

A Study of Hospital Inpatient Unit Design Factors Impacting Direct Patient Care Time, Documentation Time, and Patient Safety

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Introduction

Architects have seemingly tried everything to create the ideal inpatient care unit, but what design factors work best to increase nurses' direct patient care time, safety and quality? This is a national-scope study of 14 different inpatient units with various typologies (racetracks, T's, L's, triangles, etc), and numerous approaches to decentralization (pods, satellites, etc). The study uses specific judgments of 135 nurses who work in these 14 units, correlated with unit typology classifications created from analysis of floor plans of the units where these nurses work. The findings show certain locations and qualities for support resource locations (medications, supplies, linens, equipment), that are most important to nurses, and which types and locations of collaboration locations and electronic medical record workstations are more effective. Results of the study are usable by architects in designing or remodeling effective inpatient care units. The research, supported by an Academy of Architecture for Health Foundation research grant, was performed by a team of architects, supported by nursing and research advisors.

Background

Objectives in hospital acute care inpatient units, beyond treating illness or recovering from surgery or trauma, include quality of care, patient safety, staff safety, staff satisfaction, patient experience/satisfaction, family participation/education, reduction of distraction and interruptions for effective staff concentration, multidisciplinary collaboration, 'lean' operations and others. When designers, working with hospital end-user committees, are planning a new hospital inpatient care unit, they are faced with difficult choices in configuring staff work and support resource areas within an overall unit plan to accommodate all of these objectives.

Variables include variation in unit size (number of beds) and shapes (racetrack, triangles, 'L's'), specialization (medical, surgical, ortho, neuro, oncology, progressive care, etc.), varied nursing practice models, different types of electronic medical record systems as well as degrees of adoption, varying ancillary support methods (nurse servers vs. supply alcoves vs. central supply rooms, central medication rooms vs. satellite med stations, equipment inventory and degree of decentralization, etc.). Within the context of overall organizational strategies and flow

concepts, architects must make choices as to the degree of decentralization for locations of spaces for documentation, collaboration and support resources.

In inpatient care units (IPU) today, due primarily to a higher level of patient acuity, nurses are challenged to have adequate time for direct patient care. Hendrich, et. al. (2007), in their time-motion study of how nurses spend their time, found that nurses only spend 19% of it on direct patient care.

Electronic medical records (EMR) systems now allow nurses to decentralize their documentation activities in the IPU, with the promise of more time at the bedside. Gerascio-Howard & Malloch (2007), in their comparison of centralized and decentralized units, concluded that in the decentralized unit, RNs were able to spend more time in patient rooms (30% for decentralized vs. 26% for centralized). However, if decentralization of documentation isn't accompanied by the effective location and quality of support resource centers (medications, supplies, linens, equipment and collaboration spaces), nurses must take extra time to access these spaces, reducing available time for direct patient care and documentation. There is a need to understand the nurses' perspective of how different locations and types of spaces for documentation, collaboration, and support resources contribute to their patient care goals.

Documentation

The most frequent and continuous activity for nurses is documentation of the medical record and care coordination/planning (56% in the study by Hendrich, et al)EMR's emergence shows that it allows freedom of decentralization and ubiquitous access not possible in the past. Mobility of the medical record has created new opportunities for decentralizing of staff charting and collaboration space. Many solutions have emerged to accommodate this activity—corridor alcoves, open spaces near corridors, satellite groupings, and in the patient room. Cai and Zimring (2011) posit that there are 5 typologies for nurse stations: central, sub-nurse stations (satellite stations), pod clusters, and mobile.

Collaboration

In some cases, decentralization has led to reduced communication and mentoring between caregivers. Becker (2007) suggests the importance of collaboration, mentoring, and consultation in creating a "community of practice" for quality of care on the unit. Cai and Zimring (2011) cite numerous studies showing reduced communication between nurses in units with decentralized nurse stations. Zborowsky, et.al. (2010) compared centralized and decentralized units and found communication with medical staff and other social interactions were reduced in the decentralized units. Gerascio-Howard & Malloch(2007), in their comparative study of centralized vs. decentralized units, report that "RNs regretted a lack of contact with care partners and information lost from fewer networking opportunities, but also noted that a nurse locator system created opportunities for team communication. Decentralization in and of itself doesn't necessarily imply a lack of communication—specific design solutions definitely plays a part. Trzpuć & Martin (2010) studied 3 units, which would all be considered types of decentralization in this study. Using space syntax methods, they concluded communication is enhanced by open visibility, allowing opportunistic meetings, and accessibility (path length).

Support resources

The need for decentralization of medications, supplies, equipment spaces to reduce nurse walking distance is often cited as a way to deliver more safe, efficient and effective patient care. Hendrich, et.al. (2009) found that nurses spend 17% of their time administering medications. Cardon (2011) points out that medication errors are a significant factor related to distance between medication rooms and patient beds. Her study shows that one-third of the medication errors occur during the administration of the medication, from interruptions along the way, and due to 'batch processing' of multiple orders which can lead to dosing the wrong patient.

Hypothesis

The hypothesis of this study is that the location of the EMR documentation spaces, collaboration spaces, and support resources (medications, supplies, linens and equipment) locations have an impact upon nurses' direct patient care time, documentation time, safety, and overall effectiveness (effectiveness criteria). More specifically, we hypothesized that nurses would judge more favorably those unit designs with the shortest average walking distance between these resources and the patient. The study was designed to compare multiple units by correlating a detailed survey of their nurses' judgments of the impact of various design features with their unit floor plan in order to show that nurses would judge certain units' features are more successful than others in supporting the effectiveness criteria.

Research questions

This research investigates three interrelated design problems for inpatient unit support resources.

1. **Support resources spaces:** Is there a correlation between the location of certain support resources (medications, supplies, linens, equipment), and nurses' perception of their impact upon direct patient care time, documentation time, and patient safety?
2. **Electronic medical record spaces:** Is there a correlation between the different location types of documentation space (using electronic medical record system), and nurses' perception of their impact on direct patient care time, documentation time, patient safety, and minimizing noise and distractions?
3. **Collaboration spaces:** For each of 4 types of collaboration types (informal, formal, report, and physician), are certain classes of physical spaces (central, satellite, corridor alcove, patient room) perceived by nurses to be more effective than others?

Methodology

A research team within Clark/Kjos Architects performed the study, with help and review from an advisory team of practicing nurses, nurse researcher, survey consultant, process improvement consultant, and an academic research consultant.

1. **Literature review:** A limited literature search was done, seeking only those research studies related to IPU nurses' direct patient care or documentation time and safety, as affected by configuration of overall unit design, medical record documentation, or support resources. The research team sought to learn of precedents directly relevant to this study to gain any advantage of learning from previous research.
2. **Advertisement for participation:** Invitation for potential participating nursing units was done by inviting fellow architects via the AIA Academy of Architecture for Health's Academy Update email blast. The strategy was to appeal to healthcare architects to encourage their clients to participate in the survey, since this would provide an opportunity for the architects to both participate in research useful to their practice, as well as to remain in contact with their clients for whom they had designed IPU facilities.
3. **Selection of final participants:** Fifty architects initially showed interest in participating. Fourteen architect-hospital teams completed all required submittals, and these fourteen IPU's were included in the study. Only IPU's using EMR to at least 'Stage 3' using the HIMSS Analytics-2005 Clinical Transformation Staging Model scale were included. This stage of EMR adoption means that all nurse medical record documentation is completed on their hospital's EMR system.
4. **Study sites' floor plans:** Architects of each IPU provided digital floor plans, with standardized Autocad layering protocols. The research team edited floor plans to create a common graphic format for consistency of legibility of the studied features.
5. **Nurse survey development:** A survey was developed for the nurses working on the units to provide perceptions of how well each support facility's and EMR locations supported direct patient care time, documentation time patient safety, and minimizing of noise/ distractions.
6. **Pilot survey to test process:** 3 units were surveyed to test the survey question efficacy. We asked nurses taking the survey to comment on the clarity of the questions. We then attempted to correlate survey responses with floor plans. The advisory team was consulted in identifying problems of reliability and clarity, and these were corrected for the final survey.
7. **Nurse survey:** The research team required that each participating hospital unit have at least 4 nurses from each shift complete the survey. 135 nurses completed anonymous surveys (See appendix for list of participants). Survey Monkey was used for the on-line survey. The survey included 25 questions. Some questions were informational, to classify the units. Most questions sought judgments of how certain locations of support resources supported patient care goals. Judgment questions allowed the nurses to respond on a 1-5 scale, as follows:
 - 1—Not at all effective
 - 2—Not very effective
 - 3—Neutral
 - 4—Somewhat effective
 - 5—Very effective

The survey included:

1. Questions regarding medications, supplies, linen, equipment resource locations
 - a. Confirmation of category of location types for each (centralized, satellite, inside patient room, etc), so that the research team could confirm that the floor plans were being interpreted accurately.
 - b. Judgments for each of the 4 resource locations as to their impact upon the following 3 patient care goals:
 - i. Time for direct patient care
 - ii. Time for documentation

- iii. Patient safety
 - 2. Questions regarding electronic medical records spaces questions
 - a. Type of computer workstation being used (fixed, or mobile cart, or handheld)
 - b. Locations where documentation is being done (patient room, corridor alcove serving 1-2 patients, satellite serving several patients, or single central location)
 - c. Judgments for each of the above locations as to their impact on the following 4 patient care goals:
 - i. Time for direct patient care
 - ii. Time for documentation
 - iii. Patient safety
 - iv. Minimizing noise and distraction
 - 3. Questions regarding collaboration spaces
 - a. Indicating where collaboration most often occurs for the following types of collaboration:
 - i. Informal
 - ii. Formal care planning meetings
 - iii. Shift change reporting
 - iv. Physician consulting
 - b. Judgments for each of the above types of collaboration as to their effectiveness for that type of collaboration.
- 8. **Verification** of all support resources, collaboration spaces and EMR use points on floor plans and clarify operational questions that emerged. The verification process was very detailed, and in some cases required on-site verification by the research team. In some cases, room functions had changed since the floor plans were created. Such changes were identified in all units and floor plan drawings were corrected.
- 9. **Analysis** of nurse survey responses from each participating hospital unit: For support resource spaces, nurses' responses were averaged within a given unit to create a single response for that unit. For documentation space judgments, both averages and percent of positive judgments were used for scoring the survey responses.
- 10. **Correlating unit design information with nurse survey responses:**
 - a. Support resource facilities:
 - i. Calculated average distances from each support location (EMR, linen, medications, supplies, equipment) to patient bed. Measurement was done along center of corridor from centerline of door to support resource space to the center of door to patient room and on to bedside. This allowed for taking into account the differences between rooms with 'inboard' and 'outboard' bathrooms.
 - ii. Correlated nurse responses to distance metrics for each support location
 - iii. Discrepancies required re-questioning nursing staff
 - iv. Analyzed potential correlations
 - b. EMR workspace:
 - i. Correlated nurse responses to types of locations
 - ii. Discrepancies required re-questioning nursing staff
 - iii. Analyzed potential correlations
 - c. Collaboration space:
 - i. Correlated nurse responses to types of locations
 - ii. Discrepancies required re-questioning nursing staff
 - iii. Analyzed potential correlations

11. **Advisors review and consultation.** The research team met with advisory team to review analysis and preliminary conclusions. We amended findings to include advisory team advice.

Analysis

This research investigates three interrelated design problems for inpatient unit support resources—Support resources space, electronic medical records space, and collaboration space. They are described separately below.

Support resources spaces

Research question: Is there a correlation between the location of certain support resources (medications, supplies, linens, equipment), and nurses' perception of their impact upon direct patient care time, documentation time, and patient safety?

Below, survey results are summarized for 4 different resources.

Medications

Nurses' judgments for each unit were averaged to create one score for that facility. These values were correlated with average distance between the patient room and the closest medication station(s). The distances shown are refined to include the nurses' estimate of a percentage of time when two locations are accessed, for units where not all medications or related supplies for administering medications are in one location. This is to accurately test the hypothesis that the nurses would feel that shorter walking distances would support the 3 patient care goals.

Refer to Tables M-1, which attempts to correlate distance to nurse judgment of the resource location's support of the 3 patient care goals. Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments. ***The data shows that there is a partial correlation of travel distance to the nurses' judgments of support for the patient care goals. Approximately 1/3 of the units are 'outliers' and do not correlate well. Therefore the research team concluded that other factors figure prominently in the nurses' judgment.***

Comments from the nurses included the point that frequently there is a wait at the medication dispensers, offsetting the proximity advantage some of the time. ***Refer to Table M-2, which attempts to correlate number of patients per med room to nurse judgment. Here, there is no consistent correlation.***

	Norton Brownsboro	Harrison 2S (Med/Surg)	Harrison 2W (Oncology)	Good Sam Puyallup 6	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	Good Sam Puyallup 4	Prov Portland 8N (Ortho)	Emory Johns Creek Hosp.	St. Charles Redmond	Samaritan Corvallis	Samaritan Lebanon	Prov Portland 8S (Neuro)	Samaritan Albany
	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 11-20	Centralized serving 21+	Decentralized serving 11-20	Corridor cabinet	Decentralized serving 5-10	In pat room (nurse server)
Ave distance to 2nd locn		91	93		125.8	125.8				36.9		55		64
Ave distance to closest	77.5	25.7	23.5	69.9	32	36	44.2	41	38.1	37	35.2	17	28.2	4
Ave dist to combin'd locs	78	71	70	70	55	45	44	41	38	37	35	34	28	10
Time for care	3	2.4	3.3	4	3.6	3	3.3	3.9	3.9	3.8	2.9	4.3	4.1	3.9
Time for documentat'n	3.5	2.8	3.1	3.9	3.9	3.1	3.2	4	3.9	3.8	2.8	4	4.1	3.6
Patient Safety	3.9	3.5	3.3	3.9	3.9	3.1	2.8	4.1	4.1	4.2	2.9	3.7	4.4	4.4

Table M-1 Medications locations by distance

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

	Norton Brownsboro	Good Sam Puyallup 6	St. Charles Redmond	Harrison 2S (Med/Surg)	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	Good Sam Puyallup 4	Emory Johns Creek Hosp.	Good Samaritan Corvallis	Harrison 2W (Oncology)	Prov Portland 8N (Ortho)	Prov Portland 8S (Neuro)	Samaritan Lebanon	Samaritan Albany
	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 5-10	Corridor cabinet	In pat room (nurse server)
beds /med rm	24	20	18	18	13	12.5	1	12	12	12	8.7	7.3	5.3	1.0
Time for care	3	4	3.8	2.4	3.6	3	3.3	3.9	2.9	3.3	3.9	4.1	4.3	3.9
Time for documentatio n	3.5	3.9	3.8	2.8	3.9	3.1	3.2	3.9	2.8	3.1	4	4.1	4	3.6
Patient Safety	3.9	3.9	4.2	3.5	3.9	3.1	2.8	4.1	2.9	3.3	4.1	4.4	3.7	4.4

Table M-2 Medications locations by number of patients per med room

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

There is anecdotal evidence that availability of work space in medication rooms can be a factor in patient safety. The research team correlated nurse safety judgments with two different factors:

1. total amount of medication room area per unit expressed as square feet per bed
2. average medication room or space in square feet

Refer to Table M-3 below. **In correlating square-foot area per bed, the relationship is quite consistent.** Units with the largest total size of med room space (7.8 SF per bed and above) received very high judgments (3.9 and higher) (highlighted in the table). Units with med rooms below that size all received scores of 3.5 or lower, with only one facility not fitting this pattern-Norton Brownsboro).

Unit	Tot size of all med rooms as sf/bed	Ave. safety score
Providence 8S	14.1	4.4
Providence 8N	12.6	4.1
Good Samaritan Puyallup 6	10.4	3.9
St Charles Bend 3	8.4	3.9
Emory Johns Creek	8.0	4.1
St Charles Redmond	7.8	4.2
St Charles Bend 4	7.1	3.1
Good Samaritan Corvallis	6.0	2.9
Good Samaritan Puyallup 4	5.9	2.8
Norton Brownsboro	5.8	3.9
Harrison West	3.3	3.3
Harrison South	2.1	3.5

Table M-3

Refer to Table M-4 below. **In correlating average square-foot area per med room, the relationship is again quite consistent.** Units with the largest average size med room (82 SF per med room and above) received very high judgments (3.9 and higher)(highlighted in the table). **Note that the same hospitals, except one, have both the highest total SF per bed and largest average med room size, so this study cannot determine which is the more important criteria.** Units with med rooms below that size all received scores of 3.5 or lower).

Unit	Ave. med room size	Ave. safety score
Good Samaritan Puyallup 6	219	3.9
St Charles Redmond	140	4.2
Norton Brownsboro	140	3.9
Providence 8N	109	4.1
Providence 8S	103	4.4
Emory Johns Creek	96	4.1
St Charles Bend 3	82	3.9
Good Samaritan Corvallis	80	2.9
Good Samaritan Puyallup 4	71	2.8
St Charles Bend 4	57	3.1
Harrison West	36	3.3
Harrison South	36	3.5

Table M-4

Variables noted in nurses' comments which were taken into account in analyzing the data:

- Supplies (i.e., IV tubing, syringes, etc.) used when administering medications are sometimes in a separate location from the medications, requiring additional steps to retrieve them. Not all medication centers have the same stock, due to capacity limits, causing nurses to travel to two locations for administering meds to a single patient. The Pharmacy staff sometimes does not restock in a timely manner, causing nurses to travel to two locations. These problems are usually due to undersized med rooms. By blending stated % of times a second location is accessed, this was taken into account in Table M-1.
- Since medications are given at standard times, there is often a backup at med dispensers, especially in medical inpatient units, where more medications are involved. Because of this frequent comment, we analyzed the data for # patients per med room, which didn't show strong correlation (Table M-2)

Medical Supplies

Nurses' judgments for each unit were averaged to create one score for that facility. Then these values were correlated with average distance between the patient room and the closest medical supplies station(s). The distances shown are refined to include the nurses' estimate of a percentage of time when two locations are accessed, for units where not all supplies are in one location. The hypothesis is that the nurses would feel that shorter walking distances would make more time available to meet all 3 patient care goals.

Refer to Tables S-1, which attempts to correlate the distance to the nurses' judgment of the resource location's support of the 3 patient care goals. Colors are used to help visually express the pattern of values, as with the medications data. ***The data shows that there is a partial correlation of travel distance to the nurses' judgments of support for the patient care goals. Approximately 1/4 of the units are 'outliers' and do not correspond. Therefore the research team concluded that other factors figure in the nurses' judgment.***

Refer to Table S-2, which attempts to correlate type of decentralization (regardless of distance) to the nurses' judgments. Here there is a more compelling correlation, with only one 'outlier' which is not very far from the pattern. Possible reasons for this

correlation include a perception that having supplies within a decentralized zone means closer, even though distance measurements do not bear this out. Also possibly there is a greater sense of control over the supply chain when it is more dedicated to a small neighborhood.

Variables noted in nurses' which were taken into account in analyzing the data:

- Supply centers often don't have comprehensive par stock in each center, causing nurses to frequently travel to more than one location. Materials management sometimes does not restock in a timely manner, or stock consistently, again causing nurses to travel to multiple locations. By blending stated % of times a second location is accessed, this was taken into account in Table S-1.

Other noteworthy nurses' comments:

- Some nurse-server or in-room cabinets do not have much stock due to their small size, causing them to have little value, and causing nurses to travel to another location for most supplies
- One participant noted that they had received a significant number of complaints from nursing about the inconsistency of supplies in each supply room. Therefore they recently performed a 'Lean' process improvement analysis for their supply rooms. The result was that they revamped their 'par' stock in all supply rooms in each unit to make them all exactly the same, and to stock the agreed most-needed items. They reported greatly increased nurse satisfaction.

	Norton Brownsboro	Good Sam Puyallup 4	Emory Johns Creek Hosp.	Samaritan Lebanon	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	Samaritan Albany	Harrison 2S (Med/Surg)	Harrison 2W (Oncology)	Good Samaritan Corvallis	Prov Portland 8S (Neuro)	Prov Portland 8N (Ortho)	Good Sam Puyallup 6	St. Charles Redmond
	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	In patient room (nurse server),	In patient room (nurse server),	In patient room (nurse server)	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 5-10	Central location serving 21+	Corridor cabinet serving 1-4
ave dist to other loc	na	113	na	91	40	40	35	na	na	na	36	32	1	13
Ave dist to closest loc	82	37	40	17	3.5	0	32.3	29	28.4	26	0	0	28.4	0
Ave dist to combined locs	82	75	40	39.2	38.2	38	33.6	29	28.4	26	14.4	12.8	11.96	6.5
Time for care	3	1.7	4	3.4	3.5	3	3.8	2.9	2.8	2.6	3.7	4.1	3.7	4
Time for documentat'n	3.1	2.2	4	3.4	3.5	3.3	3.6	2.8	2.9	2.6	3.7	3.9	3.6	3.8
Patient Safety	3.6	1.8	4.1	3.4	3.4	3.1	3.8	2.9	3	2.7	3.7	4.1	3.4	4

Figure S-1 supply locations by distance

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

	Good Sam Puyallup 4	Norton Brownsboro	Harrison 2S (Med/Surg)	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	Samaritan Lebanon	Harrison ZW (Oncology)	Good Samaritan Corvallis	Emory Johns Creek Hosp.	Prov Portland 8N (Ortho)	Prov Portland 8S (Neuro)	Good Sam Puyallup 6	St. Charles Redmond	Samaritan Albany
	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 5-10	Patient room	Corridor cabinet serving 1-4	In patient room (nurse server)
type central vs decent	4	4	4	4	4	3	3	3	3	2	2	1	1	1
Time for care	1.7	3	2.9	3.5	3	3.4	2.8	2.6	4	4.1	3.7	3.7	4	3.8
Time for documentation	2.2	3.1	2.8	3.5	3.3	3.4	2.9	2.6	4	3.9	3.7	3.6	3.8	3.6
Patient Safety	1.8	3.6	2.9	3.4	3.1	3.4	3	2.7	4.1	4.1	3.7	3.4	4	3.8

Table S-2 supply locations by type

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

Linen Supplies

Nurses' judgments for each unit were averaged to create one score for that facility. Then these values were correlated with average distance between the patient room and the closest linen supplies station. The hypothesis is that the nurses would feel that shorter walking distances would make more time available to meet the 3 patient care goals.

Refer to Tables L-1, which attempts to correlate distance to nurse judgment of the resource location's support of the 3 patient care goals. Colors are used to help visually express the pattern of values, as with the medications and supplies data. **The data shows that there is a significant correlation of travel distance to the nurses' judgments of support for the patient care goals. Only 3, or 1/5 of the units are 'outliers' and do not correspond. Therefore the research team concluded that distance is a primary factor in the nurses' judgment.**

Refer to Table L-2, which attempts to correlate type of decentralization (regardless of distance) to the nurses' judgments. Here there is also a significant correlation, with only 1/5 'outliers' which are not very far from the pattern. Therefore it is in line with the distance factor.

Nurses' comments related to linen supplies:

- Registered Nurses that completed the survey normally do not handle linens, however, their judgments are included here since they supervise the Certified Nurse Assistants who do handle linen.
- Some units report that linen supplies are inadequate, causing nurses to 'hoard' supplies in patient cabinets or other location.

	Centralized serving 21+	Decentralized serving 11-20	central ized serving 21+	Decentralized serving 11-20	Centralized serving 21+	Decentralized serving 11-20	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 5-10	Decentralized serving 11-20	Corridor cabinet serving 1-4	Corridor cabinet serving 1-4	In patient room (nurse server),
	Good Sam Puyallup 6	Samaritan Lebanon	Norton Brownsboro	Good Sam Puyallup 4	Samaritan Albany	Good Samaritan Corvallis	Harrison 2S (Med/Surg)	Harrison 2W (Oncology)	Prov Portland 8N (Ortho)	Prov Portland 8S (Neuro)	Emory Johns Creek Hosp.	St. Charles Redmond	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit
Average distance	81.7	69	67	50	39	36.7	30.9	28.7	20.2	18	15.2	5	3.5	3.5
Time for care	3.9	3.4	3.5	3.5	3.2	2.5	2.9	3.1	3.9	3.8	4	4.7	3.9	2.4
Time for document'n	3.1	3.3	3.6	3.2	3.1	2.5	3.1	3.3	3.6	3.5	4	4.2	3.5	2.9
Patient Safety	3.3	3.1	3.7	3.5	3.2	2.6	3.3	3.3	3.9	3.5	4	4.5	3.8	2.9

Figure L-1 Linen locations by distance

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Central location serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 5-10	Decentralized serving 5-10	Corridor cabinet serving 1-4	Corridor cabinet serving 1-4	In patient room (nurse server),
	Norton Brownsboro	Harrison 2S (Med/Surg)	Samaritan Albany	Good Sam Puyallup 6	Samaritan Lebanon	Good Samaritan Corvallis	Harrison 2W (Oncology)	Good Sam Puyallup 4	Emory Johns Creek Hosp.	Prov Portland 8N (Ortho)	Prov Portland 8S (Neuro)	St. Charles Redmond	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	
Type of decentralization	1	1	1	1	2	2	2	2	2	3	3	4	4	4	
Time for care	3.5	2.9	3.2	3.9	3.4	2.5	3.1	3.5	4	3.9	3.8	4.7	3.9	2.4	
Time for documentation	3.6	3.1	3.1	3.1	3.3	2.5	3.3	3.2	4	3.6	3.5	4.2	3.5	2.9	
Patient Safety	3.7	3.3	3.2	3.3	3.1	2.6	3.3	3.5	4	3.9	3.5	4.5	3.8	2.9	

Figure L-2 Linen locations by type

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

Equipment

Nurses' judgments for each unit were averaged to create one score for that facility. Then these values were correlated with average distance between the patient room and the closest equipment station. The hypothesis is that the nurses would feel that shorter walking distances would make more time available to meet the 3 patient care goals.

Refer to Tables E-1, which attempts to correlate distance to nurse judgment of the resource location's support of the 3 patient care goals. Colors are used to help visually express the pattern of values, as with the medications, supplies, and linen data. **The data shows that there is a poor correlation of travel distance to the nurses' judgments of support for the patient care goals. Therefore the research team concluded that distance to the nearest equipment location is not a primary factor in the nurses' judgment.**

Refer to Table E-2, which attempts to correlate type of decentralization (regardless of distance) to the nurses' judgments. Here there is also a poor correlation. Therefore, it is in line with the distance factor.

Nurses' comments related to equipment:

- Equipment rooms are usually too small, and equipment scattered in multiple locations, causing nurses to travel to multiple locations to find it. It is improbable that the travel distances as measured in this study are accurate, given this fact.
- When decentralized equipment closets are placed within a unit, the equipment isn't always returned to its rightful place, again causing nurses to 'hunt and gather' for equipment. **Central equipment rooms generally scored as well and often better than decentralized locations, indicating that reliability of locating equipment is more important than shorter walking distances. In fact, it is possible that a longer travel distance to a central location is less total travel distance than 'hunting and gathering' at multiple decentralized locations.**
- **It was noted that the scores are relatively low in general, indicating that equipment gathering is a significant issue at most units**

	Emory Johns Creek Hosp.	St. Charles Redmond	Samaritan Lebanon	St. Charles 3 Ortho Unit	Good Sam Puyallup 4	Prov Portland 8S (Neuro)	Harrison 2W (Oncology)	Norton Brownsboro	St. Charles 4 Medical Unit	Good Sam Puyallup 6	Good Samaritan Corvallis	Prov Portland 8N (Ortho)	Samaritan Albany	Harrison 2S (Med/Surg)
	Centralized serving 21+	Central serving 21+	Decentralized serving 11-20	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Central location serving 21+	Decentralized serving 11-20	Centralized serving 21+	Central location serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Centralized serving 21+	Central location serving 21+
Ave distance	105.6	86	75.2	70	64	62	54.7	54.4	50	41.6	40.1	28.3	28	23
Time for care	3.4	3.3	3.1	3.4	2.3	3.9	2.9	3.4	2.3	3.3	2.5	3.1	3.4	3
Time for documentation	3.4	3.3	3.3	3.4	2.3	3.6	3.3	3.3	2.4	3.3	2.7	3	3.5	3.1
Patient Safety	3.4	3.5	3.3	3.3	2.3	3.7	3	3.5	2.9	3.6	2.7	3.3	3.4	2.9

Figure E-1 Equipment locations by distance

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

	Harrison 2W (Oncology)	Harrison 2S (Med/Surg)	Samaritan Albany	Prov Portland 8S (Neuro)	St. Charles 3 Ortho Unit	St. Charles 4 Medical Unit	Good Sam Puyallup 6	Emory Johns Creek Hosp.	Good Sam Puyallup 4	St. Charles Redmond	Good Samaritan Corvallis	Prov Portland 8N (Ortho)	Norton Brownsboro	Samaritan Lebanon
	Centralized serving 21+	Central location	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Centralized serving 21+	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized serving 11-20	Decentralized location
Type of decentralization	1	1	1	1	1	1	1	1	1	1	2	2	2	2
Time for care	2.9	3	3.4	3.9	3.4	2.3	3.3	3.4	2.3	3.3	2	3.1	3.4	3.1
Time for documtation	3.3	3.1	3.5	3.6	3.4	2.4	3.3	3.4	2.3	3.3	2.3	3	3.3	3.3
Patient Safety	3	2.9	3.4	3.7	3.3	2.9	3.6	3.4	2.3	3.5	2.3	3.3	3.5	3.3

Figure E-2 Equipment locations by type

(Note: Colors are used to help visually express the pattern of values, from red for long distances to green for short distances, and the same scale for low to high judgments)

Documentation (Electronic medical record) space

Research question: Is there a correlation between the different location types of documentation space (using electronic medical record system), and nurses' perception of their impact on direct patient care time, documentation time, patient safety, and minimizing noise and distractions?

Below, survey results are summarized for judgments of 4 different patient care impacts based on type of location for the EMR.

Impact on time for direct patient care

Location	Average judgment	Positive judgments	% positive
In patient room	3.8 of 5	12 of 14	86%
Corridor alcove for 1-2 pts	3.6 of 5	5 of 6	83%
Satellite for several pts	3.5 of 5	8 of 9	89%
Central to entire unit	2.8 of 5	1 of 3	33%

All types of decentralized EMR locations were favored over centralized, and further, the closer to the patient, the better. This seems obvious since the patient can be observed more the closer the documentation activity occurs. No surprise here.

An interesting finding emerged from this data. In patient rooms with fixed EMR, the average judgment was 4.7 out of 5—very high—while rooms where mobile EMR is used, the average judgment was 3.6, considerably lower. We received comments that the WOWs are cumbersome to move around, and we have heard this often outside of the study, so this may be the reason.

Impact on time for documentation

Location	Average judgment	Positive judgments	% positive
In patient room	3.6 of 5	11 of 14	79%
Corridor alcove for 1-2 pts	4.0 of 5	6 of 6	100%
Satellite for several pts	3.9 of 5	9 of 9	100%
Central to entire unit	3.1 of 5	1 of 3	33%

All types of decentralized EMR locations are favored over centralized, and the corridor alcove was judged best, satellite a close second best, patient room third best, and central location a distant fourth. Possible reasons for this ranking include that it is preferable to be proximate to the patient, but slight separation from the patient and family increases concentration and efficiency when documenting.

Impact on patient safety

Location	Average judgment	Positive judgments	% positive
In patient room	4.1 of 5	13 of 14	93%
Corridor alcove for 1-2 pts	3.5 of 5	5 of 6	83%
Satellite for several pts	3.4 of 5	7 of 9	78%
Central to entire unit	2.9 of 5	1 of 3	33%

All types of decentralized EMR locations are favored over centralized, and the patient room location is significantly favored in for safety, with corridor alcoves and satellites moderately rated, and centralized locations a distant fourth. A possible reason is that spending more time in or near the patient room enhances patient observation, and therefore, safety.

Minimizing noise and distractions

Location	Average judgment	Positive judgments	% positive
In patient room	3.4 of 5	11 of 14	84%
Corridor alcove for 1-2 pts	3.4 of 5	5 of 6	83%
Satellite for several pts	3.4 of 5	6 of 9	67%
Central to entire unit	2.7 of 5	1 of 3	33%

All types of decentralized EMR locations are favored over centralized, and centralized locations a distant fourth. Possible reason is that fewer people are present at any of the decentralized locations, creating less noise and distraction. For years, nurses have complained about the difficulty concentrating at central nurse stations.

Correlation with unit configuration

The research team sought to find design configuration correspondence within the data, as follows:

For satellite EMR locations:

- **For satellites that are open to visualization of the corridor space, 5 of 6 were judged positively (above 3.0) for patient safety. The average score was 3.4. It is**

common for nurses to request corridor visualization in order to monitor patient activity in the corridor, family seeking assistance, staff seeking assistance, and to listen for patient distress signals. The correlation appears to corroborate this need. Predictably, these same units received low scores for minimizing noise and distraction (only 2 of 4 positive, and average of 3.1). Intuition would tell us that the openness would invite distractions, and the data corroborates this. This poses a difficult design challenge.

- **No significant difference in judgments related to number of patients served from that location**
- **No significant difference in judgments related to average distance to patients served from that location**
- **No significant difference in judgments in safety related to visibility of corridors from the satellite work station**

For corridor alcoves:

- **For corridor alcoves that are open to visualization of the corridor space, 5 of 6 were judged positively (above 3.0) for patient safety. The average score was 3.6. It is common for nurses to request corridor visualization in order to monitor patient activity in the corridor, family seeking assistance, staff seeking assistance, and to listen for patient distress signals. The correlation appears to corroborate this need. Interestingly, these same units received high scores for minimizing noise and distraction (5 of 6 positive, and average of 3.4). Intuition would tell us that the openness would invite distractions, but the data does not corroborate this.**
- **No correlation between size of worktop, or design of the alcove to judgment of the factors requested. Some alcoves have built-in desks, some are merely spaces for WOWs.**

For centralized EMR locations:

- Only 3 of the 14 units have a central location to chart. All these units were judged with low scores. This reflects a current trend to eliminate central work areas for staff. All 3 also have EMR in patient rooms. Predictably, one of the 3 units with central EMR also has placed some computers in corridor alcoves, and although not done in a systematic consistent way, this unit's nurses judged all categories of questions higher (ranging from .5 to 1.0 higher in the 4 categories).

Nurses' comments from survey

1. Some small corridor alcoves disliked--not enough space for EMR, paper work, physician work space.

Collaboration space

Research question: Are certain types of collaboration (informal, formal, report, and physician) spaces (central, satellite, corridor alcove, patient room) more effective than others?

Survey

Nurses were asked the following:

- For each of 4 types of collaboration (informal, formal, shift change reporting, and physician consultation), indicate where it most often occurs. Options included patient room, corridor alcove, satellite, or centralized.
- For each type of collaboration, indicate its effectiveness (scale of 1 to 5 from 'not at all effective' to 'very effective').

The responses are summarized below: indicates number of units using each location and nurses' judgments of effectiveness of that location (on scale of 1 to 5), averaged.

		Patient room	Corridor alcove	Satellite	Central	Corridor or satellite	Central or satellite	Corridor or central	Corridor or patient room	Central or patient rm	Total
Informal	Number		4	3	2	2	1	2			14
	Judgmt		3.7	4.1	3.5	3.8	3.5	3.9			
Formal	Number			2	12						14
	Judgmt			4.1	3.9						
Shift chg report	Number	4		1	1				8		14
	Judgmt	4.1		3.3					3.7		
Physician consult	Number	1	5	1	5		1			1	14
	Judgmt	3.9	3.8	3.7	3.7		3.5			3.7	

Notes on correlation to design configuration

Informal:

- **All units averaged moderately high scores. All were above 3.1 (positive), and 12 of 14 were 3.5 or above (between neutral and somewhat effective).**
- **There is no correlation of scoring to average distance from the stated location to patient. Average distance between bed and collaboration location ranged from 6 to 42 feet**
- **Judgments of the different locations where informal collaboration occurs were not consistently better for any one type over another. This contradicts findings in studies cited previously in this paper that show reduced communications in decentralized nurse stations. Possibly, nurses are adapting to decentralization, and possibly, it is the unique design elements influencing the responses.**

Formal care planning meetings:

- **All units averaged moderately high scores. All were 3.4 or higher (between neutral and somewhat effective).**
- **There is no correlation of scoring to average distance from the stated location to patient. Average distance between bed and formal collaboration location ranged from 13 to 180 feet.**
- **12 of the 14 units use a large room on the unit. For these units, there is only one place where this occurs, and as distance was not a factor in favoring shorter average walking distances, one can conclude that this room can be anywhere on the unit—preferably at the edge of the unit, to preserve valuable central ‘real estate’ for other spaces.**

Shift change reporting:

- **All units averaged moderately high scores. All were 3.2 or above (between neutral and somewhat effective).**
- **There is no correlation of scoring to average distance from the stated location to patient**
- **13 of 14 occur at a very decentralized location (8 at corridor alcove, 4 at patient room and 1 at satellite). This indicates a strong arrival at true decentralization of activity enabled by EMR.**
- **Judgments indicate no preference of one type of location over the other**

Physician consultation:

- **All units averaged moderately high scores. All were 3.2 or above (between neutral**

- and somewhat effective).*
- ***There is no correlation of scoring to average distance from the stated location to patient, which range from 0 to 180 feet.***
 - ***10 out of 14 occur at a decentralized location, regardless of type of physician work space in the unit***
 - ***Judgments indicate no preference of one type of location over the other***

Conclusions

Medications and related supplies for administering medications:

Reducing distance between medications space and the patient is valuable in supporting nurses' direct patient care time, documentation time and safety, but not the only strategy that matters. The number of patients per med room did not correlate to support for the patient care goals. The medications space must be adequately sized so that all medications and related supplies can be in a single location, to avoid walking to multiple locations, which is both time consuming and demoralizing. Pharmacy staff must maintain stock for decentralization to succeed.

Size of med room has a significant impact on nurses' perception of patient safety, as shown by nurses' judgments that larger rooms and more area per bed are better for this factor.

Medical supplies

Reducing walking distance between supplies storage and the patient is valuable in supporting nurses' direct patient care time, documentation time and safety, but not the only strategy that matters. Decentralization itself may be important, creating zones of control for nurses. The supplies space must be adequately sized so that all medications and related supplies can be in a single location, to avoid walking to multiple locations, both time-consuming and demoralizing. Maintaining par stock by Materials Management staff is critical to success.

'Nurse servers' accessed from both corridor and patient room, or small cabinets in the corridor immediately outside of the patient room door, while helpful, usually do not provide enough space for a significant supply to noticeably improve time nor safety. Most supplies must still be accessed from another location.

Linen supplies

Reducing walking distance between linen supplies and the patient is valuable in supporting nurses' efficiency in general, but this is limited, since CNA's do most linen handling.

Equipment

Reducing walking distance between equipment storage and the patient did not correlate to increasing nurses' direct patient care time, documentation time and safety. This is because when equipment is decentralized to multiple locations within a unit, the items are not returned to a given location, so there is no reliability as to where an item is to be found. This causes nurses to frequently hunt for the item in multiple locations. In this survey, single centralized rooms were judged similarly to decentralized, possibly indicating that shorter walking distance to the nearest

decentralized location is offset by the frequent need to go to another equipment room. This research suggests a further study to analyze which equipment should be at what level of decentralization-in room, satellite, or central. A 'lean' process would be an opportunity to develop a strategy, even though strategies would be different for different specializations of care (ortho, cardio, medical, oncology, etc)

Electronic Medical Record (EMR) space

1. Time for direct patient care: Not surprisingly, all types of decentralized EMR locations (patient room, corridor alcove serving 1-2 patients, and satellite serving several patients) positively impact direct patient care time when compared with centralized EMR. Satellites scored highest, patient room second, and corridor alcoves third. Fixed EMR workstations scored significantly higher than mobile workstations (WOWs, tablets), to increase direct patient care time. Comments from nurses noted several problems with mobile EMR (infection control, cumbersome carts, inability to carry other things when moving with EMR device)
2. Time for documentation: All types of decentralized EMR locations (patient room, corridor alcove serving 1-2 patients, and satellite serving several patients) positively impact documentation time when compared with centralized EMR. Corridor alcoves scored highest, satellites a very close second, and patient room third. Possible reasons for this ranking include that it is preferable to be proximate to the patient, but slight separation from the patient and family reduces distractions when documenting.
3. Patient safety: All types of decentralized EMR locations (patient room, corridor alcove serving 1-2 patients, and satellite serving several patients) positively impact patient safety over centralized EMR. Patient room location scored highest, corridor alcoves a very close second, and satellite third. A possible reason is that spending more time in or near the patient room enhances patient observation, and therefore, safety.
4. Minimizing noise and distractions: All types of decentralized EMR locations (patient room, corridor alcove serving 1-2 patients, and satellite serving several patients) minimize noise and distractions over centralized EMR. Patient room location scored highest, corridor alcoves a very close second, and satellite third.
5. Other factors:
 - a. Corridor alcoves and satellites with open visualization are preferred to ones without visualization to increase patient safety. However, noise and distraction is a problem with the satellites, but not for the corridor alcoves, possibly due to less crowding since there are more of these allowing the care team to 'spread out'.
 - b. Size at these decentralized locations is often inadequate. Further study is needed to determine optimum size.

Collaboration space

1. Informal collaboration: Almost all occurs at decentralized locations, and neither type of location (corridor alcove, or satellite) is preferable consistently, in terms of effectiveness. Average distance to patient does not matter in this study.

2. Formal care planning meetings: Distance does not affect effectiveness. Therefore, one can conclude that this room can be anywhere on the unit—preferably at the edge of the unit, to preserve valuable central ‘real estate’ for other uses.
3. Shift change reporting: Almost all occurs at decentralized locations, and neither type of location (patient room, corridor alcove, or satellite) is preferable consistently, in terms of effectiveness. Average distance to patient does not indicate preference of one type.
4. Physician consulting: In 2/3 of units, it occurs at decentralized locations, and 1/3 at central locations. Neither type of location (patient room, corridor alcove, satellite, or central location) is preferable consistently, in terms of effectiveness. Average distance to patient does not indicate preference of one type.

Limitations of this research and follow-up research recommended

The following limitations are noted:

1. The surveys included 4 nurses per shift. Some hospitals have 2 shifts (8 respondents) and others have 3 shifts (12 respondents).
2. The research team noticed that some hospital units with long walking distances scored relatively high and some units with short distances scored low. We contacted the nurse managers of these ‘outliers’, we were informed that the poorly-scoring unit has a staff with a poor attitude, and conversely, we were informed that the highly scoring unit has a staff with a great attitude. This reminds us that cultural issues can confound research data, and that no perfect correlation exists.
3. This is a qualitative study. The judgments of nurses in the survey are, by definition, their own perceptions. In addition, differences in how one nurse scores will be different from another. However, it is assumed here that the average of 8 to 12 nurses’ judgments is a reasonable composite.
4. Accuracy of floor plans: Although the research team thoroughly checked with both architects and nurse managers to confirm layouts and how each room is used, we could not visit all 14 units, so there is the potential of some minor misinterpretation.

The following follow-up research would be fruitful to build on this study:

1. Quantitative studies: Time-motion studies would be valuable to provide a more objective analysis of time spent travelling between support resources within a comparative study with multiple hospital units like this one. Waiting times at medication rooms could also be measured to see the magnitude of time wasted while waiting.
2. Direct observation studies: Regarding quality of documentation spaces, a direct observation study would provide a more objective analysis of factors comparing satellite stations, corridor alcoves, and patient room documentation. Number of interruptions and background noise and distractions could be quantified, as well as other collaboration activities, to provide a more detailed understanding of patterns of the different types of locations.

3. Correlation with patient outcome data: A valuable study would be to correlate the nurses' perceptions with patient outcome data related to:
 - a. Medication, supplies and equipment access safety judgments correlated with medication and other patient care errors. In particular, each hospital's HCAHPS scores could be correlated to some of the nurses' safety judgments.
 - b. Nurses' judgment of unit features improving direct patient care time correlated with patient perception of nurses' time spent in their room.
 - c. Nurses' judgment of unit features improving documentation time correlated with quality of documentation
4. Other statistical models could process the data collected here to provide additional correlations
5. Space syntax studies; This study's floor plans can be further spatially analyzed using the space syntax methods used by Hendrich, Chow, Banfa, Choudhary, Heo and Skieerczynski (2009) as well as Trzpuć and Martin (2010) and by Zadeh, Shepley and Waggener (2012) to analyze nurse communication patterns, and other critical special connections and operational flow.
6. In this study, nurses scored decentralized collaboration spaces' effectiveness similar to centralized ones, which contradicts some other studies cited previously here. It is possible that nursing practice has adapted to the emerging decentralization in nursing unit designs. Further study of this critical factor is needed.

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Hendrich, Chow, Banfa, Choudhary, Heo and Skieerczynski (2009) Unit-Related Factors That Affect Nursing Time With Patients: Spatial Analysis of the Time and Motion Study, *Health Environments Research and Design Journal* 2(2) 5-20

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Zadeh, Shepley, and Waggener (2012), Rethinking Efficiency in Acute Care Nursing Units: Analyzing Nursing Unit Layouts for Improved Spatial Flow, Health Environments Research Journal 6(1), 39-64

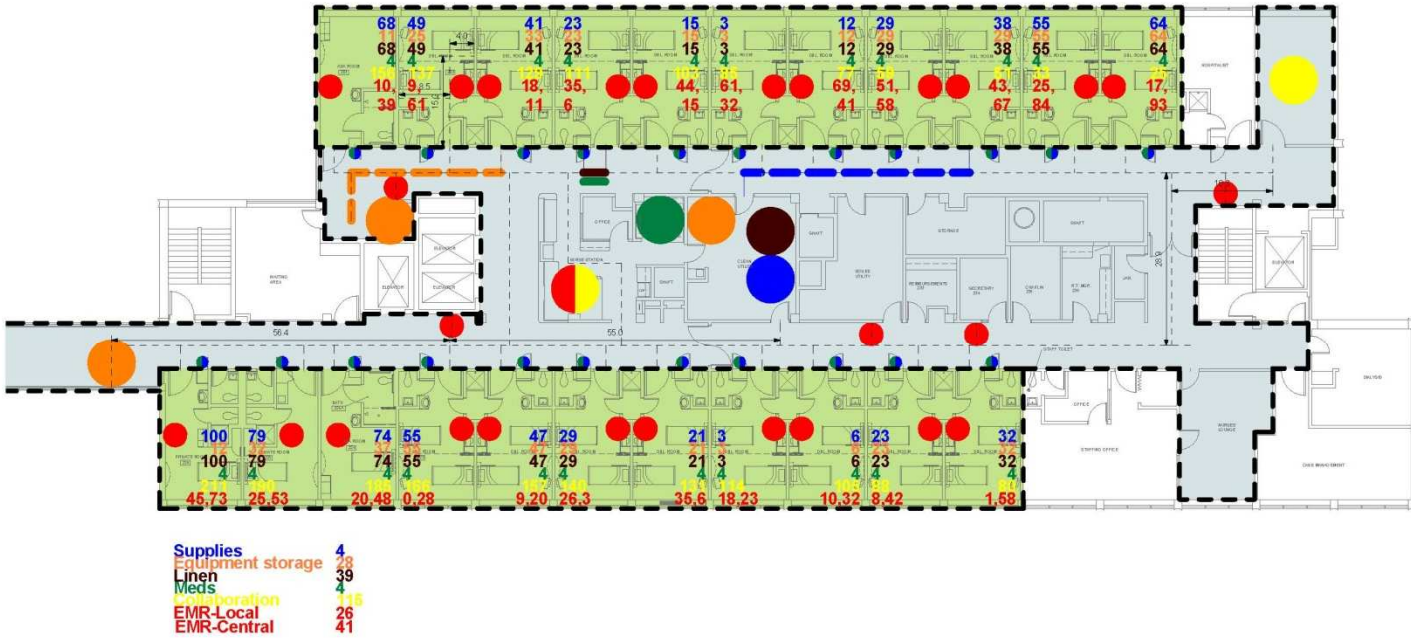
Zborosky, Bunker-Hellmich, Morelli, and O'Neill (2010), Centralized vs. Decentralized Nursing Stations: Effects on Nurses' Functional Use of Space and Work Environment, Healthcare Design 11(10) 51-78

Appendix

1. List of survey participants and number of nurses who completed the survey from each hospital

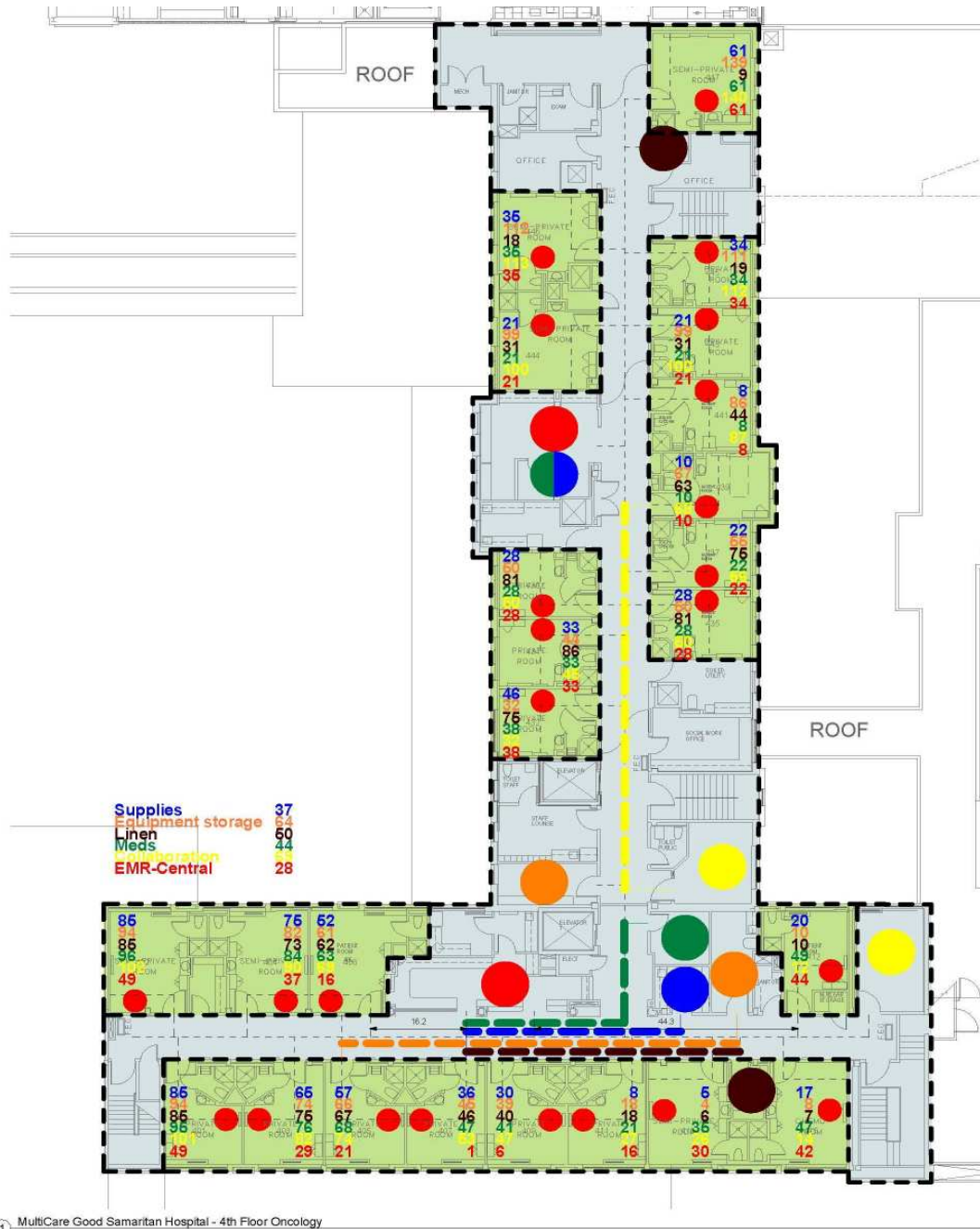
Unit	Tot number of nurses completing the survey
Providence 8S	7
Providence 8N	10
Good Samaritan Puyallup 6	7
St Charles Bend 3	8
St Charles Bend 4	7
St Charles Redmond	6
Emory Johns Creek	9
Good Samaritan Corvallis	8
Good Samaritan Puyallup 4	6
Norton Brownsboro	19
Samaritan Albany	19
Samaritan Lebanon	9
Harrison West	12
Harrison South	8
Total	135

2. Floor plans



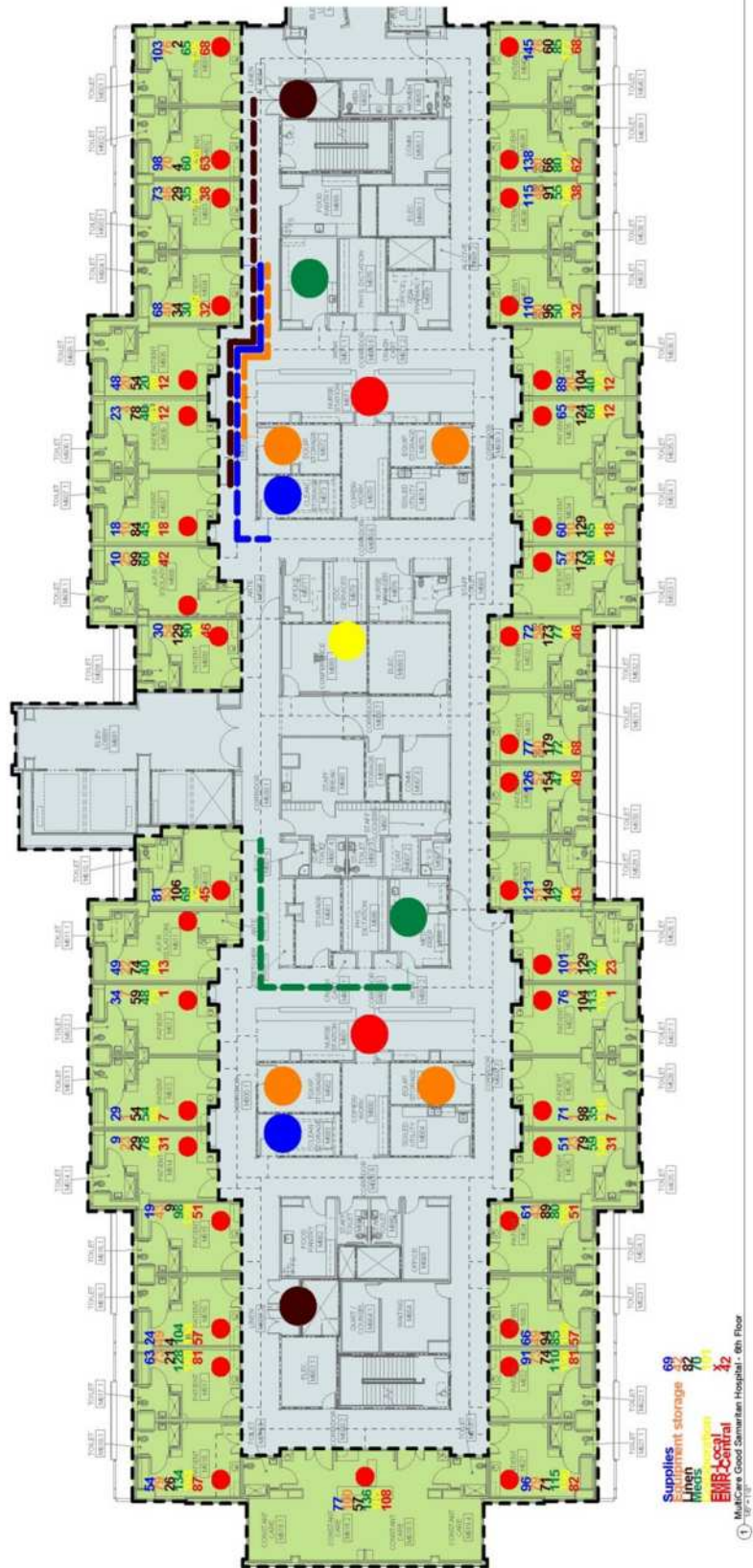
① Samaritan Albany General Hospital - Level 2
1/8" = 1'-0"

Samaritan Albany General Hospital Medical-Surgical Unit, Albany, OR

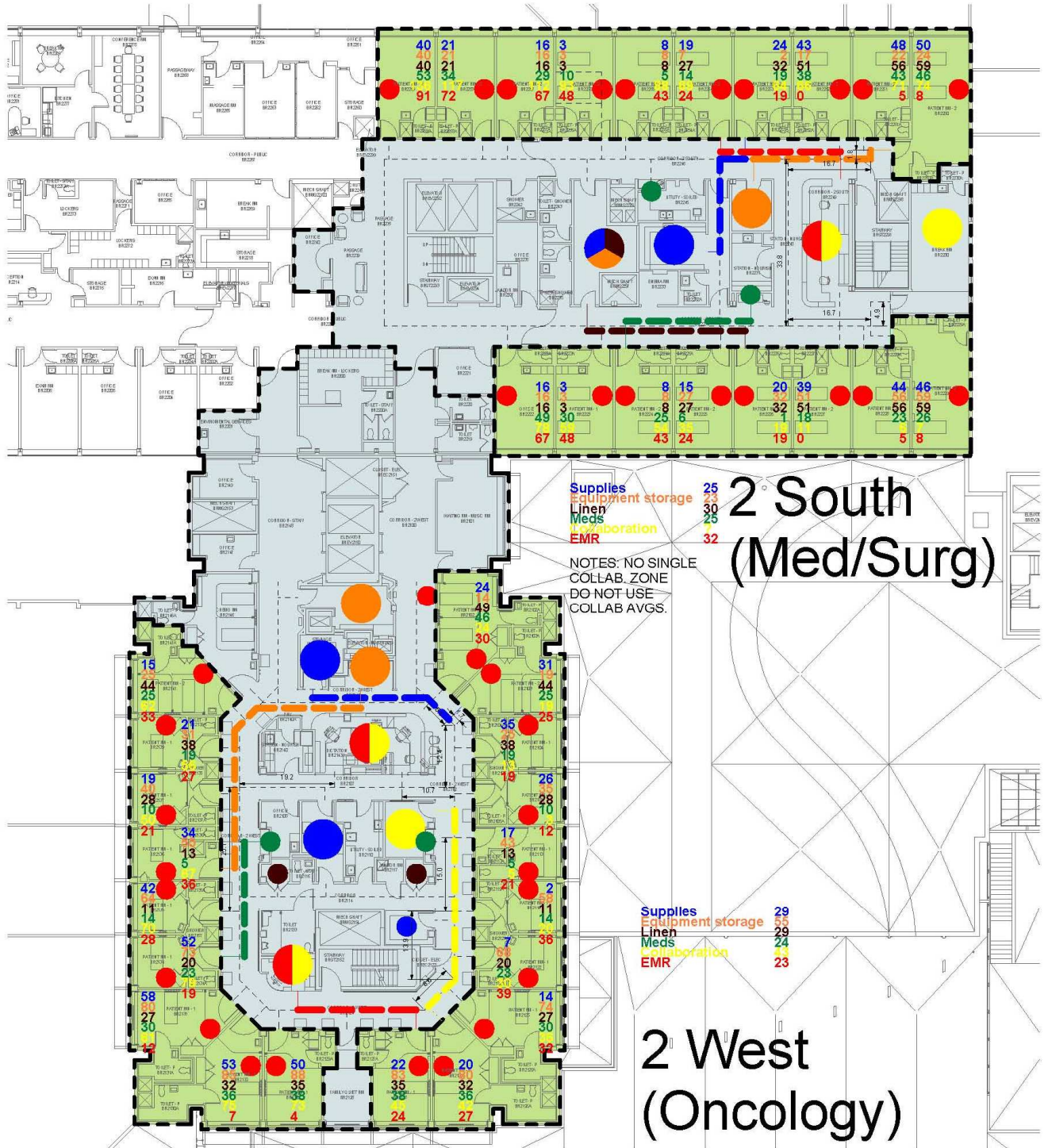


1 MultiCare Good Samaritan Hospital - 4th Floor Oncology
1/2" = 1'-0"

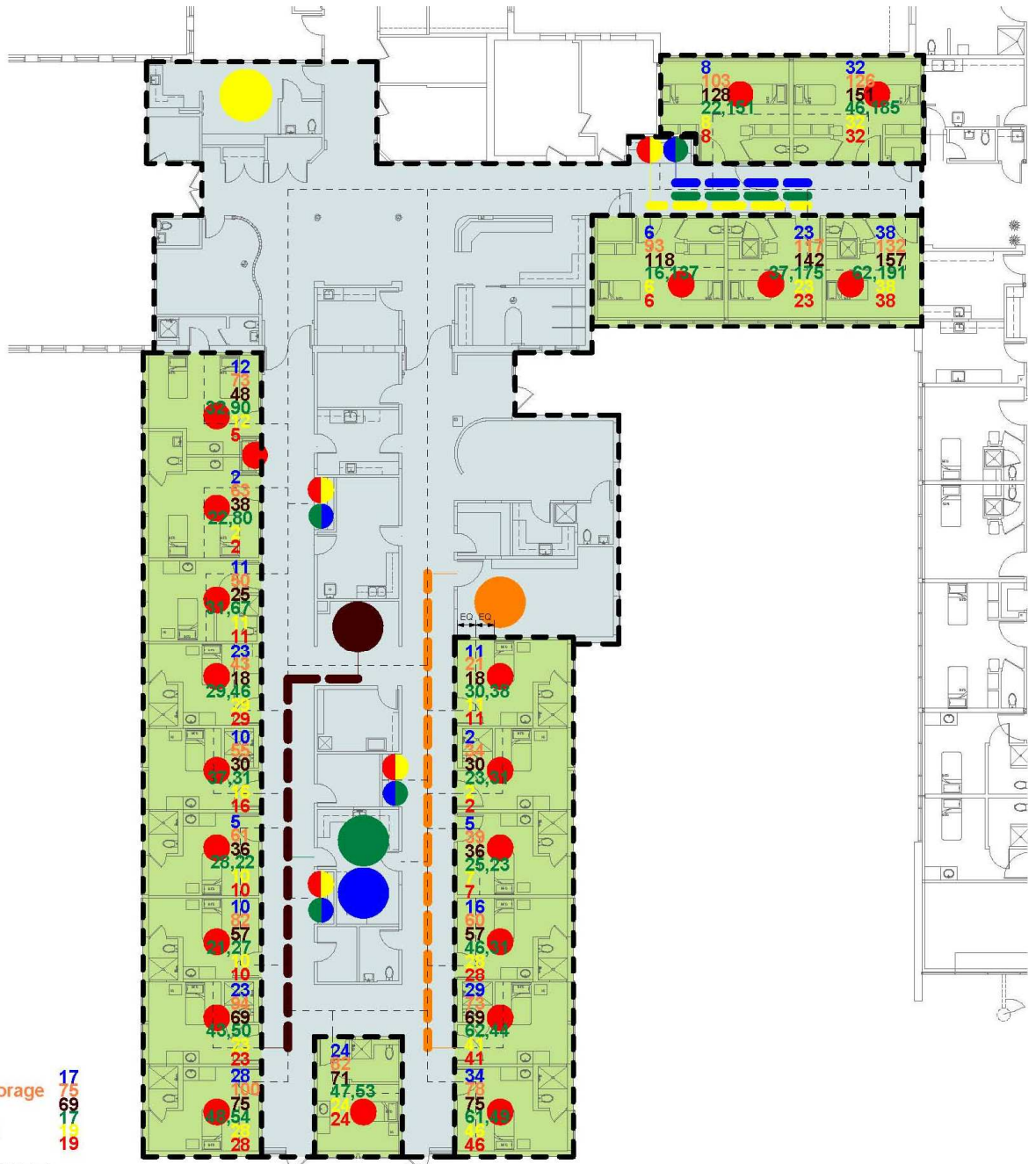
MultiCare Good Samaritan Hospital 4th Floor Medical Oncology Unit, Puyallup, WA



MultiCare Good Samaritan Hospital 6th Floor Medical Unit, Puyallup, WA



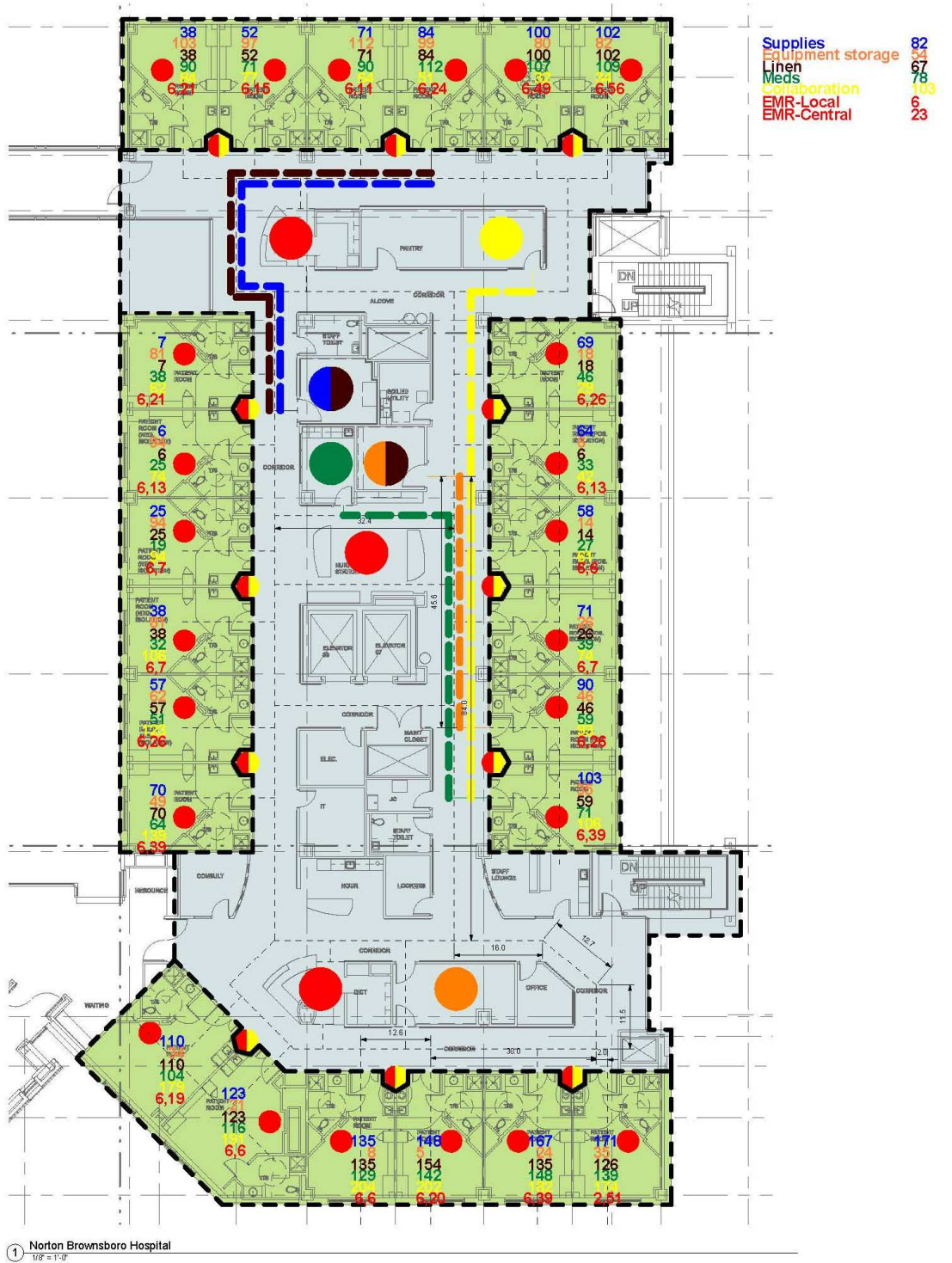
Harrison Medical Center 2-West Medical Oncology & 2-South Med-Surg Units, Bremerton, WA



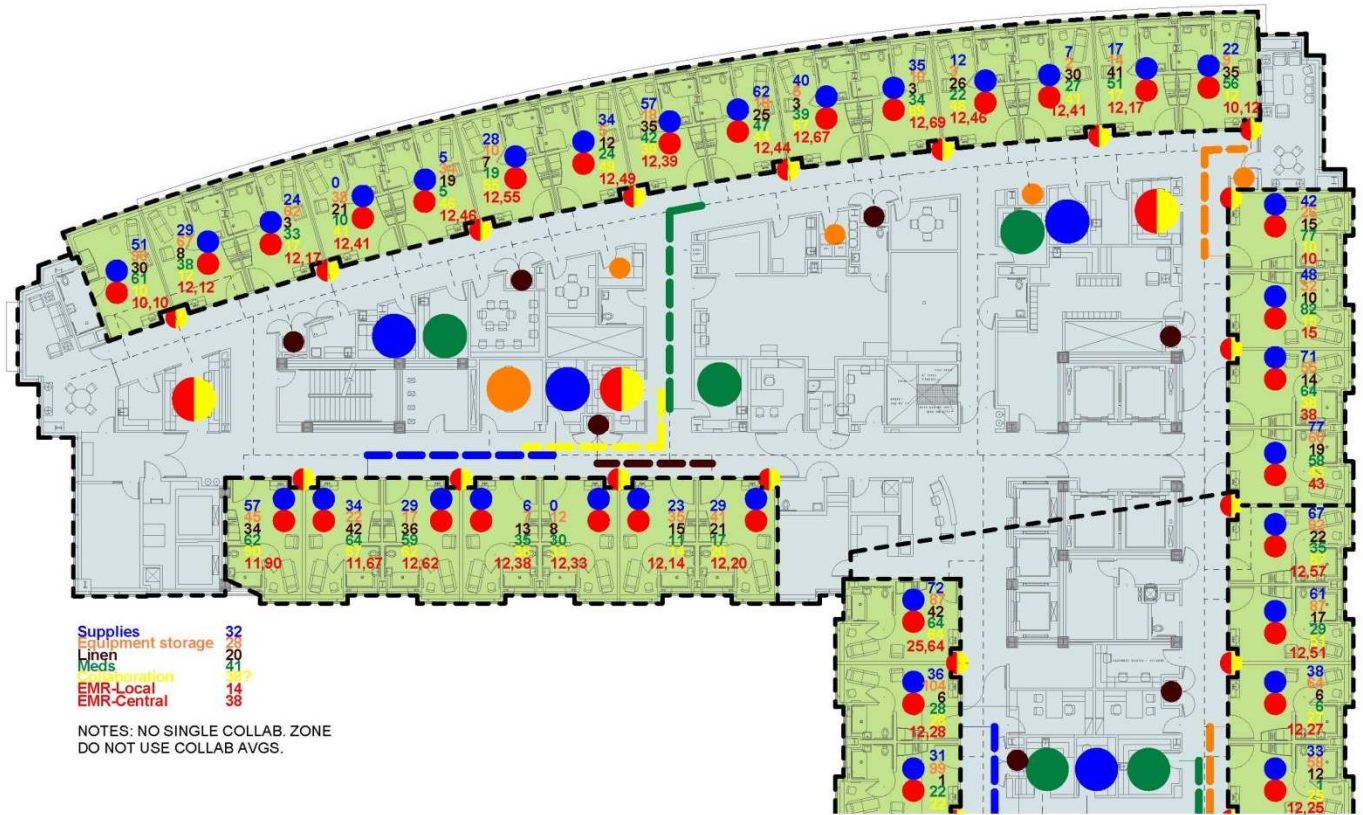
NOTES: NO SINGLE
COLLAB. ZONE
DO NOT USE
COLLAB AVGS.

① Samaritan Lebanon Community Hospital
1/8" = 1'-0"

Samaritan Lebanon Community Hospital Medical-Surgical Unit, Lebanon, OR

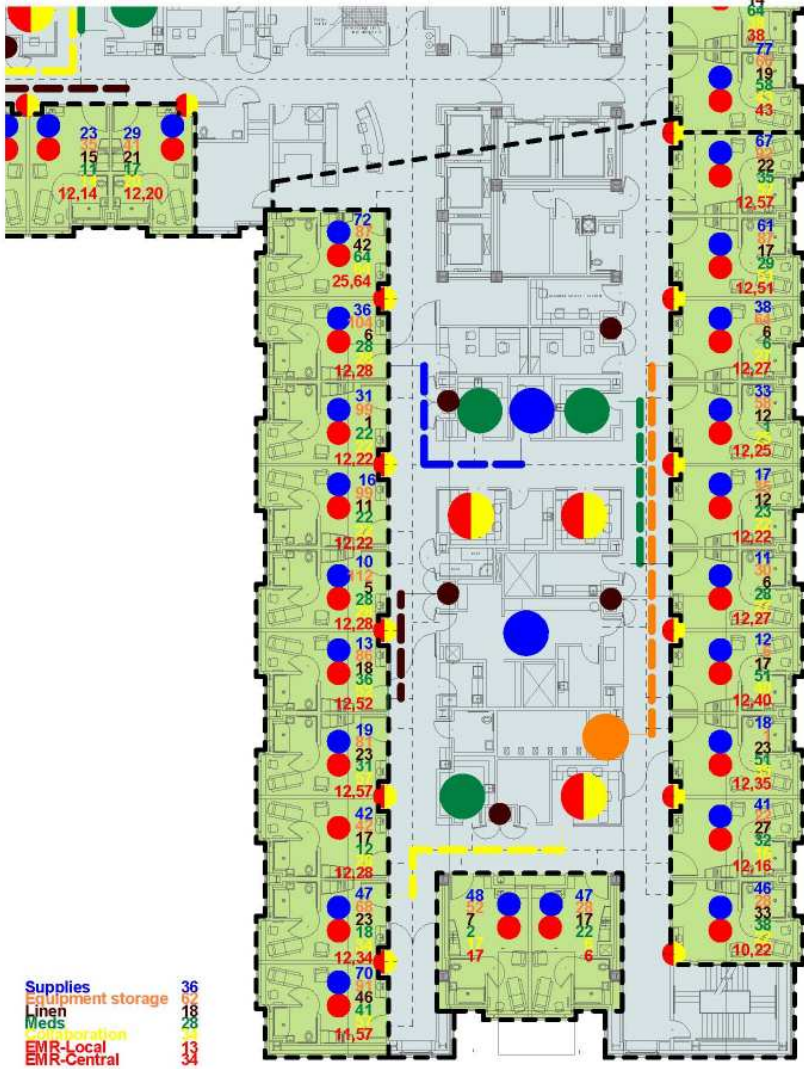


Norton Brownsboro Hospital, Medical-Surgical Unit, Louisville, KY



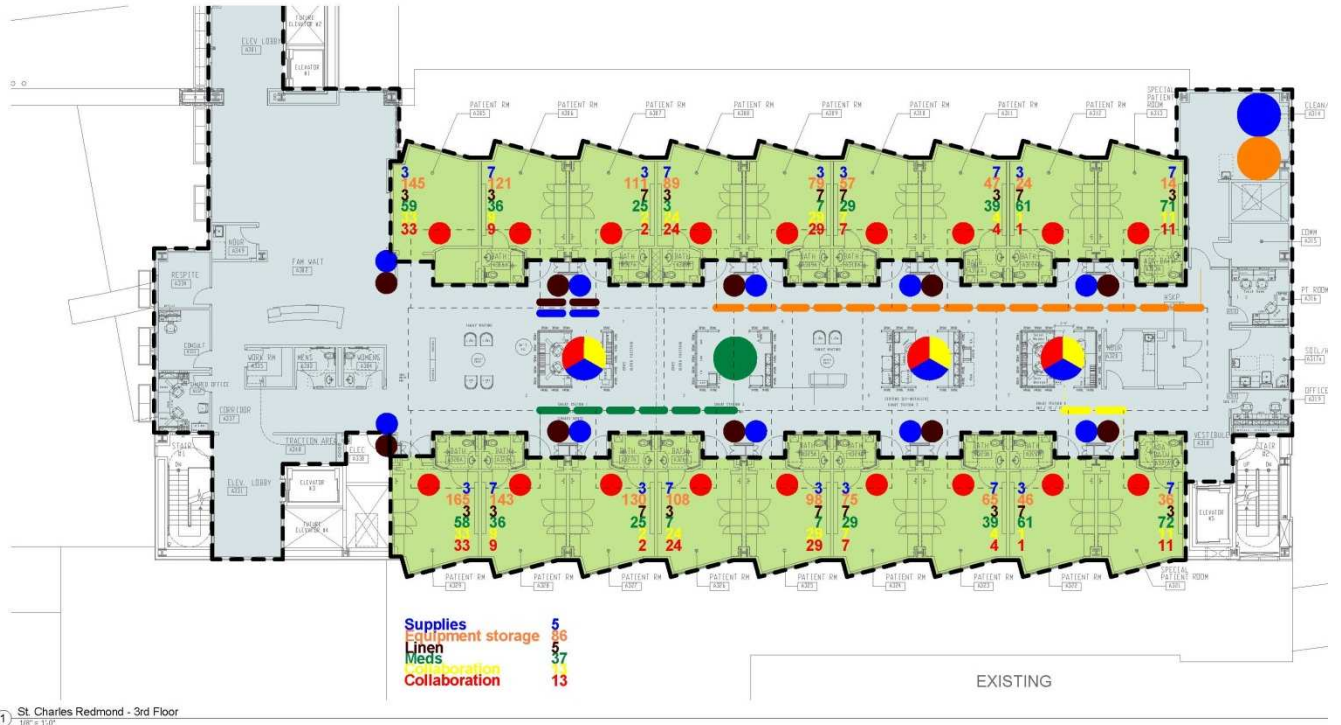
① Providence 8 N - Ortho
 10/1/14

Providence Medical Center 8-N Orthopedics, Portland OR



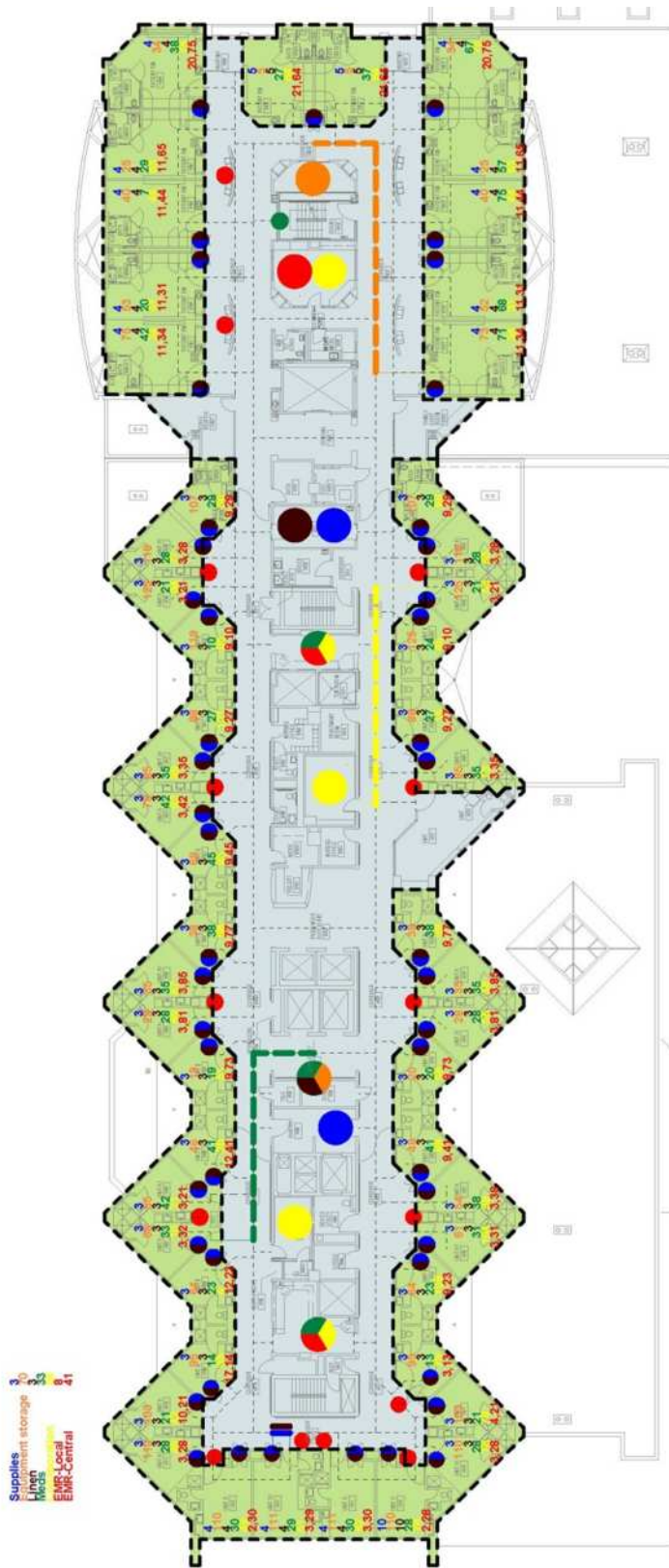
① Providence 8 South - Neuro
109-110

Providence Medical Center, 8-S Neuro Unit, Portland, OR



1 St. Charles Redmond - 3rd Floor
 1/8" = 1'-0"

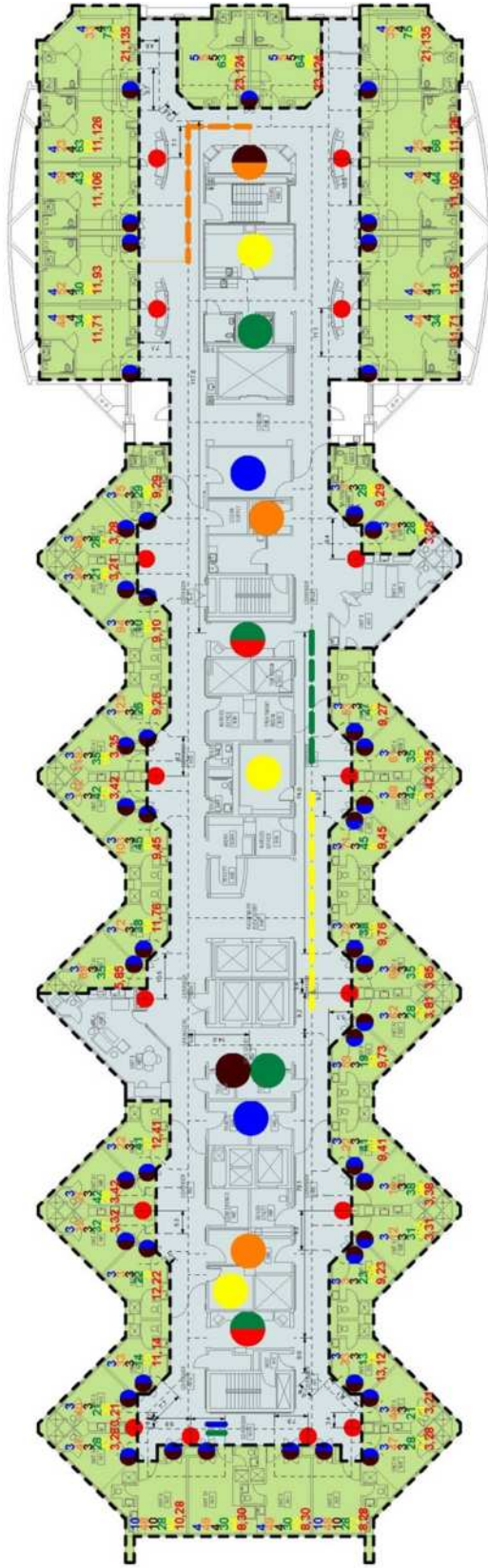
St. Charles Medical Center-Redmond, Medical-Surgical Unit, Redmond, OR



① St. Charles Medical Center 3rd Floor - Ortho

St. Charles Medical Center-Bend, 3rd Flr Orthopedic Unit, Bend, OR

Supplies
 Linen
 EMR
 EMR-Central



① St. Charles Medical Center-4th Floor - Med/Surg

St. Charles Medical Center-Bend, 3rd Flr Orthopedic Unit, Bend, OR

3. Survey instrument

A Survey of U.S. Hospital Inpatient Charting Station Design

Survey Background and Purpose

This survey is being conducted by the Hospital Workplace Research Group (HWRG) with grant funding from the Academy of Architecture for Health Foundation. Research findings will be presented at health design conferences and published widely. The research will be used by architects to design more effective inpatient units, and hospitals to evaluate their units for improvement opportunities.

Your facility's architect and hospital administration have volunteered to assist HWRG in this study. You are being asked to help by completing this survey. As a nurse, you understand better than anyone how the location of various services and supplies affects your ability to deliver quality care. This survey focuses on those locations and the effectiveness of various configurations of acute care units.

The survey is comprised of 25 questions and will take approximately 10 minutes to complete. All individual responses are anonymous and will be kept confidential.

1. Please indicate which hospital and unit you work for.

- Good Samaritan Regional Medical Center, Third Floor, Corvallis, OR
- Multicare Good Samaritan Hosp, Dally 6 FI Medical
- Harrison Medical Center 2-West Medical Oncology
- Harrison Medical Center 2-South Medical-Surgical
- Multicare Good Samaritan Hosp, Dally 5 FI ICU/PCU
- Multicare Good Samaritan Hosp, River 4 FI Med Onc
- Samaritan Albany General Hospital
- Providence Portland Medical Center 8-North Orthopedics
- Providence Portland Medical Center 8-South Neurology
- Samaritan Lebanon Community Hospital
- Norton Brownsboro Hospital
- Emory Johns Creek Hospital, Johns Creek, GA
- St. Charles Medical Center, Redmond, OR
- St. Charles Medical Center, Medical Unit, Bend, Or
- St. Charles Medical Center, Ortho Unit, Bend, OR

A Survey of U.S. Hospital Inpatient Charting Station Design

Participant Information

2. Which shift are you currently working?

- Day
- Evening/Swing
- Night

3. What is the average number of patients per RN on this unit on your shift?

- 1-3 patients
- 4-8 patients
- 9-12 patients
- 12 or more patients

A Survey of U.S. Hospital Inpatient Charting Station Design

Medications, Supplies, Linens and Equipment

11. On my unit, patient medications are kept: (If medications are stored in more than one location, please indicate the location closest to the patient.)

- In the patient room
- In a corridor cabinet serving 1-4 patients
- At a decentralized location serving 5-10 patients
- At a decentralized location serving 11-20 patients
- At a centralized location serving 21 or more patients

Other (please specify)

12. Please rate (on a scale of 1 to 5) how effective the location of patient medications is for your workflow in terms of:

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
Time for direct patient care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. On my unit, often-used medical supplies (dressings, syringes, IV supplies, etc.) are kept: (If often-used medical supplies are stored in more than one location, please indicate the location closest to the patient.)

- In the patient room
- In a corridor cabinet serving 1-4 patients
- At a decentralized location serving 5-10 patients
- At a decentralized location serving 11-20 patients
- At a centralized location serving 21 or more patients

14. Please rate (on a scale of 1 to 5) how effective the location of often-used medical supplies (dressings, syringes, IV supplies, etc.) is for your workflow in terms of:

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
Time for direct patient care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A Survey of U.S. Hospital Inpatient Charting Station Design

15. On my unit, frequently-used linens are kept: (If linens are stored in more than one location, please indicate the location closest to the patient.)

- In the patient room
- In a corridor cabinet serving 1-4 patients
- At a decentralized location serving 5-10 patients
- At a decentralized location serving 11-20 patients
- At a centralized location serving 21 or more patients

16. Please rate (on a scale of 1 to 5) how effective the location of linens is for your workflow in terms of:

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
Time for direct patient care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. On my unit, medical equipment is kept: (If medical equipment is stored in more than one location, please indicate the location closest to the patient.)

- At a decentralized location serving 10 or fewer patients
- At a decentralized location serving 11-20 patients
- At a centralized location serving 21 or more patients

18. Please rate (on a scale of 1 to 5) how effective the location of medical equipment is for your workflow in terms of:

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
Time for direct patient care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A Survey of U.S. Hospital Inpatient Charting Station Design

Patient Care Collaboration

19. Informal staff collaboration regarding patient care most often occurs:

- A corridor/alcove location serving 1-2 patients
- A satellite location serving several patients
- A centralized location serving the entire unit

Other (please specify)

20. Formal health care team meetings regarding patient care most often occurs:

- A corridor/alcove location serving 1-2 patients
- A satellite location serving several patients
- A centralized location serving the entire unit

Other (please specify)

21. Report at shift change most often occurs:

- One-on-one at a decentralized corridor/alcove location
- One-on-one at a satellite location
- In a central report room for the entire shift

Other (please specify)

22. Consultations with physicians most often occur:

- Patient rooms
- A corridor/alcove location serving 1-2 patients
- A satellite location serving several patients
- A centralized location serving the entire unit

A Survey of U.S. Hospital Inpatient Charting Station Design

23. Please rate (on a scale of 1 to 5) how effective the following patient care collaboration locations are for your workflow.

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
The location most often used for informal staff collaborations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The location most often used for formal health care team meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The location most often used for shift change reporting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The location most often used for physician consultations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A Survey of U.S. Hospital Inpatient Charting Station Design

Conclusion

24. Please rate (on a scale of 1 to 5) how effective the overall workflow in your unit is in terms of:

	1 - Not at all Effective	2 - Not very Effective	3 - Neutral	4 - Somewhat Effective	5 - Very Effective
Time for direct patient care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time for documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient care collaboration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. List up to three things you would change about the layout of your unit to make it more supportive of your patient care goals.

1.
2.
3.

Thank you for taking time to complete this survey. Your answers will inform designers of the most effective configurations for inpatient care units.