3 – Memorial Sloan Kettering (August 2014)**

- Project/Site:** MSK Oncology Unit Renovation (New York, NY)  
 Inpatient Unit Renovation – demographic includes neuro- and ortho-oncology patients; structure and HVAC shafts to remain
- Design Phase:** Schematic Design
- Participating Architect:** HOK Architects (New York office)

- Participant Roles:** 16 participants (1 partial) (Nurse Leader, Nursing, Architecture/Medical Planning, Interior Design, Capital Planning, Infection Control, Health & Safety, Pharmacy, Hospital Administrator, MD, Quality & Safety, Construction/Fire Safety, Dir. Design - MSK)
- Familiarity with Project:** One participant involved in Year 2 testing at Garfield, but not modules selected for pilot site (medical planner)
- Format and Timing:** SRA orientation conducted prior to onsite session to part of audience; 3.75 hours onsite, including abbreviated SRA orientation and project orientation: Facilitated discussion from Excel tool on screen, design drawings available on table; tool and project orientation (30 minutes); facilitated use (150 minutes); survey and feedback session (45 minutes)
- Modules Attempted:**
1. Falls
  2. Medication Safety
  3. Infection Control
- Time Use:** The session was held as a facilitated discussion. The group was informed that the session would cross modules while keeping large-scale issues in common (e.g., unit layout or room design). It was explained that they might not complete everything in the modules. The goals were to evaluate the efficiency of a more directed conversation while still allowing an organic design discussion and to determine whether a facilitated workshop is an acceptable format. There were significant limitations associated with the existing project infrastructure and budget.
- Lessons Learned:**
1. As with the previous team, the group wished that they had been able to spend time with the tool prior to use but, even without prior review, they felt it was a good way to establish a systematic approach, ensure nothing was overlooked, and promote a method to leave personal agendas aside.
  2. In order to get the text large enough on the screen, the only two visible columns were the consideration and notes (i.e., no item number, rationale). However, the facilitator could also explain rationale during discussion and move to other sections of the tool, due to familiarity with the content.
  3. Participants felt that crossing risk categories (falls, medication safety, etc.) in a hierarchy of decision making (e.g., unit layout) was an effective way to keep everyone engaged and participating in the discussion.
  4. Although priority and cost magnitude columns were added to facilitate the decision making, only the priority column was addressed. The patient population had been previously identified as high risk due to comorbidities, and the cost magnitude seemed to create too many barriers to flow.
  5. The priority became confusing, as participants were often basing the priority as “high” on what they could do (or what policies were already in place). This prompted a discussion on “jobbing” the tool and not harnessing the full value.
  6. There were a number of topics that had not yet been addressed due to the level of detail. Many of these fell into categories of institutional standards (e.g., FFE), suggesting that organizations may want to pre-populate certain considerations or have a higher level discussion about whether any standards need to be updated in the context of safety.
  7. Some in the group felt that they could have spent more time in a single sitting without losing focus. However, based on observations of the room, the facilitator ended the discussion several minutes early due to multiple conversations, some participants needing to leave, and a general sense of mental fatigue.

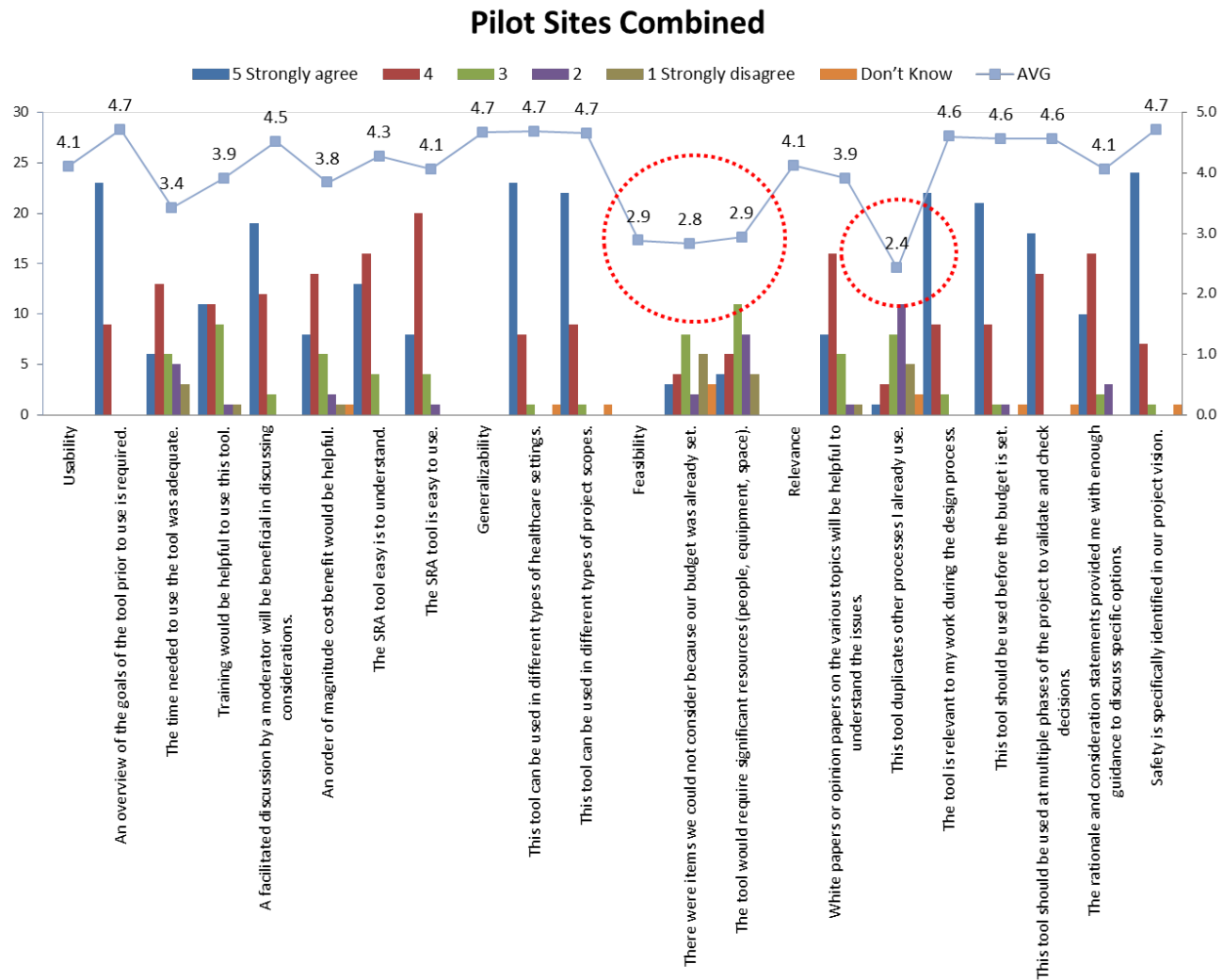
8. Participants felt a benefit to the diversity of views for the full session and remarked on the importance of having a dedicated time to focus on safety, rather than rolling the discussion into other design-related meetings. Planners in particular commented on the usefulness of hearing multiple points of view simultaneously and having a discussion around the issue, rather than meeting with individual groups and taking what was last said or trying to speculate on reasoning.

9. Nearly a dozen people expressed a perceived return on investment for the time committed (expense) to the process.

10. The group had positive feedback about a facilitated discussion and felt that someone from the organization should be trained in the use of the tool to be the “keeper” of the process for all projects going forward.

11. Even though some details had not yet been considered, the group felt that the level of detail was beneficial and started to prompt discussions that often happen too late in the process. Some participants stated that the tool should be used during the development of the functional program to ensure that the right considerations were brought forward into the project.

The combined survey results are shown below.



The SRA tool contained the following major components (each of which includes one, two, or more tabs). The revisions made during this year were indicated with italic, underlined text below.

- Cover page and home page providing an introduction of the background and purpose of the tool as well as direct links to other parts of the tool
- Safe design roadmap, including an instruction page and a checklist of 39 key safe design strategies used by healthcare administrators in four major phases of construction projects (i.e., strategic planning, facility master planning, process and operational planning; programming and design; construction and commissioning; and sustainment/occupancy). A 3-point scale was used: 1 – not developed, 2 – in process, and 3 – fully developed/work well.
- Project data page for documenting project information and the SRA components to be completed based on project needs
- A page providing links to all risk components, including links to risk data, design consideration, and external resource pages for each risk component
- Risk data and SRA checklist for the six individual topic areas. At the beginning of each topic area section, users were instructed to evaluate the risks and potential harms by using tables and a “heat map.” This was followed by a checklist that included all the design considerations as well as rationale developed in Year 1. Users were asked to record their evaluation about each design consideration (i.e., estimated risk, priority, and cost magnitude) and optional notes related to the evaluation.
  - 100: infection control
  - 200: medication safety
  - 300: falls
  - 400: patient handling
  - 500: behavioral health/psychiatric injury
  - 600: security

A series of tags was used to provide information related to each design consideration that might be helpful in decision making (i.e., risk estimate, relevance to FGI guidelines [required, suggested, not included], location, source [research, consensus, or opinions]). Sorting function was embedded in the tool so that users can sort the design considerations by the tags (e.g., sorting by building category, risk level, or inclusion in FGI guidelines). This would allow users to focus on design considerations that were most relevant for a particular construction project (e.g., unit layout considerations could be omitted for a plumbing renovation project). For the area of HAL, an existing tool for infection control during construction phase (called Infection Control Risk Assessment [ICRA]) was also incorporated for user’s convenience.

- A glossary providing definitions of terms used in the tool
- A list of research references in supporting design considerations

#### *The user guide*

The PPT user guide described background information (e.g., the significance of including the SRA requirement in the FGI guidelines, the process of developing the SRA tool, the major components of the SRA tool) as well as recommended steps for using the tool:

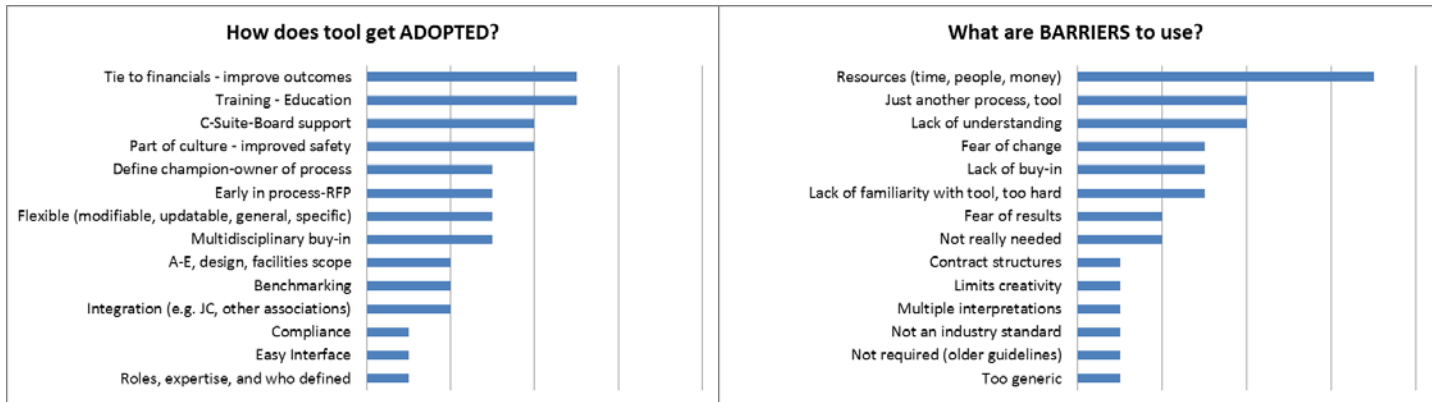
- Preparation and planning
- Identification of key safety goals
- Team composition and participants
- Resources
- Use under various design conditions
- The Excel-based SRA tool (including a detailed description of the tool with annotated screenshots)
- Actions after completing the SRA (e.g., building design improvement, reporting, post-occupancy evaluation)

The user guide also included a list of potential future work to update, expand, and implement the tool; an acknowledgment of contributors; and a request for comments and suggestions to further improve the tool.

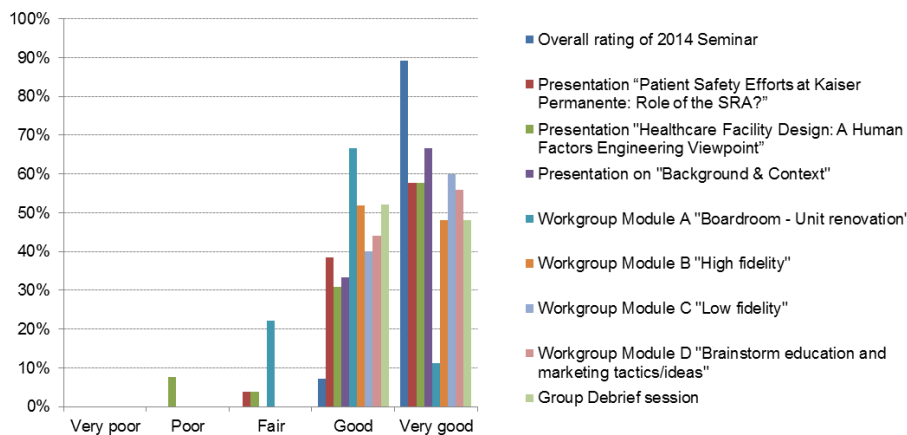
#### *Seminar results*

##### Participant feedback about the seminar (post-seminar surveys)

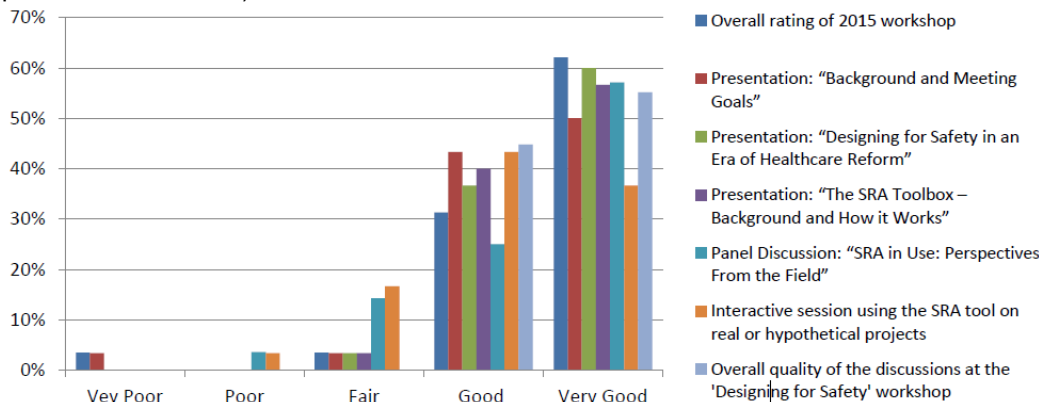
In the Year 1 (2013) seminar survey, most of the 29 respondents reported that the seminar was well organized and effective in reaching the goal of building consensus around key SRA items. All survey respondents expressed willingness to devote time and energy for further development of the SRA tool in the second and third years of the project.



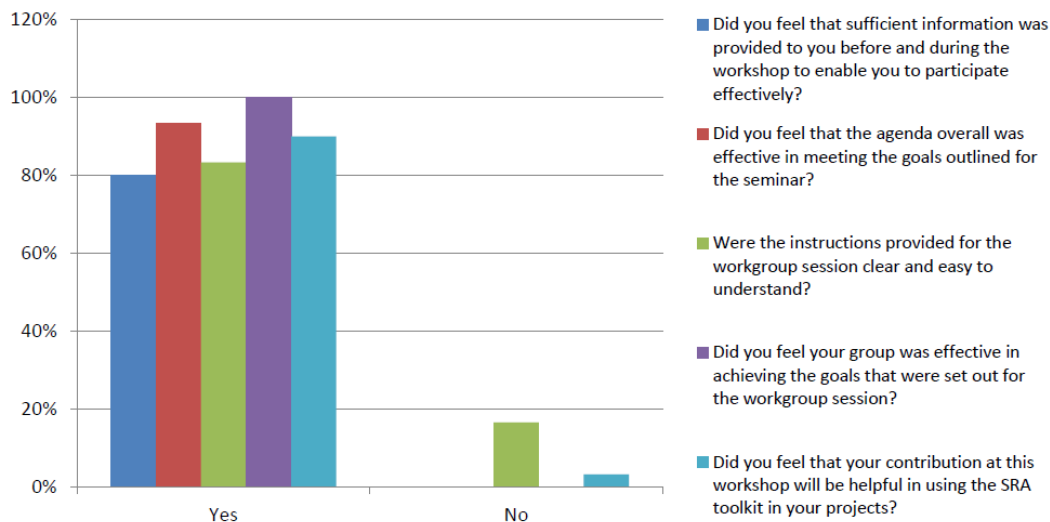
A total of 29 individuals responded to the survey after the Year 2 (2014) seminar. The majority of respondents rated the seminar high overall as well as in the individual presentations and workgroup sessions (see figure below). Most expressed willingness to contribute to the further development of the SRA tool, including attending the Year 3 (2015) seminar to be held in conjunction with the PDC Summit. Excel spreadsheet was the preferred format for the SRA tool (chosen by 65% of respondents) versus a PDF format.



A total of 30 participants (attendees and faculty members) completed the survey after the Year 3 (2015) seminar. The majority of respondents rated the overall seminar as well as the individual presentations and workgroup sessions with high marks – 93% rated the seminar as “very good” or “good.” Feedback from attendees indicated that there is a learning curve that is required for using the tool. For example, some felt that more time was needed for reading the hypothetical scenario and discussing the SRA consideration items. (Unlike in Year 2, this had been provided in advance.)







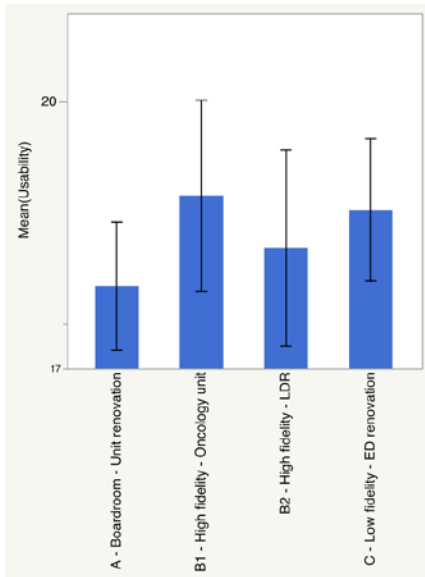
### Lessons learned on tool format & content (from the 2014 Seminar)

Workgroup members provided specific feedback regarding individual design consideration statements as well as the overall tool format. The notes recorded from the workgroup sessions were aggregated into an Excel spreadsheet and synthesized to inform further adjustments to the tool. Below is a list of suggestions/comments applicable to multiple considerations, multiple components, or the tool as a whole.

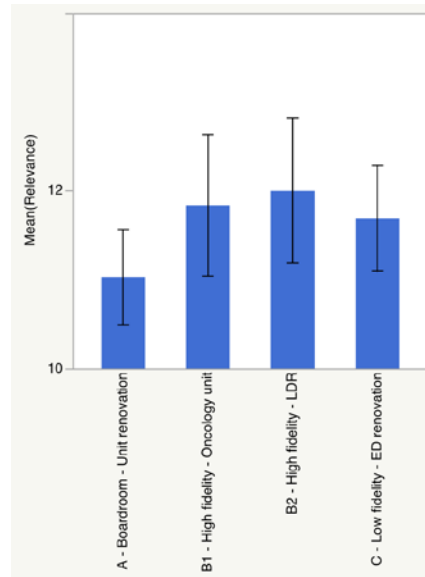
- The tool by itself was content driven. In addition to environmental design, other factors, such as cultural issues and operational processes, often impact safety. It might be helpful to provide a guide around the process, including:
  - The composition of SRA team (e.g., subject-matter experts) and individuals' responsibilities;
  - The engagement of external facilitation services;
  - Connection to cultural and operational issues, especially other existing safety processes;
  - The required information to serve as input to the SRA (risk evaluation?); and
  - How to address potential conflicts/trade-offs between components, etc.
- The decision on adopting a design consideration would depend on an accurate evaluation of its value versus cost as well as its relative priority among all the considerations. Without clear budget constraints, there was a tendency to incorporate all or most of the items. Participants found that more data (e.g., cost, patient demographics) were needed to evaluate risks and priorities.
- Design considerations addressing similar or closely relevant issues (e.g., design disciplines, such as mechanical design) should be grouped together to make the tool easier to use.
- For a specific project (e.g., scenarios covering specific patient types), some design considerations might be irrelevant (i.e., NA – not applicable). It would be ideal to be able to filter out those irrelevant considerations to avoid fatigue in using a long tool with many NA's.
- The results of the SRA might be the relative priority levels (e.g., high, medium, low) of design considerations instead of simple yes-no-maybe answers. Some suggested that the column should be placed to the left of the "Notes" column.
- Because the mock-ups were only for patient rooms, the workgroup members used unit/building floor plans to address many design considerations that were relevant or connected to other spaces (e.g., storage space for patient handling devices).
- Rationales were useful but need revisions to further strengthen and clarify (e.g., references).
- Simulated environments (i.e., mock-ups) helped visualize spaces and facilitate communication.
- Definitions were needed for some terms, especially for those not familiar with the subject. Some terminology might be outdated. This brought up the need to update terms.
- The tool would be helpful as a check-in across design phases.

Feedback around the usability and relevance of the SRA tool was generally positive. Using the tool in mock-ups, where design considerations could be more easily visualized, was considered more effective than using it in a meeting room setting. The low-fidelity mock-ups were perceived favorably by some participants, because the room layout could be adjusted by moving the furniture, fixtures, and equipment. An interesting finding was that ratings became more favorable when participants became more familiar with the tool. Some participants also reported

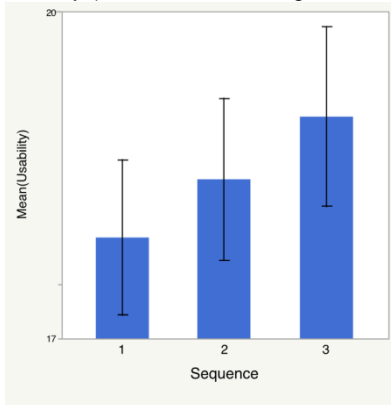
that the tool became easier to use the second or third time than it was the first time. This indicated a possible learning curve in using the tool, such that appropriate training might be suggested.



Usability (summation of 5 rating items on 5-point scale)



Relevance (summation of 3 rating items on 5-point scale)



Change of ratings over sessions 1-3

### Ideas for tool dissemination

Several ways of informing end users about the existence and proper use of the SRA tool included:

- Disseminate messages about the tool and its value broadly across all relevant conferences, professional networks, and social media to all potential stakeholders, such as general public, patient advocacy, regulator, and accreditors;
- Incentivize use of the tool by demonstrating its cost-effectiveness (e.g., ROI, storytelling); and
- Provide assistance and training (e.g., recorded video instructions) on use of the tool, including the time and cost.

Almost all stakeholders of healthcare (e.g., providers, professional organizations, healthcare administrators, patients, universities, etc.) should be targeted for dissemination. Methods of reaching out to the groups included tailored communication, engagement with professional organizations, and connection to existing safety processes.

The marketing materials should include the following content: purpose and benefits of using the tool, rationale/research evidence, and instructions on how to use the tool (e.g., team composition, time, cost, process) as well as and case studies (success stories) of using the tool. Multiple formats could be used for the marketing materials, including face-to-face and virtual communication: web pages with links housed at industry websites, social media, video, YouTube, conferences, webinars, workshops, articles in popular trade magazines, white papers, hands-on practice, and so on.

Some potential barriers to SRA tool dissemination were identified: vague wording (e.g., “optimize,” “maximize”); lack of easy-to-understand output of using the SRA tool (e.g., a pass/fail score); unclear benefits; inertia to adopt new tools; possible perception that this may be a complicated process, costing time and money and duplicating other existing processes; and lack of clear guidance for using the tool. (This was prior to the development of the user manual.)

#### Seminar format as an education module

The seminar format that was used for the PDC pre-conference workshop featured a combination of lectures and hands-on discussion/practices for realistic hypothetical building projects as well as the involvement of experts and other professionals who participated in the development and testing of the SRA tool. This format was found to be effective in educating healthcare design and construction stakeholders on SRA and disseminating the SRA tool. This method can serve as an educational and training format for further integrating the SRA process in building design and construction.

## **7. PUBLICATIONS & PRODUCTS**

### *Publications*

- Joseph, A., Malone, E., Taylor, E., & Quan, X. (2014, August). Designing For Safety - Making Patient and Staff Safety a Priority during the Healthcare Facility Design Process. Hospitalinfrabiz Magazine. Online Magazine. Retrieved August 2, 2014, from <http://www.hospitalinfrabiz.com/making-patient-and-staff-safety-a-priority-during-the-healthcare-facility-design-process.html>.
- Taylor, E., Joseph, A., Quan, X., & Nanda, U. (2014). Designing a tool to support patient safety: Using research to inform a proactive approach to healthcare facility design. In *Advances in Ergonomics In Design, Usability & Special Populations: Part III (Vols. 1–20, Vol. 18, pp. 7889–7899)*. Krakow, Poland: AHFE International/CRC Press (Taylor & Francis Group).
- Taylor, E., Hignett, S., & Joseph, A. (2014). The environment of safe care: considering building design as one facet of safety. *Proceedings of the International Symposium of Human Factors and Ergonomics in Healthcare*, 3(1), 123–127.
- Joseph, A., & Taylor, E. (2014, February). Safety First: Designing Healthcare Spaces To Avoid Adverse Events. *Healthcare Design Magazine*.

### *Planned publication:*

- Joseph, A., Taylor, E., & Quan, X. (in progress). Creating safer healthcare environments using an evidence-based design process. In V. K. Singh (Ed.). *Innovative, Lean & Evidence Based Healthcare Facilities Planning and Design*.
- Taylor, E., Quan, X., & Joseph, A. (2015a). Testing a tool to support safety in healthcare facility design. *Procedia Manufacturing*, in press.
- Joseph, A., Taylor, E., & Quan, X. (in progress). First, do no harm: Developing a safety risk assessment tool for healthcare building design. *Innovation Learning Network online magazine*.

### *Presentations*

- Taylor, E., Quan, X., & Joseph, A. (2015b, July). Testing a tool to support safety in healthcare facility design. Research presented at the 6th International Conference on Applied Human Factors and Ergonomics, Las Vegas.
- Taylor, E., & Quan, X. (2015, June). You don't know what you don't know! Deliberately designing for safety. Webinar presented for The Innovation Learning Network “Virtual Thursday” Webinar Series.
- Taylor, E., & Quan, X. (2015, March). Tools You Can Use: Tracking Safety and Mitigating Risk in Healthcare through Facility Design. Webinar presented for The Center for Health Design ICONS and Innovators Webinar Series.
- Joseph, A., Taylor, E., & Quan, X. (2015, March). Using a Safety Risk Assessment in the Health Care Facility Design Process. Education Session presented at the 2015 PDC Summit, San Antonio, TX.
- Joseph, A., & Taylor, E. (2014, November). Safety by Design: How Teams Can Proactively Use Facility Design to Reduce Adverse Events. Education Session presented at the Healthcare Design Conference 2014, San Diego, CA.
- Taylor, E. (2014, September). Designing for Safety: Assessing Risks in the Healthcare Built Environment. Learning Lab presented at the Exchange 2014, Tampa, FL.
- Joseph, A., Malone, E., & Taylor, E. (2014, March). Designing for Safety: Assessing Risks in the Health Care Built Environment. Education Session presented at the 2014 PDC Summit, Orlando, FL.

- Taylor, E., & Joseph, A. (2013, November). Developing a Framework for Conducting Safety Risk Assessment During the Healthcare Design Process. Roundtable presented at the Healthcare Design Conference 2014, Orlando, FL.
- Taylor, E. (2013, July). Patient Safety: Considering Risk in the Built Environment. Webinar presented for The Center for Health Design ICONS and Innovators Webinar Series.

*Products*

- Final SRA tool (in Excel and PDF formats)
- Final user guide
- Seminar pre-meeting materials
  - Agenda
  - Advisory committee
  - Speakers/faculty
  - Attendee lists
- Design for Safety Seminar results
  - Survey results
- Case study documentation