A Decade of Operations, A Moment of Clarity Revisited, where perception meets reality

MD Anderson Cancer Center Orlando
Orlando, Florida
research background

learning objectives

1. Compare and contrast centralized and decentralized clinical work configurations.

2. Learn about national benchmarking standards - National Nurses Time and Motion Study.

3. Learn about the function of simulation modeling in post occupancy evaluations.

4. Understand the correlation between design intent and operational reality.
table of contents

1. MD Anderson Planning
2. Previous Study
3. National Nurses Time and Motion Study
4. Simulation Modeling
“Nursing is the act of utilizing the environment of the patient to assist him in his recovery.”

- Florence Nightingale, 1860
1. md anderson orlando planning

1. Criteria
2. Programing + Planning
3. Design
project timeline

- 1995: Design process begins
- 1998: Construction is underway
- 2000: Substantial completion
- 2013: How is the environment performing?
- 2015:?
## Planning Criteria

<table>
<thead>
<tr>
<th>1996-97 AIA Guidelines</th>
<th>2010 FGHI Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-private rooms</td>
<td>All private rooms</td>
</tr>
<tr>
<td>Toilet room can serve 4 beds</td>
<td>Toilet room private</td>
</tr>
<tr>
<td>120 nsf per private room (<em>100 sf</em>)</td>
<td>150 nsf per room</td>
</tr>
<tr>
<td>3’ clear @ sides + foot of bed</td>
<td>4’ @ sides + 5’ @ foot of bed</td>
</tr>
<tr>
<td>Handwashing sink in toilet room</td>
<td>Sink @ room entrance</td>
</tr>
</tbody>
</table>

*Note: 100 sf* is a reference to the space provided per room in the 1996-97 AIA guidelines.
project review
existing
project review
early concept
project review
exterior
project review

patient unit comparison
2. previous study review

1. Approach...
2. Research....
3. Findings.....
Post-occupancy evaluation (POE) is a process of systematically evaluating the performance of buildings after they have been built and occupied...

- Wolfgang Preiser, 2002

- indicative
- investigative
- diagnostic
Research question
How is the hospital performing? What has changed?
Which nursing station model works better?

Pilot study
Conduct a post-functional evaluation:
• Interviews
• Observations
• Surveys + Questionnaires

Redefine process

Measure + evaluate
What is quantifiably measurable? Compared to what? Benchmarks?

What other questions are there?
1. In the literature
   • Post Occupancy Surveys  • Nursing Stations layouts

2. Our RLF Study: Qualitative Descriptive Study
   Interview, observation, surveys

3. Time and Motion Study on process and distances traveled

4. Description of processes
   • Interviews  • Surveys
   • Floor plans  • Simulation Modeling
Qualitative descriptive 2012 study

Topic of Interest
The built (work) environment of two medical surgical units on nursing process and work flow in post-occupancy use.

Purpose
Describe nurses and ancillary personnel perspective of the built environment

Aims Describe how:
1. Med-Surg work environment facilitates or interferes with the process of daily care.
2. Nurses perceive different nurse station configured units.
3. All staff would redesign these units.
**Interview Questions 2012**

**Nurses**

- **Demographic** (n = 10)
- **Pre and post occupancy**
  - Locations
  - Architectural input
- **Workload**
  - Operational flow: 12 hour shifts
  - Nurse to Patient ratios
    - Days: 1:3.5 + Nights: 1:5
- **Functional use of space**
- **What would they change?**
<table>
<thead>
<tr>
<th></th>
<th>RN 1</th>
<th>RN 2</th>
<th>RN 3</th>
<th>RN 4</th>
<th>RN 5</th>
<th>MD</th>
<th>SPEECH</th>
<th>PT</th>
<th>DIET</th>
<th>RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department</td>
<td>Nursing</td>
<td>Nursing</td>
<td>Nursing</td>
<td>Nursing</td>
<td>Nursing</td>
<td>Medicine</td>
<td>Speech</td>
<td>Rehab</td>
<td>Nutrition</td>
<td>Respiratory</td>
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<tr>
<td>Years in profession</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>28</td>
<td>15</td>
<td>13</td>
<td>13</td>
<td>11</td>
<td></td>
<td></td>
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<tr>
<td>Years at this facility ORMC</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>26</td>
<td>15</td>
<td>16</td>
<td>6</td>
<td>13</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Role on this unit</td>
<td>Pt. care</td>
<td>NOM</td>
<td>NOM</td>
<td>ADM</td>
<td>ADM</td>
<td>MD</td>
<td>Pt. care</td>
<td>Pt. care</td>
<td>Pt. care</td>
<td>SVR, pt. care</td>
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<tr>
<td>Architectural input</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No'</td>
</tr>
<tr>
<td>Yrs worked Decentralized</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>13</td>
<td>9</td>
<td>Yes</td>
</tr>
<tr>
<td>Yrs worked Centralized</td>
<td>9</td>
<td>0</td>
<td>1.5</td>
<td>8</td>
<td>5</td>
<td>14</td>
<td>6</td>
<td>13</td>
<td>9</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Findings Nursing Management Rounding 2012

flow on unit 7

Decentralized NS
Printer locations
Rounding
Medication
Findings Nursing Management Rounding 2012

flow on unit 9
findings 2012
themes

• Decentralized and Centralized
  – Look for and travel to
    • Nurses
    • Computers
    • Supplies
    • Outlets
  – Allied Health Professionals
    • Face to Face communication
    • “Real-time” charting
    • Departmental laptops
findings 2012 reflections

- Preconceptions and ideas vs actual
- Relevance and implications of study
- Importance to nursing
findings 2012

reflections

• Preconceptions and ideas vs actual
• Relevance and implications of study
• Importance to nursing
• **Suggestions for future research - 2013**
  – Simulation Modeling
  • Analysis of variables as compared to National Nurses Time and Motion Study
  • Architectural correlational studies
3. national nursing time + motion study

1. Introduction
2. Methods
3. Results
Title:
A 36 Hospital Time and Motion Study: How Do Medical Surgical Nurses Spend their Time?

Citation:
<table>
<thead>
<tr>
<th>Care Categories and Subcategories of Nursing Time</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Nursing Activity Category</strong></td>
<td><strong>Nursing Activity Subcategory</strong></td>
</tr>
<tr>
<td>Waste</td>
<td>Waiting</td>
</tr>
<tr>
<td></td>
<td>Looking/retrieving</td>
</tr>
<tr>
<td></td>
<td>Delivering</td>
</tr>
<tr>
<td>Unit Related Functions</td>
<td>Unit-related functions, i.e., faxing, transporting; status board updates; equipment prep; narcotics counting</td>
</tr>
<tr>
<td>Nursing Practice</td>
<td><strong>Patient care activities</strong></td>
</tr>
<tr>
<td></td>
<td>Care coordination</td>
</tr>
<tr>
<td></td>
<td><strong>Medication administration</strong></td>
</tr>
<tr>
<td></td>
<td>Documentation</td>
</tr>
<tr>
<td>Non Clinical</td>
<td>Personal time</td>
</tr>
<tr>
<td></td>
<td>Patient/family care</td>
</tr>
<tr>
<td></td>
<td>Administration/teaching</td>
</tr>
</tbody>
</table>
Nurses spent 30.8% of reported time in patient rooms.
Nursing practice accounts for more than three-quarters of all nursing time.
Nursing Practice Activity Sub Categories

Documentation (147.5 min) 35.3%
Medication Administration (72 min) 17.2%
Patient Care (81 min) 19.3%
Care Coordination (86 min) 20.6%
Assessment/Vitals (30.9 min) 7.2%

Documentation, medication administration, and care coordination together consumed the majority of all nursing practice time.
benchmark methods

• Why this study:
  – Look at nurses movement, patient care, and environment
  – Provoke future research applications
  – Computer Simulation Modeling aided study

• Study Limitations:
  – Sample Size
  – Layout configuration
  – Technology differences
  – Qualitative research

Nurse’s Time and Motion Study is a guide to measure our results.
### Benchmark Results

More than 75% of all reported time devoted to nursing practice.

<table>
<thead>
<tr>
<th>Time and Motion and MDACCO</th>
<th>T &amp; M</th>
<th>Level 7</th>
<th>Level 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>767</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Medication Administration (M)</td>
<td>17.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Care (C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Practice</td>
<td>19.3%</td>
<td>26.5%</td>
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<tr>
<td>Patient Assessment</td>
<td>7.2%</td>
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<td></td>
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<tr>
<td>Rounding (R)</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
benchmark results

More than 75% of all reported time devoted to nursing practice.

<table>
<thead>
<tr>
<th>Time and Motion and MDACCO</th>
<th>T &amp; M</th>
<th>Level 7</th>
<th>Level 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Layout</td>
<td>R, C, Rd</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Distance traveled miles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day Shift (median)</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening/Night</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Racetrack (R), Corridor (C), Radial (Rd), Triangular (T)
4. Simulation modeling

1. Approach
2. What ifs
3. Model
Quantitative
  – Historical
  – Subject Matter Expertise (SME)

Qualitative
  – Interviews
  – Observation
simulation modeling metrics

• Census
• Admissions and discharges – per day – Arrival source
• Length of stay
• Distance Matrix
Case studies
- Patient Types
- Nursing Assignments

Processes
- Medication Administration
- Patient Care
- Rounding
What do you want to change?

• What if scenario 1:
  – What if we merge 2 med rooms into a single med room?

• What if scenario 2:
  – What if we equally stocked the second medication room and geographically assigned patient rooms to each?
“Simulations is a technique for using computers to imitate, or simulate, the operations of various kinds real-world facilities or processes.”

“Quantitative data is used to create a mathematical series of relationships forming a model that is used to understand how a system behaves.”
simulation modeling
why?

1. Faster & Less Expensive than “Real World” testing
2. Variation, processes, complex systems
## Simulation Modeling Metrics

### Flows + Distances

<table>
<thead>
<tr>
<th>Patient Rooms</th>
<th>9A04</th>
<th>9A06</th>
<th>Clean</th>
<th>Med</th>
<th>Soil</th>
<th>Nour</th>
<th>Equip</th>
<th>Emerg</th>
<th>Copy</th>
<th>Jan</th>
<th>NS1</th>
<th>NS2</th>
<th>NS3</th>
<th>Dict</th>
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</thead>
<tbody>
<tr>
<td>Room 9A04</td>
<td>X</td>
<td>27</td>
<td>110</td>
<td>127</td>
<td>120</td>
<td>102</td>
<td>39</td>
<td>67</td>
<td>125</td>
<td>202</td>
<td>70</td>
<td>59</td>
<td>137</td>
<td>84</td>
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<tr>
<td>Room 9A06</td>
<td>27</td>
<td>X</td>
<td>90</td>
<td>107</td>
<td>100</td>
<td>81</td>
<td>26</td>
<td>45</td>
<td>105</td>
<td>181</td>
<td>57</td>
<td>37</td>
<td>116</td>
<td>74</td>
</tr>
<tr>
<td>Room 9A08</td>
<td>32</td>
<td>5</td>
<td>85</td>
<td>102</td>
<td>95</td>
<td>76</td>
<td>31</td>
<td>40</td>
<td>100</td>
<td>176</td>
<td>62</td>
<td>32</td>
<td>111</td>
<td>69</td>
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<tr>
<td>Room 9A10</td>
<td>53</td>
<td>30</td>
<td>65</td>
<td>53</td>
<td>75</td>
<td>55</td>
<td>52</td>
<td>25</td>
<td>48</td>
<td>155</td>
<td>83</td>
<td>15</td>
<td>90</td>
<td>38</td>
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<tr>
<td>Room 9A12</td>
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<td>35</td>
<td>60</td>
<td>50</td>
<td>70</td>
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<td>57</td>
<td>22</td>
<td>45</td>
<td>150</td>
<td>88</td>
<td>12</td>
<td>85</td>
<td>35</td>
</tr>
<tr>
<td>Room 9A14</td>
<td>79</td>
<td>56</td>
<td>40</td>
<td>55</td>
<td>50</td>
<td>30</td>
<td>78</td>
<td>32</td>
<td>60</td>
<td>124</td>
<td>102</td>
<td>26</td>
<td>64</td>
<td>50</td>
</tr>
<tr>
<td>Room 9A16</td>
<td>84</td>
<td>61</td>
<td>44</td>
<td>58</td>
<td>53</td>
<td>33</td>
<td>82</td>
<td>36</td>
<td>63</td>
<td>119</td>
<td>107</td>
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<td>53</td>
</tr>
<tr>
<td>Room 9A18</td>
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<td>82</td>
<td>65</td>
<td>79</td>
<td>74</td>
<td>54</td>
<td>103</td>
<td>56</td>
<td>83</td>
<td>92</td>
<td>115</td>
<td>50</td>
<td>35</td>
<td>73</td>
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<tr>
<td>Room 9A20</td>
<td>110</td>
<td>87</td>
<td>70</td>
<td>83</td>
<td>79</td>
<td>59</td>
<td>108</td>
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<td>88</td>
<td>87</td>
<td>120</td>
<td>55</td>
<td>40</td>
<td>78</td>
</tr>
</tbody>
</table>

### Unit No.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Type/Style:</td>
<td>triangular</td>
<td>Triangular</td>
</tr>
<tr>
<td>Total Patients</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Total Unit Gross Square Footage</td>
<td>19,276.60</td>
<td>19,276.60</td>
</tr>
<tr>
<td>Support Space per Bed*</td>
<td>109.80</td>
<td>109.50</td>
</tr>
<tr>
<td>Unit Gross SF per Bed**</td>
<td>642.55</td>
<td>642.55</td>
</tr>
<tr>
<td>Total Lineal Feet of Corridors</td>
<td>560.00</td>
<td>552.00</td>
</tr>
<tr>
<td>Lineal Feet of Corridor per Bed</td>
<td>18.67</td>
<td>18.40</td>
</tr>
<tr>
<td>Square Feet of Corridor per Bed</td>
<td>157.50</td>
<td>157.70</td>
</tr>
</tbody>
</table>
medication administration
process

• Process (varies for new patients: chemo, IV start)
  – Minimum: 10”, Typical: 15”-20”, Maximum: 30”
    1. Find a computer
    2. Check Computer
    3. Call Pharmacy for medication
    4. Call ‘transport’ office for IV pump
    5. Find another nurse for verification and double check
    6. Go to omnicell and get in a queue for the room and med supply

• Architecture
  – 2 omnicells not equally stocked
    • contains only PO (oral) medication
    • contains medication and supplies for medication
      – IV tubing, needles, syringes
### medication administration

**process: chemotherapy**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>CPOE</td>
</tr>
<tr>
<td>2</td>
<td>labs ordered and done</td>
</tr>
<tr>
<td>3</td>
<td>labs accepted and call to pharmacy so pharmacy can mix meds</td>
</tr>
<tr>
<td>4</td>
<td>pharmacy tech arrives to unit with meds</td>
</tr>
<tr>
<td>5</td>
<td>pharm tech calls nurse on personal phone</td>
</tr>
<tr>
<td>6</td>
<td>RN A goes to front desk to sign for meds</td>
</tr>
<tr>
<td>7</td>
<td>RN A goes to look for RN B to help with med verification carrying meds around with RN A finds RN B who searches another computer to look up pt 1 meds while carrying the original meds</td>
</tr>
<tr>
<td>8</td>
<td>RN A goes to do other work or go to PT 1 room.</td>
</tr>
<tr>
<td>9</td>
<td>RN B goes to PT 1 room and locks med into personal box</td>
</tr>
<tr>
<td>10</td>
<td>RN A goes to Omnicell to get the &quot;pre-meds and emergency meds&quot;</td>
</tr>
<tr>
<td>11</td>
<td>RN A meets RN B in PT 1 room and gives premeds</td>
</tr>
<tr>
<td>12</td>
<td>RN A goes to other OMNICELL get other supplies such as IV start supplies</td>
</tr>
<tr>
<td>13</td>
<td>RN A stays in room to give CHEMO. For 1st 15 min</td>
</tr>
</tbody>
</table>

1. puts in computer request to 'transport' dept to get IV med pump delivered
2. transport delivers pump to pt room
medication administration

flow on level 7
medication administration
flow on level 9
medication administration
simulation model flow

Nurse at Nurse Station → Travel to Patient Room → Travel to Omnicell → Does Omnicell have medication? → Travel to Patient Room → Administer Meds

Nurse at Nurse Station → Travel to Patient Room → Travel to Omnicell → Travel to Next Omnicell → Travel to Patient Room → Administer Meds
patient care
process

• Process
  – Handover 12 hours shifts
    • Each nurse exchanges information 2x /shift
    • per patient and walking time to each room and to find the oncoming nurse **3-5 minutes**
  – Assessment every shift
    • **Minimum 5” typical -15-20”, Maximum 45”**
    • + hunting, gathering, walking time to get necessary supplies (3-5”)
  – Reassessment (check patient, vital signs) **15”**
    • Day shift every 2-3 hours, 12pm 6pm
    • Night Shift every 4 hours, 4am

• Architecture
  – Go room to room with oncoming shift nurse
  – See patient and then gather supplies
patient care
flow on level 7

Decentralized NS
Printer location
Patient Assessment
patient care

flow on level 9
patient care
simulation model flow

Nurse at Nurse Station → Travel to Patient Room → Assess or Reassess Patient → Return to Nurse Station
rounding
process

• Process
  – Purposeful - not rigid
  – Patient is ‘rounded’ on Every hour
  – Alternating nurse with nurse tech
    • So nurse rounds every 120 minutes
    • Minimum 5”, Typical -10”, Maximum 30”

• Architecture
  – Go to all rooms in assignment
  – Go to all locations for which rounding uncovered a need
    • Omnicell (pain meds)
    • Kitchen (nutrition, water)
    • Phone calls (care coordination)
    • Clean utility (change beds, blankets)
    • Patient BR
simulated rounding model flow

- Nurse at Nurse Station
- Travel to Patient Room
- Does patient need medication?
  - Yes: Travel to Omnicell for Meds
  - No: Travel to Patient Room
- Does patient need nourishment?
  - Yes: Travel to Nourishment
  - No: Travel to Patient Room
- Does patient need clean linens?
  - Yes: Travel to Clean Utility
  - No: Travel to Patient Room
- Does patient need help with bathroom?
  - Yes: Help Patient in Bathroom
  - No: Return to Nurse Station
simulation modeling
Simulation modeling
Now...we will run the model!
### Simulation Modeling Results

<table>
<thead>
<tr>
<th>Nurse</th>
<th>Miles Walking</th>
<th>Med Admin Hrs / Shift</th>
<th>Patient Care Hrs / Shift</th>
<th>Rounding Hrs / Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse 1</td>
<td>0.9</td>
<td>298</td>
<td>112.2</td>
<td>265.2</td>
</tr>
<tr>
<td>Nurse 2</td>
<td>0.7</td>
<td>250</td>
<td>101.3</td>
<td>245.2</td>
</tr>
<tr>
<td>Nurse 3</td>
<td>0.7</td>
<td>231</td>
<td>97.2</td>
<td>228.3</td>
</tr>
<tr>
<td>Nurse 4</td>
<td>0.8</td>
<td>250</td>
<td>94.1</td>
<td>218.3</td>
</tr>
<tr>
<td>Nurse 5</td>
<td>0.7</td>
<td>217</td>
<td>90.1</td>
<td>215.4</td>
</tr>
<tr>
<td>Nurse 6</td>
<td>0.8</td>
<td>231</td>
<td>85.8</td>
<td>205.3</td>
</tr>
<tr>
<td>Nurse 7</td>
<td>0.8</td>
<td>231</td>
<td>81.3</td>
<td>199.6</td>
</tr>
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<td>Nurse 8</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Avg</td>
<td>0.8</td>
<td>244</td>
<td>94</td>
<td>225</td>
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</table>
simulation modeling

results

Nurse Hours / Shift

<table>
<thead>
<tr>
<th>Task</th>
<th>Hours / Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med Admin</td>
<td>4.00</td>
</tr>
<tr>
<td>Patient Care</td>
<td>1.50</td>
</tr>
<tr>
<td>Rounding</td>
<td>3.50</td>
</tr>
<tr>
<td>Other</td>
<td>2.00</td>
</tr>
</tbody>
</table>
## Simulation Modeling Results

<table>
<thead>
<tr>
<th>Time and Motion and MDACCO</th>
<th>T &amp; M</th>
<th>Level 7</th>
<th>Level 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>767</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Medication Administration (M)</td>
<td>17.2%</td>
<td>32.0%</td>
<td>33.4%</td>
</tr>
<tr>
<td>Nursing Practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Care (C)</td>
<td>19.3%</td>
<td>26.5%</td>
<td>12.9%</td>
</tr>
<tr>
<td>Patient Assessment</td>
<td>7.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rounding (R)</td>
<td>N/A</td>
<td>30.8%</td>
<td>31.5%</td>
</tr>
</tbody>
</table>
## Simulation Modeling Results

<table>
<thead>
<tr>
<th>Time and Motion and MDACCO</th>
<th>T &amp; M</th>
<th>Level 7</th>
<th>Level 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Layout</td>
<td>R, C, Rd</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>Distance traveled miles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day Shift (median)</td>
<td>3.0</td>
<td>0.82</td>
<td>1.04</td>
</tr>
<tr>
<td>Evening/Night</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Racetrack (R), Corridor (C), Radial (Rd), Triangular (T)
## Simulation Modeling Results

<table>
<thead>
<tr>
<th>What if Scenario 1</th>
<th>Unit 7 Miles / shift / nurse</th>
<th>Unit 9 Miles / shift / nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline – - 2 omnicells not equally stocked</td>
<td>0.82</td>
<td>1.04</td>
</tr>
<tr>
<td>Scenario 1 – - 1 omnicell only fully stocked</td>
<td>0.80</td>
<td>0.89</td>
</tr>
<tr>
<td>Difference</td>
<td>0.02</td>
<td>0.15</td>
</tr>
</tbody>
</table>
## Simulation Modeling Results

<table>
<thead>
<tr>
<th>What if Scenario 2</th>
<th>Unit 9 Miles / shift / nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline – (unit 9 only) - 2 omnicells not equally stocked</td>
<td>1.04</td>
</tr>
<tr>
<td>Scenario 1 – (unit 9 only) - 1 omnicell only fully stocked</td>
<td>0.89</td>
</tr>
<tr>
<td>Scenario 2 – (unit 9 only) - 2 omnicells fully stocked w dedicated rooms</td>
<td>0.72</td>
</tr>
</tbody>
</table>
What if Scenario 3

<table>
<thead>
<tr>
<th>Baseline – (unit 7 only) - 1 Clean room utility room</th>
<th>Unit 9 Feet / shift / nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>245</td>
</tr>
</tbody>
</table>

245 feet does not sound like much. However, it adds up quickly. This equates to 17 miles per year for every nurse.
simulation modeling
take away

Post-Occupancy
Pre-Occupancy
selected references: original

- Lake, E., The Nursing Practice Environment: Measurement and Evidence, Medical Care Research and Review, Supplement to Volume 64 Number 2, April 2007 104S-122S
updated references: rounding

updated references


updated references


- Salonen, H., Lahtinen, M., Lappalainen, S., Nevala, N., Knibbs, L. D., Morawska, L., &
updated references