

## Durable Coated Fabrics Task Group

<b>Project Name:</b>	Midwest University-Based Hospital System	<b>Case Study Description:</b>	Degradation and Failure Issues of Polyurethane Fabrics & Surfaces on Furnishings Repair & Mitigation Strategies
<b>Department:</b>	Inhouse Design/Facilities	<b>Report Date:</b>	4/4/2019
<b>Areas Impacted:</b>	Emergency Department Patient Tower (LEED® Gold)	<b>Installation Dates:</b>	8/2014 12/2014

<p><b>S</b></p> <p>Situation</p>	<p>A prominent Midwest University-Based Hospital System is experiencing accelerated degradation and failure of polyurethane upholstery fabrics and surfaces on clinical, public, and office area furnishings. The following narrative describes what materials are involved, cleaning methods, and proposed solutions and costs to repair furnishings and mitigate further damage moving forward across the University’s Hospital platform.</p>
<p><b>B</b></p> <p>Background</p>	<p>Approximately 80% of the fabrics specified for these projects were polyurethane-based (PU) coated fabrics to replace PVC coated fabrics. Practice GreenHealth “green” guidelines state that participating hospitals should not exceed 30% PVC – coated fabrics of purchased furnishings per year.</p> <p>In addition to Durable Coated Fabrics: 100% of arm caps and wood finishes are polyurethane or urethane-based.</p>
<p><b>A</b></p> <p>Assessment</p>	<p><b>Emergency Department: Failures 6 months after opening:</b></p> <p>Polyurethane Fabrics:</p> <ul style="list-style-type: none"> <li>• Strange pink and red/brown staining</li> <li>• Peeling of the polyurethane coated fabrics</li> </ul> <p>Grey polyurethane arm caps:</p> <ul style="list-style-type: none"> <li>• Top surface was wearing off rapidly, revealing the yellow foam, and breaking apart</li> </ul> <p>The fabric manufacturer provided replacement fabric at no cost, but we had to pay for the reupholster’s work. Within another year, the same failures have repeated, and look much worse. Currently working on budgets to replace all of the seating with something completely different to avoid more fabric/finishes failure.</p> <p><b>Emergency Department: Failures by June 2017:</b></p> <ul style="list-style-type: none"> <li>• Polyurethane fabrics are peeling on the top of back cushions, edges of seat cushions, and hand rub points on arm edges, exposing the backing to cleaners and contaminates.</li> </ul>

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- Beige patterned PVC upholstery with a polyurethane-based performance top coat on inpatient sleep settees are turning pink. We understand it might be a chemical reaction between cleaners and polyurethane surfaces.
- Polyurethane arm caps cracking and peeling.
- Wood arm caps on recliners and lounge furniture - finish has degraded and exposing raw wood.

**Issues in Public and Patient Areas include the following for predominantly polyurethane-based or top coated materials:**

- Cleaning Chemicals “no rinse” protocol
- Heat
- Oils
- Sweat
- 24/7 Use
- Rubbing/abrasion



Photos of product failures.

**Epidemiology (EPI) Concerns from a Healthcare Associated Infection (HAI) issue:**

1. Unable to properly clean and disinfectant the surfaces due to damage or type of material.
2. Limiting the number of disinfectants for low level disinfection in order to not confuse staff and to ensure they follow manufacturer’s instructions for use.

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3. Ensure we use products that meet CDC requirements and are EPA registered.
4. Ensure compliance with the Hospital's Cleaning and Low Level Disinfection Policy.

EPI has defined the following HAI risks associated with the exposed sub-surfaces, cushion cores, soft backings, and raw wood:

- Multidrug resistant organisms (e.g. MRSA, VRE)
- Clostridium difficile (C. diff)
- Acinetobacter
- Pseudomonas
- Klebsiella

### Clinical Support Areas: Failures

- Task chairs and stools in 24/7 patient care areas, (nurse stations, etc..) with polyurethane coated fabrics are peeling and are down to the bare cushion in many areas – all edges peeling, including backs and sides, at seams. The urethane arm caps on these chairs are starting to rip, peel, and crumble.
- We have just replaced 235 seat cushions in a Tower in the central nurse stations and will replaced 200 arm caps in September 2018.

**Issues in Clinical Support Areas include the following for predominantly polyurethane-based materials:**

- Heat
- Oils
- Sweat
- 24/7 Use
- Rubbing/abrasion



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	<p><b>Disinfecting chemicals and “no rinse” protocol voids warranty:</b></p> <ul style="list-style-type: none"> <li>• All fabric manufacturers stated that even though their fabrics are warranted for the EVS cleaning solutions we use, the fact that we <b>do not rinse</b> cleaning chemicals off the upholstery, arm caps, wood finishes, etc....<b>voids the warranty.</b></li> <li>• Some of the manufacturers of the cleaning solutions require water rinsing after application, with drying time of 10 minutes, to protect upholstery/surfaces from damage.</li> <li>• From an infection control and operational logistics/room turn time; this is not our current method for “low level disinfection.”</li> <li>• The warranty does not refer to the use of UV light disinfecting methods.</li> </ul> <p><b>Staff chairs cleaning and disinfection:</b> Typically, staff task chairs rarely get cleaned by EVS using a low pH cleaner, and these are some of the worst peeling/upholstery and arm cap failures we have seen.</p> <p>The failure appears to be from heat and sweat/oils in 24/7 use areas, obviously not a build-up of cleaners. The polyurethane fabrics on an 8 - hour use standard office chairs have not shown peeling yet, but are starting to wrinkle at the waterfall edge, where most peeling starts.</p> <p>Evaluation of the molecular interaction between cleaning chemicals, UV light systems, environmental contaminants (i.e. sweat, body heat, oils, etc.), and upholstery materials with a University’s Chemical Engineer was conducted to help inform our facilities team in what cleaning chemicals to try to avoid, and which upholstery materials would have a prediction of failure based upon the molecular interaction between the chemical make-up of each product. We gained understanding that the damage to the upholstery material would occur when the cleaning chemicals were still wet, so waiting until the cleaner was dry to sterile water rinse (10 minutes average), did not deter or delay damage to the upholstery. The cleaner residue would instead transfer to clothing or skin.</p>
<p><b>R</b> Replacement Cost Implications</p>	<p><b>Quantity and type of product impacted by upholstery failure.</b> The following is an approximate number of units from the original project order with polyurethane fabrics that are experiencing rolling/continuous failures:</p> <ul style="list-style-type: none"> <li>• Inpatient sleep settees and overnight sleep chairs, patient recliners – 1,053</li> <li>• Large scale lounge seating, fully upholstered arms, seats, backs – 540</li> <li>• Infusion Recliners and exam /infusion room guest seating – 923</li> <li>• (ED only) modular and exam room seating – 130</li> <li>• Upholstered Task chairs &amp; stools – 1,623</li> </ul> <p><i>Note that we have ordered a great deal of additional furniture with <b>these same polyurethane fabrics and finishes since 2013</b> to replace many public waiting areas throughout the university hospital campus and all off-campus buildings and clinics. The same failures have exhibited or are anticipated to occur depending upon installation dates.</i></p>

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	<p><b>Replacement Cost Estimates</b></p> <ol style="list-style-type: none"> <li>Direct product replacement costs based upon quantities above: <ul style="list-style-type: none"> <li>Inpatient sleep settees and overnight sleep chairs, patient recliners – 1,053: <b>\$3.9 mil</b></li> <li>Large scale lounge seating, fully upholstered arms, seats, backs – 540: <b>\$1.8 mil</b></li> <li>Infusion Recliners and exam /infusion room guest seating – 923: <b>\$1.9 mil</b></li> <li>(ED only) modular and exam room seating – 130: <b>\$170K</b></li> <li>Upholstered Task chairs &amp; stools – 1,623: <b>\$1.1 mil</b></li> </ul> </li> <li>Downtime cost impacts (including offline patient rooms): <b>Mitigated by purchasing new items to swap out during bed turns and after hours. Requires \$20K investment upfront and 200 SF storage space for holding broken and back up furniture for inpatient units.</b></li> <li>Facility coordination cost impacts: <b>ADD 1 FTE salary and benefits to assess, track coordinate, budget, manage dealer bids, installation management, many times after hours 7-10 PM.</b></li> <li>Other hidden/miscellaneous cost impacts: <b>legal team, supply chain analysis/discovery, EPI testing, hard trash drop fees &amp; recycling labor, third party testing of replacement fabrics. Furniture repair technician salary FTE to replace arm caps, shoes, seats and backs for small quantities of repair/replace.</b></li> <li><b>Total costs: TBD – still accumulating, discovering more costs and escalation due to tariffs.</b></li> </ol>
<p style="text-align: center;"><b>R</b></p> <p>Recommendations</p>	<p><b>Immediate Action – Replacement materials for failing PU surfaces based upon recommendations by University’s Chemical Engineer until further testing can be completed</b></p> <ol style="list-style-type: none"> <li>Upholstery fabrics: <ol style="list-style-type: none"> <li>Specify PVC - safest choice for the short term - hydrophobic, least friendly to micro-organisms, inherently fire-resistant, stands up to bleach/hydrogen peroxide the best.</li> <li>Specify 100% Nylon construction – another safe choice - Nylon deemed more stable, not as “rubbery” as polyurethane.</li> <li>Specify, a waterproof leather “carrot” type fabric (standard at The Cleveland Clinic) for non-patient care areas only. “Carrot” materials are homogeneous vs. “radish” materials that have a thin veneer coating with a soft core. “Carrot” materials also tend to be costlier than radish materials.</li> <li>Avoid Polyurethane (PU) upholstery for the time being. PU could possibly be re-formulated to be more durable and meet additional performance criteria, taking into consideration the material and top coat.</li> <li>Avoid PET (a sponge for oils, friendly to micro-organisms, develops brittleness with bleach/hydrogen peroxide and UV (like a rubber band that has been stretched too much and splits/breaks, exposed to UV)</li> <li>Avoid Silicone - stands up to bleach/hydrogen peroxide, low abrasion resistance, sticky surface created depending upon cleaner/disinfectant used. Usually coated with a PU top coat (i.e. "sta-kleen").</li> </ol> </li> <li>Arm top caps: Solid surface materials <ol style="list-style-type: none"> <li>Corian</li> <li>Polyester</li> <li>Solid core plastic laminate</li> </ol> </li> </ol>

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3. Wood: Avoid wood arm caps and surfaces except for administrative office areas.
4. Metals: Avoid aluminum and painted surfaces in patient care areas disinfected with bleach or hydrogen peroxide-based cleaners.

**Strategic Approach to a Solution: Academic Research and Lab Testing: Task Force**

It is proposed to initiate a task force to take a strategic approach to collaborative materials and chemicals testing with academic partners:

1. Discover source(s) and predictability of material failures.
2. Determine what materials work best with required disinfection and sterile cleaning within the healthcare environment and publish standards for materials and cleaning chemicals/protocols.
3. Evaluate performance of “carrot” vs. “radish” materials (as defined above).
4. Potentially work with manufacturers to create a new performance-based coated fabric (i.e. evaluating using materials used in other industries, such as marine or automotive, and top coat formulations.)