

Concise Communication

Hospital mattress failures—A hidden patient danger

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Abstract

The objective of the research was to assess the condition of beds and mattresses in 4 US hospitals. In total, 727 beds and mattresses were evaluated, and 523 (72%) had damage: 340 (47%) required mattress cover replacement and 183 (25%) required replacement of the entire mattress.

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Hospital beds and mattresses are medical devices that are reprocessed after every use. The mattress covers for higher-end hospital mattresses have evolved from vinyl to a fabric coated with polyurethane that allows for moisture vapor transmission (MVT). MVT mattresses prevent fluid from penetrating but allow moisture to escape, which may aid in the prevention of pressure injuries. However, fabric-coated mattress covers are more susceptible to damage than the thicker nonporous vinyl covers. Chemical damage from the use of strong disinfectants can cause the mattress cover to break down over time, which ultimately leads to mattress failure. Mattress failures have led to outbreaks of infections with multidrug-resistant organisms and patient deaths.^{1,2}

The US Food and Drug Administration (FDA) issued the second Safety Communication about mattress damage in 2017.³ They recommended routine inspection of all mattresses for damage. Also, the Centers for Disease Control and Prevention (CDC) recommends that mattresses be replaced when torn or visibly stained.⁴ Bed manufacturers recommend inspection for mattress damage after each patient.^{5,6}

Two previous studies have investigated hospital mattress damage. Bradbury et al⁷ examined 656 medical–surgical beds in a hospital in the northeastern United States.⁷ They reported that 27% had interior damage from leakage, all of which required immediate replacement, and most mattresses were estimated to be ≥ 5 years old. In a more recent multihospital study in Canada, Marks et al⁸ inspected 2,651 mattresses, and 833 (33%) were damaged. They reported that 68% of the damage was mechanical damage and 32% was chemical damage from disinfectants.

To build on the work of Marks and Bradbury, we sought to better describe the types of damage found on hospital mattresses and on the metal bed frame (bed deck), as well as the age of failed mattresses.

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Methods

In 4 hospitals of a midwestern US hospital system, all beds and mattresses were evaluated for damage. After external examination, each mattress was opened, and the mattress core was visually evaluated for damage. Finally, a LED light was used to identify smaller punctate defects in the cover. Each bed frame was visually examined for evidence of rust. If available, the age of the mattress was determined based on a label on the mattress.

Data collected included mattress model, bed model, mattress date of manufacture (if tag present), stains present on mattress cover (external surface of top of cover, external surface of the bottom cover, inside top of cover, inside of bottom cover), damage to zipper or outside air connections, punctate defects in cover noted without LED light, punctate defects in cover only seen with the use of an LED light, holes in the fire barrier, foam damage (compression, tearing, or crumbling), damage to inside air connections, unacceptable gel compression (>3.2 cm), and rust visible on bed deck (ie, isolated or widespread).

Results

In total, 727 beds and mattresses were evaluated. Of these, 523 (72%) were damaged; 340 (47%) were recommended for replacement of the mattress cover, and 183 (25%) required replacement of the entire mattress (cover and core). Of those requiring replacement of the entire mattress, 174 (95%) had large staining (>15.2 cm) visibly present. An additional 6 mattresses had gel failure, and 3 mattresses did not have a reason recorded. Of the 340 covers that needed replacement, 176 (52%) had visible holes or staining of the inside of the cover (Table 1). The fire barrier had damage in 79 (11%) of the beds. Bed deck rust was identified on 175 beds (24%), and widespread rust was observed on 65 beds (9%).

Only 300 (41%) of the 727 mattresses evaluated had tags indicating the date of manufacture (Table 2). Damage requiring replacement of the cover was present in 151 (50%), of which 123 (81%) were <4 years old. Damage requiring complete replacement (cover and core) was present in 58 (19%), of which 33 (57%) were <4 years old.

Table 1. Beds For Which Only the Mattress Cover Was Recommended for Replacement

Condition	No Stains on External Surface or Inside Mattress	Stains on External Cover but No Stains Inside	No Stains on Surface but Localized or Midsized Stains Inside Mattress Cover ^a	Stains on Surface and Localized Midsized Stains Inside Mattress Cover ^b	Total Covers Replaced
No punctate defects or holes		20	8	1	29
Localized: punctate defects not readily visible without light	164	31	35	23	253
Several small and visible scuff defects	8	9	15	6	38
Widespread: large and readily visible holes	6	7	2	5	20
Total covers replaced	178	67	60	35	340

^aLocalized stains were <7.6 cm.

^bMid-sized stains were 7.6–15.25 cm.

Table 2. Age of Mattresses When Tag Was Available

Age of Mattress	Mattresses, No. (%)	Mattresses with Damage of Cover or Core, No. (%)	Mattresses With Replacement of Cover Only, No. (%)	Mattresses Completely Replaced (Cover and Core), No. (%)
0–12 mo	8 (2.7)	1 (0.5)	0 (0)	1 (1.7)
13–24 mo	67 (22.3)	16 (7.6)	16 (10.6)	0 (0)
25–36 mo	54 (18.0)	42 (20.5)	28 (18.5)	14 (24.1)
37–48 mo	113 (37.7)	97 (46.2)	79 (52.3)	18 (31.0)
49–60 mo	29 (9.7)	25 (11.9)	20 (13.2)	5 (8.6)
61–72 mo	8 (2.7)	7 (3.3)	4 (2.6)	3 (5.2)
73–84 mo	9 (3.0)	9 (4.3)	3 (2.0)	6 (10.3)
85–96 mo	8 (2.7)	8 (3.8)	1 (0.7)	7 (12.1)
97–108 mo	1 (0.3)	1 (0.5)	0 (0)	1 (1.7)
108–120 mo	1 (0.3)	1 (0.5)	0 (0)	1 (1.7)
>120 mo	2 (0.7)	2 (1.0)	0 (0)	2 (3.4)
Total	300	209	151	58

Discussion

Mattresses arguably represent the single highest-touch element for a hospitalized patient, and damaged mattresses pose a potential patient safety risk. The current study showed that most beds (72%) in a hospital system in the midwestern United States had damage. This research is the first to demonstrate that many of the failed mattresses were <4 years old and that the prevalence of rust on the bed decks was substantial.

The higher rate of damage noted in the present study may be attributable to the inspection process, which included the entire interior of the mattress and use of an LED light. In the current study, we identified obvious failure in 49% of mattresses and small punctate defects in 23%. Examining only obvious failures, the results did not appear qualitatively different than those of prior reported studies, which have reported failure rates between 27% and 33%.^{7,8} In the study by Bradbury,⁷ 27% of the mattresses had interior damage from leaking, which was similar to our study, in which 24% had large stains (>15.25 cm). Bradbury did not report on damaged covers without staining. Identification of small punctate defects is important because they can lead to mattress

failure. In our study, 62 of the 174 mattresses with large interior staining only had small punctate defects in the cover. The Centers for Disease Control and Prevention (CDC), the US Food and Drug Administration (FDA), and mattress manufacturers recommend replacement of damaged mattresses and covers due to infection risk.⁴

The American Hospital Association states that the depreciable life of the mattress is 5 years, and mattress manufacturers state that the expected life of the mattress is only 1–3 years.^{5,6,9} In this study, the most mattress failures (52%) were in mattresses that had been in service for <4 years. At a minimum, these results indicate that routine inspections of all mattresses, even recently purchased ones, is necessary to minimize patient safety risks.

The bed deck is expected to last 5–10 years according to manufacturers.^{5,6,9} The current study is the first to report on the percentage of rust found on the bed decks. We detected rust on 24% of the beds, and 9% of all beds had widespread rust, which makes cleaning and disinfection difficult. To properly repair these rusted beds, they must be sent out for sandblasting and powder coating.

The current study must be interpreted in light of a few limitations. First, although 4 hospitals were involved in the study, they were all part of a single healthcare system. Second, the beds and mattresses were primarily from a single manufacturer. Third, only 300 (41%) of the 727 mattresses evaluated had a tag identifying the date of manufacture. Despite these limitations, our findings, coupled with prior studies, support the need for routine inspections of beds and mattresses to minimize infection risk.

In conclusion, these findings confirm that damaged mattresses are common in hospitals, which potentially places patients at increased risk for infection. The rate of failure was higher in this study than those reported in previous studies, which may be attributable to enhanced visual inspections and interior inspections. Most of these failed mattresses were <4 years old, and many of the bed decks had rust, indicating that even relatively new beds and mattresses require routine inspection for damage.

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Conflicts of interest. Dr. Hooker is a medical advisor for Trinity Guardion, which manufactures a launderable bed barrier.

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