

Life-Cycle Benefits of Flooring Surfaces in Health Care -- Our Methodology Was All Wrong?

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Our Task

The Florida Hospital *Office of Design* oversees 1400 beds located in six facilities in Central Florida. One of the tasks we undertook in 1997-98 was to objectively test to see if we were making the *best* flooring choices for our hospital system.

We looked at the following obvious choices to see if they would work for us, and we also investigated a few other alternatives as well:

- VCT
- Sheet Vinyl
- Carpet
- Other type floors such as Rubber, “Marmoleum”, Wood, Terrazzo and Marble.

We assumed that our previous methodology was the most correct approach to use in choosing flooring:

1. *Design*
2. *Budget*
3. *Install*
4. *Suffer (the consequences).*

After we began our study, however, we realized we needed a “New Methodology” in testing and choosing flooring. We realized that although we still need to *Design* the flooring choices (after testing various alternatives), we now need to *Budget* the project differently by taking into account the *Life-cycle cost savings over at least fifteen years of maintenance and use*. With this new methodology, we updated our “Standards” for *Installation*. And we now *enjoy* our savings by applying the difference for use in other areas of the hospital!

Once we began testing the various products in a few areas, we found that *the average cost to maintain the cheapest VCT floor over its lifetime is NINE to FIFTEEN times the initial cost of the Floor!* *This realization was so remarkable that we determined our methodology had been flawed from the beginning and we started to inquire what else we were evaluating with shortsightedness!* Attachment 1

We then observed that *the average cost to maintain the most expensive floors like rubber and ceramic tile over their lifetime was less than the original installation cost of the floors*. We realized that these more expensive floors were much cheaper **over time** than other cheaper floors, and that initial cost savings was not an indicator of actual savings. This paper is intended to explain how we came to these realizations and put them into place in our standards.

How Did We Find Out We Were Wrong?

We chose to test an occupied patient unit by objectively installing all of the products and tracking their results with input from Design, Nursing, Administration, Environmental Services, Engineering and Facilities. In the beginning, we looked for a unit that had a lot of traffic which needed to be updated immediately, and had staff willing to put up with a “quilt” or hodgepodge look. We ultimately chose a pediatric unit where the mix of different surfaces would be fun.

Our review team represented more departments and more combined years of experience than most facilities can afford to designate to such a project. We encouraged each member question the other on the best materials and the methodology we were using. We noted that often times half of the review team would like a product for obvious reasons, only to find out that other staff hated the pattern or the hardness or the labor required to keep it clean. We enjoyed our testing.

Who Was Our Review Team?

- *Architecture/Design Representatives*
- *Administration/Nursing Representatives*
- *Environmental Services Representatives*
- *Installation/Construction Representatives*
- *Engineering/Facility Representatives*
- *Healing Environment Representatives*

We realized from the onset of this project that the objectives that each representative based their decisions on were far different. It was not until the study ended that we fully appreciated the input that each individual brought to the table. We now know that for a hospital system to make a fully informed decision, they need to recognize the biases that individual departments have. For Example:

- *Design* initially wanted a relatively low short-term cost with the best specifications.
- *Nursing* initially wanted the lightest, cleanest, best smelling, most comfortable product.
- *Administration* initially wanted the lowest short-term cost with the best aesthetics.
- *Environmental Services* wanted the easiest to clean and the most durable product.
- *Engineering and Facilities* wanted the easiest to install and darkest color possible to hide stains, with a low short term cost.

We all realized we were only looking at pieces of the picture. The methodology we concluded with was to look at all the choices with each team member, discuss the pros and cons of the products, track the maintenance and long term costs, and then educate each other on our standards for future savings.

Where Did We Test the Products?

We had two areas of the hospital that had a lot of traffic, which needed to be updated immediately and would not suffer too much from looking like a “test area”. We determined the 15 hard floors and 12 carpet samples that we wished to try. We specified each product in the same “medium” hue (medium green or blue) so that all of the tests were “apples to apples”, and so that the entire area did not appear to be a patchwork of various products, colors or finishes. We tracked the cost to install each floor by initial installation cost. We also tracked the cost to maintain those floors over time. We concluded by presenting our findings to the Florida Hospital Interior Committee and to other professional organizations.

Note: We evaluated each flooring material based upon “patient room” use (patient rooms were chosen as the test basis due to four reasons: turnover time, fluid spill frequency, drying/finish time, guest sensitivity to cleanliness, smell & aesthetics).

How Did We Finalize the Flooring Tests?

After looking at all of the major manufacturers, and installing the two different test areas, we soiled the floors with Dirt, Oil, Coffee, Ink, and Betadine. We noted how the floors reacted to various stains, which floors required finishing (wax), and whether carpets required wet or dry cleaning. We documented comments, and videotaped the results and tallied the overall savings.

What Were the Primary Concerns?

- Cost
- Cleanability
- Aesthetics
- Noise Control
- Overall Life-Cycle Decisions
- Seamless/Installation/Workability
- Security (Slip/Fall Issues)

The 10 “TEST” Questions (*With Our Answers*)

1. Do HARD Floors fare better than SOFT (Carpet) Floors in this unit? YES!

- *Carpeted floors require a minimum of 4 hours down time after being soiled. (45 minutes to clean, plus 3 hours to dry).*
- *Hard floors (with finish) require 2.5 hours down time on a regular basis. See attached email from Libby Fossom. Note 3*
- *Unfinished Hard Floors take 20 minutes to clean, because there is no “dressing” dry time. Rooms turn around much more quickly when floors do not need to dry.*

2. Do DARK floors fare better than LIGHT floors in this unit? NO

- *We originally assumed that dark floors might fare better than they did. The medium colored floors with pattern fared the best of all. Very Light and Very Dark floors fared worst.*

3. Do VISUALLY active patterns hide dirt better than SOLIDS in this unit? YES

- *VISUALLY ACTIVE patterns are much more likely to hide stains than solid. We do not use solid colors any more anywhere except for occasional insets, particularly in carpet. We now do not use solid borders anywhere in our carpet concepts.*

4. Do ORGANIC patterns fare better than GEOMETRIC patterns? YES

- *Organic patterns are the most likely to hide liquid stains, and we now specify organic patterns over geometric patterns predominately.*

5. IS SIMULATED WOOD equal to or superior than REAL WOOD for this unit? YES

- *SIMULATED WOOD products like Amtico and Toli look as real as wood, and were not as expensive or difficult to maintain, install or replace, in our findings. One product also had very high psi ratings, which interested us greatly in lobby and high traffic areas.*

6. Do CARPET SQUARES fare better over time than the SHEET CARPET for this unit? YES

- *Carpet squares are easier to replace & rotate, easier to modify, easier to install.*
- *We also asked ourselves if 36”x36” squares look better than 18”x18” squares for this unit and decided that there was no difference in hallways. We eventually specified 36” squares for all of our lobbies, however, due to the high quality of the 36” modulares we observed.*

7. Are Quarter-Turned carpet squares acceptable for this unit? YES

- *We prefer Quarter-Turned carpet squares, since it the obvious pattern fools the eye into following the obvious edges and leads the eye away from spots, replacements, traffic patterns, etc. Replacements are easily accomplished with quarter turned carpet squares.*

8. IS YARN dyed superior or SOLUTION dyed carpet superior for this unit?

- *There has been much discussion amongst our staff regarding this issue. Our environmental services staff state we do not use bleach in our cleaning products, therefore solution dyed carpets may be overkill. We found that solution dyed carpets we have used seem more limited in color; may “ugly” out much quicker than the yarn dyed carpets (due to the “greasy” finish); and do not appear to hold color better than yarn dyed. We now consider yarn-dyed carpets with solution dyed as our choice.*

9. DO NON-WELDED products fare as well as WELDED products? YES

- Regarding Carpets, YES, because we now to limit carpet in patient areas to hallways, where welding might now be an issue. Because we are able to shut down hallways to clean the carpets and let them dry, we do not feel that we need to weld these areas. Additionally, we rotate soiled areas quickly with non-welded products.

10. Are CHEAPER products really cheaper than MORE EXPENSIVE products? NO!

- *Actually the more expensive initial cost products actually tested out to be cheaper over 15 years. We only look at LIFE CYCLE COSTS NOW, and have reformed our methodology likewise.*

Methodology

After we identified our team, our test questions and our concerns, we compared the information on a complicated tracking system (see excel spreadsheet with color-coded columns). In the first few columns we noted the material, the PSI, the distributor and our remarks. We then tracked (in the blue column) our cost and an outside contractor’s cost to install 1,000 SF of the product. These first few columns resulted in what we called the “First Glance”, our initial conclusions made by our study. The later conclusions, as outlined below in the “Second Glance” and the “Third Glance”, were subsequently later improvements in our methodology. Each interim conclusion later proved to be wrong, because the subsequent conclusion was a more complete methodology. We believe the final glance incorporates all of the necessary facts to make the most informed decision regarding floor covering.

The Investigation-First Glance (Patient Room Scenario/Blue Columns).

We initially tracked the INITIAL COST installed of the various tests:

<u>Product</u>	<u>Cost/ SF</u>	<u>Installed Cost</u>
VCT	\$1.20-1.50 SF	Cheapest
Sheet Vinyl	\$2.47-5.00 SF	More \$\$
Rubber	\$4.00-5.50 SF	More \$\$\$
Carpet	\$2.22-8.50 SF	Most \$\$\$\$

This “first glance assumption” initially gave false hope to our team that by installing VCT (the cheapest product initially) throughout patient care areas, we were saving the hospital thousands of dollars over other more expensive products. We even Value Engineered entire floors by deleting the more expensive floors and substituting VCT. We quickly realized out this methodology was wrong and incomplete!

The Investigation-Second Glance (Patient Room Scenario/Green Columns)

We tracked the **COST to REPLACE** each floor with 15 years of use:

<u>Product</u>	<u>Cost/ SF</u>	<u>Replaced?</u>
VCT	\$1.20-1.50 SF	NO
Sheet Vinyl	\$2.47-5.00 SF	NO
Rubber	\$4.00-5.50 SF	NO
Carpet	\$6.66-25.50 SF	3 TIMES!

This second glance gave us a different taste of Life-Cycle Costing, in that we proved that some of the cheaper floors (VCT) lasted 3 times as long as carpets. At this point one might conclude that due to cost we delete carpet in favor of hard floors throughout, (which we knew was a shortsighted conclusion). However, before we discredited this methodology completely we realized it was helpful to us in convincing administration that wherever carpet is used, it should be budgeted to be replaced at least every 5 years. Additionally, this conclusion helped us in sorting the numerous questionnaires (attachment 3) which we received and noted that hospitals all over the country are taking their carpet out and replacing it with hard surface floors, partly due to their **perception** of bacterial growth which may or may not be accurate.

The Investigation-Third Glance (See red columns on Spreadsheet)

When we tracked the Total Average COST after **MAINTAINING** 1,000 SF of each floor over 15 years we found the real disparity in flooring costs, which ultimately caused us to realize our previous methodology had flaws:

<u>Product</u>	<u>Cost/ SF</u>	<u>Clean 1,000 SF/15yrs</u>	
VCT	\$1.20-1.50 SF	\$19,789	(6 Times the original cost)
Sheet Vinyl	\$2.47-5.00 SF	\$17,732	(7 times the original cost)
Rubber	\$4.00-5.50 SF	\$ 9,095	(only 2 times the original cost)!
Carpet	\$6.66-25.50 SF	\$27,501	(4 times the original cost)

Hard Surfaces

We confirmed finally that the cheapest Hard Floor, VCT, was the most expensive floor after considering Life Cycle Replacement and Cleaning Costs. This extreme cost difference was so high from the initial cost “savings” we had anticipated that we immediately changed our methodology of Value Engineering to include the maintenance factor. Additionally, we implemented new standards and protocols based on these findings alone.

Then, when we realized the cost to clean VCT was nearly twice the cost of cleaning rubber and other non-finished floors we began to look again at the more expensive floors that we had originally discounted due to their “initial” cost. VCT may be cheap to install initially, but we realized it is was the most expensive floors to maintain properly over time—largely because of the amount of finish required to maintain its shiny appearance.

We concluded that the most expensive Hard Floor, Rubber, was the cheapest after considering Life Cycle Replacement and Cleaning Costs. Rubber was half the cost to clean/maintain than the other hard surfaces' requiring finish, since it is a product that does not scratch or mar easily. Rubber does not require continued expensive finishes or as much maintenance as other floors. We are currently searching for other rubber products that our staff will be pleased with that can be used in lieu of vinyls and VCT's.

Carpet was determined to be the most expensive Floor before and after considering Initial Cost, Life Cycle Costs, Replacement Costs and Cleaning Costs...However, we determined that there are specific areas where only carpet is desirable (for aesthetic, noise and safety reasons).

However, Carpet IS Justified In...

- High-End Lobby Type Areas (nick-named the "Front-of-House").
- Areas needing quiet/acoustic qualities (Corridors, Offices)
- Comfort of feet/Aesthetic Reasons (Nurse Stations)
- Areas where slip and falls occur most often.

We concluded that in the areas that carpet is most justified, we would budget and expect to pay more for these qualities in these areas. We also realized that we need to budget carpet replacement every 5-6 years.

Patient Room Basis for Testing

We determined that **Patient Rooms** would be our basis for testing flooring products, because staff do not have enough time to properly clean Patient Rooms and turn them around. (Unlike other areas that can be temporarily shut down for cleaning purposes, Patient Rooms are occupied nearly 100% of the time in busy hospitals).

Patient rooms require Hard Floors for these reasons:

- Hard floors do not "ugly" out as fast as carpet does.
- Hard floors are easier to turn around (maintenance-wise, keeping our bed shortage to a minimum).
- Hard floors keep the patient rooms feeling/smelling more sterile, resulting in more favorable patient response.
- Hard floors last three times longer than carpeted floors.
- Hard floor spills clean up easier & more effectively, making the room more sterile appearing.
- Hard floors are easier to push beds and equipment on.
- Numerous responses from other hospital systems questioning the perception of bacteria in carpets. (See attachment 3). Even though bacteria is not clinically shown to be higher in carpeted areas, it is felt by staff and patients to be less sterile.

We concluded that the use of hard floors in patient rooms would give us the most economical, most aesthetically appealing look for a longer life than we could obtain with carpet. It is important to note that Nursing and Safety cautions us to factor in added costs regarding the higher noise levels and prevalence of falls with hard surfaces.

Patient Rooms VCT Vs. Vinyl?

Once we realized we wanted hard surfaces in Patient rooms, we continued with our quest to test which hard surfaces were the best. We remembered how the Initial Cost of VCT was one quarter the cost of Sheet Vinyl, which had incorrectly prompted us to specify VCT in many patient rooms and the need to look further into the extended maintenance costs:

Product	Cost/SF	Cleaning/Labor/Supply Costs
VCT	\$1.25 SF	\$22,913
Sheet Vinyl	\$5.00 SF	\$6,066-22,913**
Rubber	\$5.00 SF	\$4,095**

Why Are the Maintenance Costs So Varied?

The Cleaning/Labor/Supply Costs of the flooring materials differences are mostly related to *on the amount of Finish required, the amount of Labor required, and the amount of traffic on each location*. This proved VCT and some sheet vinyls as too expensive and carpet as too time consuming to continue using in patient rooms.

**This range takes into consideration maintenance crews spending enormous amounts of time stripping, waxing & finishing some Vinyl and all VCT floors. The process of stripping, waxing and finishing requires patient rooms to be left empty with fans blowing while each step is dried. This additional time, material and labor adds up over time to many times the cost of the floor material, and we realized that the cost to maintain carpet and sheet vinyl with finish are both very high. Once again, we realized our methodology has to go beyond the initial cost comparison and the replacement cost scenario into the full Life Cycle Cost analysis with maintenance costs.

In Fact

After doing our Life Cycle Analysis, we proved that the INITIAL savings of thousands of dollars by installing VCT and carpet was lost over time installing floors which required FINISH maintenance programs. We determined again, that our methodology should be based on the total picture...

- Testing sample areas of products first by Environmental Services maintenance programs.
- Choosing the flooring requiring the **least finish** possible.
- Making sacrifices in some areas for other Areas (save money in the back-of-house and apply it to the front-of-house finishes and to the patient rooms.)
- Using the **long-term maintenance cost/investment impact**.

By using the above methodology, we now justify the \$88/yard carpet in our Lobbies, with no finish sheet vinyls in our patient rooms. We are now educating staff how to evaluate flooring based on all of the criteria they see. We now look for products that last longer and look better with less maintenance over time.

Note there are two “no-finish” vinyl floors, many rubber floors, several ceramic other surfaces that are basically FINISH-FREE. Several of these floors are now being installed in our hospital lobbies, patient rooms and public areas. These products are able to stand a lot of traffic, and do not require as much maintenance over time, thus save the hospital thousands of dollars.

Conclusion

Because of our test, our questionnaire and our excel spreadsheet we were able to review our methodology and analyze what we did correctly and incorrectly. Without these tools and our extensive review team, we would not have reached these conclusions as a group. We now know that the right or wrong floor decision will cost our hospital system millions of dollars of labor and maintenance over time. In review of our methodology, the test answers resulted in knowledgeable changes to our specifications for flooring surfaces at Florida Hospital.

3 Questions Which We Knew the Answer Before We Started

- ◇ Did HARD Floors (VCT) fare better than SOFT (Carpet Floors) in this unit? YES
- ◇ Did VISUALLY active hide dirt better than SOLID patterns? YES
- ◇ Did NON-WELDED products fare as well as WELDED products? YES

3 Questions Which We Were Surprised by the Answer

2. Did DARK floors fare better than LIGHT floors in this unit?

We were surprised that the darker floors would fare as poorly as the lighter floors, and that only MEDIUM hued floors would do well.

4. Did ORGANIC patterns fare better than GEOMETRIC patterns?

We had not realized that geometric patterns would fare as poorly as they did. We were pleased with how well organic patterns fared during testing.

5. Was SIMULATED WOOD equal to or superior than REAL WOOD for this unit?

We visited other hospitals that used real wood, and were surprised to find how much more expensive real woods were compared to simulated wood.

6. Did CARPET SQUARES fare better over time than the SHEET CARPET for this unit? YES

The initial extra expense of carpet squares was found to be well worth the cost over extended periods of time.

3 Questions Which We Were Shocked by The Answer

7. Were quarter turned carpet squares acceptable for this unit? YES

We found that this alternative is actually the most acceptable for institutional use, because the eye is already used to the geometric pattern, and the visual noise created by turning the carpets hides the new look of replacement carpet.

8. Was YARN dyed superior to SOLUTION dyed carpet for this unit?

We debated numerous times with engineering and environmental services on the Yarn vs. Solution dyed issues. Yarn won.

10. Were CHEAPER products as good as MORE EXPENSIVE products?

The opposite is true.

Test Questions Which Helped Us Convince Others

- All of the above.
- Medium dark floors cost less to maintain than Light or Dark floors
- You can afford nice Carpet if you value engineer elsewhere.

- Expect to replace carpet every 5 years!

- Choose a Finish Free product!
- Perceptions cost a lot of money to in upkeep costs.

Institutional Conclusions

- We will continue to revise and use our analysis system and team approach.
- We will continue to track costs with all departments.
- We will continue to make decisions based on long-term life cycle costs.
- We will share our knowledge with others.

Attachment 1 (Excel Color Spreadsheet** request original from author)

Attachment 2 (Libby Fossom's email).

Attachment 3 (Email responses to inquiry on carpet & bacteria)