SHS Orcas: The first integrated information system for long-term healthcare facility management

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Abstract

SHS.com (Shared Healthcare Systems) provides software solutions and services for the senior healthcare market. In 1998, SHS engaged Cooper to help design a next-generation healthcare information system that would for the first time provide true integration of clinical, financial, and case management information, allowing comprehensive management of long-term healthcare facilities.

Cooper had an opportunity to design a product that not only improved the efficiency of healthcare facilities, but also helped improve the quality of care given to their residents. The system needed to help facility staff make sense of data as well as capture it.

To address these important issues, Cooper interviewed and observed healthcare facility staff and residents during an intensive ethnographic research period. The research and analysis culminated in a set of user archetypes, called *personas*. The team used persona- and scenario-based methods to drive the design of an integrated suite of clinical, case management, and financial tools.

Keywords

Healthcare, case management, information system, clinical, financial, trend analysis, ethnography, personas, scenario-based design, design patterns, design principles, interaction design

Industry/category

Healthcare/Information System

Project statement

Shared Healthcare Systems, formerly known as Sun Healthcare Systems, asked Cooper Interaction Design (Cooper) to create a conceptual, interaction, and interface design for a next-generation long-term care information system called Orcas. Orcas provides an integrated solution for nurses managing resident care, case managers making resident admission decisions, and business managers in charge of billing and insurance processing.

Project participants

Cooper assigns a core design team of 2-3 designers (typically two interaction designers and one-half visual designer per interface) allocated 100% to a project. We find that keeping teams small encourages collaboration, keeps efficiency high, and eliminates the logistical overhead that results from too many voices competing at once.

Interaction designers work in pairs, and assume the role of **ethnographers** in addition to their design duties. We at Cooper feel that this dual role is critical to successful design: designers must be able to empathize with the needs and goals of users, customers, partners, and client stakeholders via first-hand immersion in their daily routines.

Interaction designers come in two complementary "**flavors**" that we pair as teammates at Cooper: one is primarily responsible for the evolution of the **design concept** during the course of the project, the other is primarily responsible for the evolution of the **design narrative**. Narrative is particularly important not only in the communication of interaction design concepts, but in the development of them as well. Interaction design is concerned with the behavior of artifacts and systems, and narrative is a particularly powerful tool in the design and communication of behaviors.

Visual Designers work closely with the interaction designers throughout the course of the project to develop and execute visual languages that meet the information needs of users as well as the branding needs of clients.

Some of our interaction designers have **industrial design** skills/backgrounds; we employ these individuals as required on a project.

Cooper Design Team

Interaction Design (concept): Robert Reimann, Kim Goodwin

Interaction Design (narrative): Lane Halley, Steve Calde[1]

Visual Design: Kim Goodwin

Point of Care concept sketch: Ryan Olshavsky

Deliverable Production: Courtney Cochrane

Account Management/Sales: Glenn Halstead

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[1] Steve Calde designed the case management interface with Kim Goodwin. Robert Reimann, Kim Goodwin, and Lane Halley designed the clinical and financial interfaces.

Client Team

Client Champion/Technical: David West

Client Champion/Business: Jeff Mukamal

Financial SME: Judy Wheeler

Clinical/Case Management SMEs: Sheila Garner, Marilyn Cross

Technical SMEs: Bill Barnum, Dave Yarnell

Project dates and duration

The Orcas design project lasted five months (25 February 1998 to 29 August 1998). Cooper provided several days of additional support during the early stages of the development process.

Design process

Cooper's Goal-Directed Design method combines **ethnography/stakeholder interviews** and **product/literature review**, detailed user models (**personas**), **scenario-based design**, and a core set of **interaction principles and patterns** to design the form and behavior of products and services that meet the needs and goals of users, while also addressing business/organizational concerns and technical constraints of our clients. These methods are roughly reflected in our design phases: *Research, Model, Envision, and Refine*.

Research phase

Cooper's Research phase employs ethnographic field study/contextual inquiry (1998, Beyer and Holzblatt), for an analysis of potential users of the product, review of market research and other literature, competitive product audits, as well as interviews with stakeholders, developers, subject matter experts (SMEs), and technology experts.

One of the principal outcomes of Cooper's field observation and interviews is an emergent set of **usage patterns**—identifiable behaviors that help categorize modes of use of a potential or existing product. These patterns point at **goals and motivations** (specific and general desired outcomes of using the product). In business and technical domains, these behavior patterns tend to map to professional roles; for consumer products, they tend to correspond to lifestyle choices. Usage patterns, and the goals associated with them, drive the creation of **personas** in the Model phase of Cooper's design process.

Team research

For its field study, the team visited 6 long-term healthcare facilities at representative locations across the country. Both "model" and "problem" facilities were visited. The team interviewed 35 long-term healthcare professionals/employees who the team believed would be candidates for using a system such as Orcas.

The design team interviewed/observed facility staff in work environments to obtain first-hand insights about use of reference materials, notes, and tools (digital, mechanical, and paper-based), and how employees interacted with each other, their customers, and their residents. Special attention was paid to the physical environment in which the system would be deployed: following nurses on rounds helped clarify how frequent time away from their desk and computer affected their ability to gather information and later retrieve it. Interview questions included not only task-specific details, but also broader questions such as "What's a good work day like?" that were intended to elucidate goals and motivations.

Initial findings

As the designers analyzed interviews across facilities, patterns emerged regarding preferred workflow habits, as well as obstacles that hindered workflows. The team learned that nurses and business office managers would probably rely heavily on the system. However, doctors and managers would only be occasional consumers of information, and would seldom be involved in data entry. Facility residents and their families, though not direct users of the system, would be affected by information presented by the system and the way it in which it was used and gathered.

The team also discovered a case management role that had not been previously identified by the client: a registered nurse who is responsible for creating a cost-effective, but clinically appropriate care plan. In an environment of increasing costs and decreasing Medicare payments, this role was determined to be critical to the effective future management of facilities.

Research further indicated that information-management needs of long-term care facilities were very poorly served by existing paper and digital systems. Computers were used only for limited applications, such as billing or filling out required Medicare forms. Clinical information was stored in multiple paper systems; information about each resident was written in the resident's paper medical record, copied into the nurse's duty log, manually entered into computerized Medicare forms, and manually entered into the computerized billing system. A clerk solely responsible for checking errors and omissions was employed to audit paper records. Managers looking for financial or clinical trends set up their own spreadsheets and entered the data once again. Corporate managers had visibility into the status

of each facility only through hand-compiled reports or personal visits.

Some other key patterns that the team discovered:

- Healthcare facilities are busy and filled with unexpected events. People have trouble keeping track of what they need to do, so important details can fall through the cracks.
- Because information is not collected at the point of care, data entry may be inaccurate or even forgotten.
- Data entry doesn't match workflow, making it difficult to know whether information in the system is current, accurate and complete.

From this information, the design team created a **problem statement** (or **product challenge**) that encapsulated the overarching issues discovered in the research. This concise problem statement provides a focus for the design team and the client throughout the project.

The problem statement was also used to help create a **product vision statement** as part of the Model phase, which formed the high-level **design mandate** for the product. Both the challenge and vision statement were presented to the client, discussed, and agreed upon before further design work commenced.

Model phase

During the Model phase, usage and workflow patterns discovered through analysis of the field research are synthesized into domain and user models. Domain models can include information and workflow diagrams. User models, or **personas**, are fictional, detailed, *archetypal* characters that represent distinct groupings

Orcas Personas

Key Orcas personas are shown below. In all, the team created 17 personas.

Customer Personas

Gerta Weissman – Resident (Served)

Administrative Personas

Bill Parker, Jr. – Facility Administrator (Primary)

Case Management and Admissions Personas

Sandra Martin, RN – Case Manager (Primary)

Shelly Thomas – Admissions Coordinator (Secondary)

Financial Persona

Georgia Myers – Business Office Manager (Primary)

Clinical Personas

Rhonda Wilson, RN – Unit Coordinator (Primary)

Joyce Cho, RN– MDS coordinator (Secondary)

Point-of-Care persona

Carla Olivares – Certified Nurse Assistant (Primary)

of behaviors, goals, and motivations observed and identified during the Research phase (1999, Cooper).

Personas serve as the main characters in a narrative, scenario-based approach to design that iteratively generates design concepts (in the Envision phase), provides feedback that enforces design coherence and appropriateness (in the Refine phase), and provides a powerful communication tool that helps developers understand design rationale and prioritize features based on user needs (1999, Cooper).

Cooper employs a variety of methodological tools and processes to synthesize, differentiate, and prioritize personas (2001, Goodwin), including exploration of different types of goals (life goals, experience goals, end goals), and mapping personas on ranges of behavior to ensure there are no gaps or duplications. To be effective, personas should be distinct along single or multiple axes of behavior.

Specific design targets are chosen from the personas through a process of comparing goals, deriving needs (objects, actions, and contexts) from the goals, and assigning a hierarchy of priority based on how broadly each personas' needs encompass the needs of other personas. A process of **designating persona types** determines the amount of influence each persona has on the eventual form and behavior of the design.

Possible persona type designations include: **primary**, where the persona's needs are sufficiently unique to require a distinct interface form and behavior; **secondary**, where a primary interface will serve the needs of the persona with a minor modification/addition; **supplemental**, where the persona's needs are fully satisfied by a primary interface; **served**, where the persona is not an actual user of the product, but is indirectly affected by it and its use; **negative**, where the persona is created as an explicit, rhetorical example of whom **not** to design for.

Key Personas for Orcas

Approximately 50 job roles were initially identified by the client as potential design targets. Based on their analysis of usage patterns, the design team was able to select **five primary personas**—a nurse supervisor, a case manager, a business office manager, a facility administrator, and a nursing assistant—from a field of 17 total personas. **Two secondary** personas—a specialized nurse and an admissions coordinator—needed small modifications or additions to the primary personas' tools.

Also critical to the persona set, though she was not a user, was Gerta Weissman, an 87-year old resident with Alzheimer's. Gerta was important as **a served** persona because any solution must protect her dignity and privacy, as well as ensure the quality of her care.

The remaining nine personas were determined to either be supplemental, or were deemed (in the case of some of the corporate personas) by the client and team to be outside the scope of the project.

The persona analysis ultimately determined that five unique interfaces would be needed to create a truly comprehensive and integrated information system that enables each persona to achieve his or her goals.

The personas also became an invaluable internal resource and powerful marketing tool for SHS. The company posted persona pictures around the office to remind everyone they were building a product to solve people's goals, not to showcase technology. Orcas marketing materials are also focused on the personas and the ways in which the product serves their goals.

Persona Example: Rhonda Wilson, RN
Nurse Unit Coordinator

Rhonda is a 36-year-old RN who has worked at several skilled nursing facilities. She started out in acute care but moved to long-term care so she could have more autonomy. Rhonda was promoted to Unit Coordinator four years ago because she is very competent and generally well organized.

Rhonda is entirely overwhelmed and is drowning in paper, even more so than the average nurse. She often misses eating dinner with her boyfriend because she has to work late, filling out forms and reports.

Rhonda's goals are to:

- **Spend time on patient care and staff supervision, not paperwork.**

- **Be proactive.** Rhonda needs to understand trends in order to solve problems before they happen, instead of just reacting to crises.

- **Know that things are being done right.** Rhonda supervises the unit because she's good at what she does. If nurses aren't following procedure or documenting things, she wants to know right away.

Envision and Refine phases

Design methods employed by teams during the Envision and Refine phases provide the much-needed connection between user research and models, and the framework (and eventually detail) of the design. Both of these phases employ scenario-based design methods (1995, Carroll), with the important innovation of focusing the scenarios not on "user" tasks in the abstract, but first and foremost on meeting the goals and needs of specific, typical users (personas), with an understanding of which tasks are truly important, and

why, leading to an interface that minimizes necessary tasks (effort) while maximizing return. Personas become the main characters of these scenarios, and the designers explore the design space via a type of role-playing (1999, Cooper).

In the Envision and Refine phases, teams also employ two other critical methodological tools. The first is a set of general **interaction design principles** (1995, Cooper) that, like their visual design counterparts (1995, Mullet and Sano; 1983, Tufte), provide guidance and in determining appropriate system behavior in a variety of contexts. The second is a set of **interaction design patterns** that encode specific solutions (often with variations based on context) to classes of previously analyzed problems (1977, Alexander). Design patterns are hierarchically organized, and are continuously evolving; rather than stifling designer creativity, they often provide needed leverage to approach difficult problems with proven design knowledge.

For each interface/primary persona, the process of design at in the Envision phase involves an analysis of persona needs (expressed in term of objects, actions, and contexts), prioritized and informed by persona goals, behaviors, and interactions with other personas. This analysis is accomplished through an **iterative scenario** that starts with a "**day in the life**" of the persona using the product, describing high-level touch points with it, and thereafter successively defining detail at ever-deepening levels. As this iteration occurs, both business goals and technical constraints are also considered and balanced with persona goals and needs.

Once needs at a given level of detail are described, they are translated first into design elements, and then organized using patterns and principles into design

Figure 1: The team created detailed descriptions of each persona, including a stock photo and a biography. The text to the right represents a summary of Rhonda's persona description (each description was about a full page in the actual deliverable).

sketches and behavior descriptions. Successive iterations provide successive detail. The approach is often a balance of top-down (pattern-oriented) design and bottom-up (principle-oriented) design.

The **Refine phase** proceeds similarly to the Envision phase, but with greater focus on task coherence, using "**key path**" scenarios focused on storyboarding paths through the interface in high detail. The culmination of the Refine phase is the documentation of the design, which is delivered as a detailed Form and Behavior Specification.

Envision/Refine results

Using each of the primary personas in day in the life scenarios, the team created a high-level framework for the entire Orcas system, which the team determined would consist of four role-based, mouse and keyboard-driven desktop interfaces and one in-room point-of-care device that incorporated a touch screen and bar code scanner. The scenarios also enabled the team to determine which behaviors and interface elements could apply across interfaces, and which were unique to individual interfaces.

It was critical to map out the framework for all five interfaces before delving into detail for any one interface, to ensure coherence of workflows.

The team used whiteboards as the primary early-stage design medium, which allowed the team to think freely and make changes easily, since no time was being invested in "pushing pixels" with a drawing program.
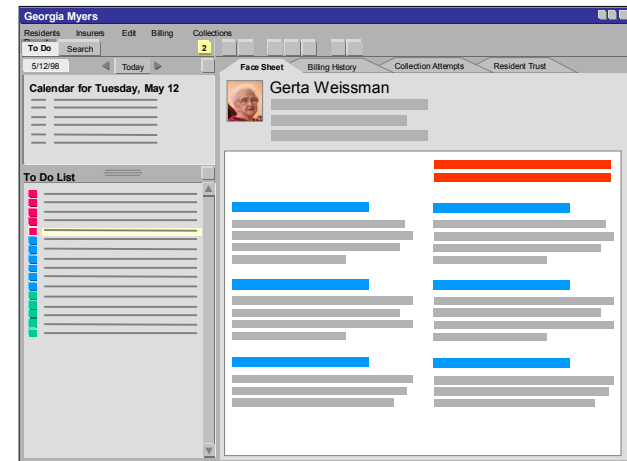
Figure 2: During the Envision phase, the team created high-level sketches of the interface framework and of key screens. We used Microsoft PowerPoint because it was quick, flexible, and didn't give the appearance of a "finished" interface to the client.

The framework was presented to SHS stakeholders via high-level sketches and walkthroughs. The team had shared captured whiteboard sketches with SHS during the four-week Envision phase, but a more formal PowerPoint presentation demonstrating some simple scenarios that showed the high-level interactions and state changes helped communicate the design and generate enthusiasm on the client's development team.

Although the design was at a high level, it was sufficient to elicit valuable feedback from the SHS stakeholders and developers. That feedback was integrated during the **Refine phase** of the design, where the Cooper team focused its efforts on detailing three of the interfaces in considerable detail, and the other two to a lesser extent.

Before diving into interaction details, the team spent additional time with clinical and financial SMEs to understand in more detail the information requirements for the system. This brief second round of research was invaluable. At the beginning of the project, the team didn't know enough about the problem or the solution to ask the detailed questions that surfaced later. The team used key path scenarios to flesh out key interactions, this time down to each mouse-click, keystroke, and system information push. The team again vetted solutions at the whiteboard, but frequently took time to sketch the interface in pixels at accurate screen resolution to ensure that there was enough space for everything. After the interactions were fleshed out, the design team worked on creating a main screen drawing for each interface using accurate content, then applied the client's visual branding. Next, they created additional drawings showing state changes and important secondary screens in order to communicate design details to the development team. Final screens were rendered in Adobe Photoshop.

After the details of the interface were completed, the Cooper team collaborated with the SHS management and development teams to clarify questions, suggest workarounds for solutions that couldn't be implemented in release one, and discussed possible implementation strategies. The design team created a detailed form and behavior specification, which SHS used as a foundation for a functional specification. As questions arose during implementation, developers consulted the form and behavior spec in order to understand the "spirit" of the design, and were able to make good decisions about areas not covered in the design.

Solution details

Orcas needed to be more than a software package; it needed to be a multi-faceted information system focused on *residents*, even though residents would never use the system directly.

By empowering care practitioners, case managers, and people in charge of billing, residents benefit because the chance of some aspect of their care falling through the cracks would be minimized or eliminated. To empower practitioners, Orcas needed to help facility staff better manage their daily workflow. It also needed to help the staff provide excellent patient care, without interrupting workflow or seeming invasive to the residents.

Several different kinds of users needed access to the patient record. Instead of trying to create a single interface that served everyone's needs, the team created a single interface framework, and designed appropriate components for separate, role-based interfaces that were specific to the specialist using them. All three primary desktop interfaces were focused around the all-important resident record, which contains details about the resident's care plan, medical history, and insurance and billing information. However, each primary persona would only see that slice of the resident record that was appropriate to his or her specialty.

Although the team could not design every screen, representative screens were chosen so that SHS developers could easily extend the design as necessary. Implementation has been extraordinarily faithful to the design as presented in Cooper's specifications.

Clinical Interface, **Rhonda Wilson, RN, Nurse Unit Coordinator,** Primary Clinical Persona

Rhonda is the primary clinical persona because she has broad responsibilities for resident care, charting, tracking and staff supervision. She needs tools to help her manage what she has to do and understand resident status at a glance and see what trends may be developing in her unit.

Planner view

Rhonda has three views: planner, find and trends. The planner view is selected.

To-do list item

Rhonda clicks on this to-do list item and Orcas loads Gerta's chart into the workspace with the care plan section selected.

Chart

Rhonda can view notes written by therapists, doctors, and other nurses, add her own notes, or track Gerta's weight and other vitals over time.

New problem

When a new problem is added to Gerta's record, Orcas adds an entry to the care plan so Rhonda will put an action plan in place.

Figure 4: The clinical interface provides global information, reminders, and to-do items in the planner (left), and details about a selected resident in the workspace (right). The system pushes important information to Rhonda by highlighting new information in the resident's care plan, notifying her of dangerous drug interactions, and informing her about trends that may affect patient care.
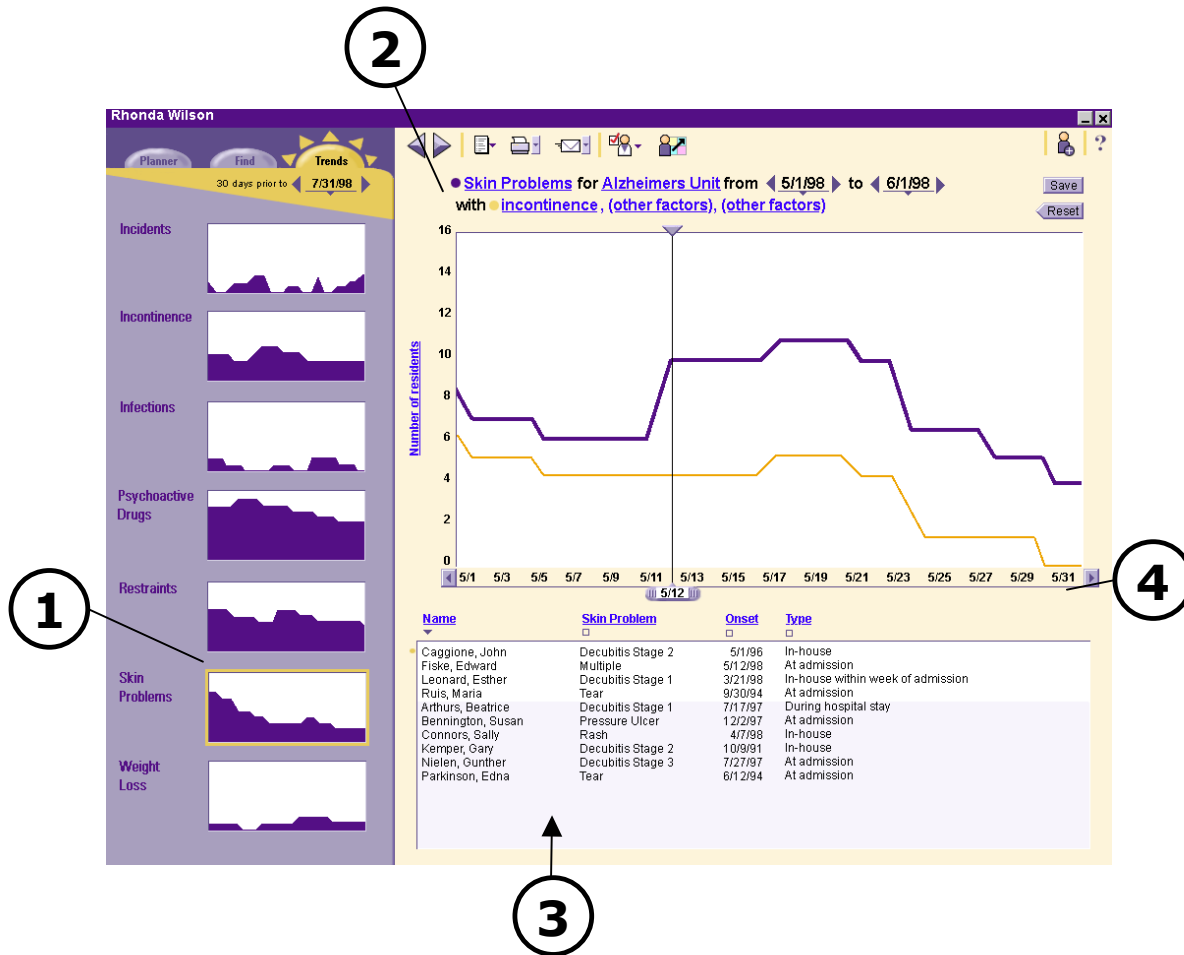
Rhonda Wilson

Planner | Find | Trends

30 days prior to ◀ 7/31/98 ▶

Incidents

Incontinence

Infections

Psychoactive Drugs

Restraints

Skin Problems

Weight Loss

● Skin Problems for Alzheimers Unit from ◀ 5/1/98 ▶ to ◀ 6/1/98 ▶
with ● incontinence , (other factors), (other factors)

Save | Reset

Number of residents — 16, 14, 12, 10, 8, 6, 4, 2, 0

5/1 5/3 5/5 5/7 5/9 5/11 5/13 5/15 5/17 5/19 5/21 5/23 5/25 5/27 5/29 5/31

5/12

Name	Skin Problem	Onset	Type
Caggione, John	Decubitis Stage 2	5/1/96	In-house
Fiske, Edward	Multiple	5/12/98	At admission
Leonard, Esther	Decubitis Stage 1	3/21/98	In-house within week of admission
Ruis, Maria	Tear	9/30/94	At admission
Arthurs, Beatrice	Decubitis Stage 1	7/17/97	During hospital stay
Bennington, Susan	Pressure Ulcer	12/2/97	At admission
Connors, Sally	Rash	4/7/98	In-house
Kemper, Gary	Decubitis Stage 2	10/9/91	In-house
Nielen, Gunther	Decubitis Stage 3	7/27/97	At admission
Parkinson, Edna	Tear	6/12/94	At admission

Figure 5: The trend tool lets Rhonda spot patterns and search for correlations.

ABOUT TRENDS

The organizer trend view contains thumbnails of key clinical trends. The thumbnails contain current data for the facility. Rhonda can view the thumbnails for a quick overview of trends, or she can load them into the workspace to take a closer look with the trend tool.

1. The selected trend thumbnail is loaded into the workspace in more detail.

2. Rhonda dynamically modifies a natural language sentence to change the factors graphed or add additional factors.

3. The detail area below the chart shows additional information about the point in time selected in the graph.

4. Clicking on the scroll controls moves the time window forward or backward, but does not change the scale of the chart.

*Administrative Interface,* **Bill Parker, Facility Administrator,** Primary Administrative Persona

Bill is a people person who manages by walking around. He knows that when his staff is happy, they are more loyal and productive. Bill wishes he could spend more time with staff and residents, but he's wedded to his calculator and spreadsheets, trying to determine whether he'll make his numbers this month. There is a whiteboard on Bill's office wall showing the latest census information, which he updates by hand every morning. He needs a variety of facility information at his fingertips, because he needs to know whether he's over- or under-staffed, who's in what beds, how many accounts are more than 60 days overdue, and whether there are any clinical problems developing.

DESIGN DETAIL: CENSUS TOOL

The census tool is one of several visual tools Bill uses to track the operational health of his facility. This graphic thumbnail of the facility provides a visual model to help Bill understand facility occupancy at a glance.

- Orcas collects information from resident records and automatically displays it in the census tool. This is a live display that updates as new information is entered into Orcas.

- Different types of rooms, such as certified and uncertified, or beds in a special unit are indicated with Rich Visual Modeless Feedback (RVMF).

- Census flags, such as contagious conditions, are automatically set.

Facility totals
Orcas shows current census data for the facility, listing occupancy, empty beds, bed holds, and unavailable beds.

Unit name
Rooms in the facility are grouped as laid out in Bill's census setup worksheet.

Flag
Orcas detects conditions in the resident record and flags those conditions that would impact room use.

ToolTip
Hover the mouse over a room for more information about the occupants.
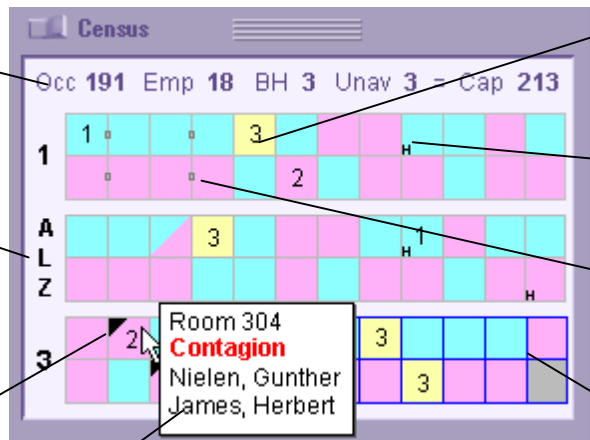
Color indicates the occupants of a room: Blue for male, pink for female both for mixed and yellow for empty. Numbers represent empty beds.

Bed hold
Bed holds are set through the resident face sheet.

Shared bathroom
These two rooms share a bathroom.

Certified rooms
Rooms with a special attribute are outlined in a different color.

Financial Interface

Georgia Myers, Business Office Manager

Primary Financial Persona

Georgia spends most of her time managing accounts and ensuring that resident financial information is correct. She needs tools to help her prepare correct bills on time and collect money. The facility depends on Georgia to make sure resident information is complete and correct and that nothing falls through the cracks.

The Orcas financial interface helps Georgia meet her goals because it puts the relevant resident financial information right at her fingertips. Georgia's interface provides a to-do list so she won't forget things and important details won't drop through the cracks.

Collapse or expand details

Georgia mostly looks at high-level billing information, but when a question arises, she may need to know every detail, down to how many syringes were used for this resident on a given day.

Bookmarks

Georgia is frequently interrupted, so we gave her a bookmark area to keep track of unfinished tasks or frequently used records. She can click anywhere in a record and drag to this area, then click on the bookmark later to return to the same spot.

Search selector button
Click on this button to see a drop-down list of search statements grouped by type.

Search statement
Search statements can contain drop-down lists of options or can accept typed values, such as a date or text string.

Search criteria
Click here to see a drop down list of other valid search criteria, such as "discharged." Orcas remembers your selected criteria and restores them next time you select this search statement again.

More detail about the selected item is shown in the workspace to the right. Changing the selected item changes what is shown in the workspace.

Orcas modelessly alerts Georgia that this resident 's Medicare days are nearly used up.

Save search
Click here to save the current settings of the search statement, criteria and attribute columns.

Tag control
Select records and click here to add a text attribute.

Resident list
Click here for a shortcut to resident records sorted alphabetically.

Forward and back controls
These controls step forward and back through recent searches.

Sort criteria
To change what is shown in the attribute column, click on the attribute name to pick a new attribute from a drop down list. For example, you can replace the resident's account status with his or her primary payor.

Sort controls
Click on this control once to make it active and sort in descending order. Click again to reverse sort order.

Attribute column
The search tool does not display all attributes of items at once. Only the attributes that are relevant to the search criteria are displayed. Different search statements will show different attributes.

Georgia Myers

Planner   Find

Show current residents alphabetically

Name	Room	Account Status
Aaronsen, Karl	102	Current
Ames, Laura	123	Current
Arthurs, Beatrice	205	30 overdue
Atkinson, Rachel	203	60 overdue
Bennington, Susan	216	Current
Boyd, James	213	Current
Caggione, John	234	Current
Carolan, Patrick	103	Current
Connors, Sally	112	Current
Daniels, Martin	134	30 overdue
DeLancy, Mark	105	Current
Fiske, Edward	107	Current
Gomez, Adam	209	Current
Hughes, Carol	211	30 Overdue
Jones, Theodore	112	Current
Kemper, Gary	114	90 overdue
Leonard, Esther	212	Current
Marquez, Jose	105	Current
Nielen, Gunther	304	Current
O'Brien, Betsy	221	Current
Owens, Jessica	204	30 overdue
Park, Ethel	308	30 overdue
Powers, Leonard	306	Current
Ramirez, Juan	122	Current
Ruis, Maria	303	Current
Stewart, Marvin	117	Current

DESIGN DETAIL: GEORGIA'S SEARCH TOOL

The search tool helps Georgia find and filter relevant database information based on attributes. Georgia uses simple interactions to create a "natural language" sentence, called a *search statement*, that describes her search.

Search statements are filters that determine the type of record shown. All records of that type show in the list, sorted by a selected attribute.

Georgia can modify underlined items in the search statement to change details of the search. Clicking the Search Selector button lets Georgia choose a different search statement type, such as "show residents by level of care," or "show bills more than 60 days overdue."

These simple controls let Georgia create powerful queries without having to learn anything about wildcards or script input. The search statements are flexible yet bounded, which means that she can't make a query that doesn't make sense.

Case Management interface

Sandra Martin, RN, Case Manager

Primary Case Management persona

Sandra is the persona who evaluates Gerta for admission into the health care facility by answering two questions: can the facility take care of Gerta, and can the facility make a profit taking care of Gerta?

Orcas allows appropriate users to access all pre-admission and post-admission information, so it is possible for one person to gather referral data, make an accurate cost prediction, verify benefits, negotiate contract exclusions, admit the resident to the facility, prepare a preliminary plan of care, and follow up on the resident's progress after admission.

Profit/Loss Indicator

As Sandra sets up the care plan for a prospective Resident, this meter shows her whether the facility will make or lose money.

Therapy Optimization

These widgets let Sandra allocate therapy time to different therapy disciplines and practitioners, so she can find the most cost-effective way to meet Gerta's therapy needs.
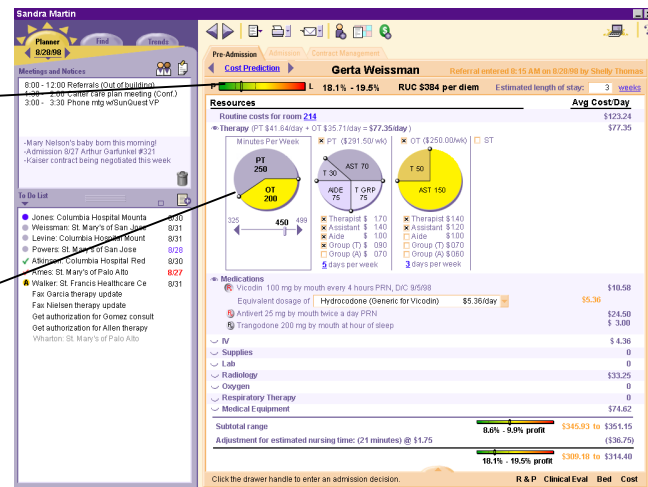
Point of Care Interface

Carla Olivares, Certified Nurse Assistant

Primary Point of Care Persona

Carla is a 22-year-old native of Panama who moved to the US when she was 16. She works two jobs to make ends meet, and neither of them pay very well. She speaks English well but reads and writes poorly. Carla's job is messy and physically strenuous; she feeds, bathes, lifts, clothes, and weighs residents who cannot do those things for themselves. Carla is so busy that it's difficult to do everything she's supposed to, much less document whether Gerta was able to feed herself today. For Carla to enter the critical data she gathers, the data entry must take place at the point of care, and it can't be a clumsy handheld device that will get in her way.

Wall-mounted touchscreen

Carla touches the picture of the resident she's been caring for to report her activites. Simple numeric and checkbox entries are accomplished with oversize touch screen widgets. Mounted in resident rooms, it's always there when Carla needs it.

Biometric login

Carla doesn't need to remember a password or punch a time-clock; the system recognizes her fingerprint when it turns on the screen, and timestamps her data entry.

Barcode scanner

Carla or Rhonda can easily scan medical supplies and medications under the screen; they are automatically added to Gerta's bill and care plan.

Post-design results

SHS has used our documentation as a recruiting tool for developers, who were not only excited with the challenge, but were also happy to see such a detailed vision. SHS reorganized its development teams not around the database, business logic, and interface layers, but around each primary persona.

Our process brought clarity to their vision, and provided a detailed plan for implementing an integrated and coherent system. Scenarios were especially useful as a vehicle for communicating details of the design to developers, but, perhaps more importantly, as a way to communicate the spirit of the design and its value to the people who will use it. Rhonda's trend tool, for example, was so compelling a nurse we showed it to burst into tears, saying she wished she'd had this tool for the past 20 years.

The development timeline in context

SHS Orcas has taken 3 years to build, partly because of a choice by SHS to switch platforms midway through development. During this switch, our design documents helped ensure that product development was not derailed in the shuffle.

In contrast, SHS's principal competitor has spent the last 5 years developing a non-integrated product that handles *only* clinical issues.

Predicted success

Shortly after product introduction, SHS had sold the product to more than 400 facilities. Initial beta sites have declined training due to the highly intuitive nature of the interface. SHS's CEO, Leo Watterson, had opposed hiring an outside design firm while CFO. He now states that, "I believe that the money we spent on Cooper was the best we've ever spent."

Acknowledgements

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