Hygienic Patient’s beds sanitation

1. Problem

Used patient’s beds (for this term see annotation 10.1) are microbiologically contaminated. Hospital-hygienic studies not only revealed patient-dependent spectrums of pathogens including multi-resistant pathogens [15,16,20,22] but also that such beds are a source of nosocomial infections [10,11,12,13,18,19]. The risk of infection becomes evident when the patient contracts a contagious disease or is colonized with multi-resistant problematic pathogens. Regarding diseases like wound infections, pneumonia including productive coughs, nosocomial urinary tract infections, intestinal infections etc. the risk of a contamination of the bed is very high indeed [14].

As hospitalized patients in general are more susceptible to infections than healthy people, the conclusion is that, in contrast to hotel beds, hospital beds should be disinfected in order to prevent a colonization and infection with pathogens and their spread. This, in turn, calls for demanding precise sanitation regulations [17].

2. Hygienic, safety-related and ergonomic requirements

The patient’s need for protection means that in terms of hygiene, thermo-physiology, safety and ergonomics and additional equipment all hospital beds have to meet the following requirements:

- Every hospitalized patient is entitled to a clean, disinfected and freshly mad bed. The same shall, in turn, apply to out-patient facilities.
- Patient’s beds have to meet the DIN EN 60601:2-38 standard. As class 1 medical products, electrically and mechanically operated beds are subject to the Medical Devices Act (Medizinproduktegesetz). Regarding cleaning and disinfection, the bed frame and additional parts affixed to the bed frame have to be sanitation-accessible, if need be.
- The patient’s thermal comfort (breathable “encasings” and breathable, comfortable bed linen) has to be guaranteed.
- In special situations, it has to be possible to clean and disinfect the mattress separately from the bed frame.
- The various parts of a hospital bed become contaminated or soiled in a very disparate fashion. This is what the sanitation frequency is based upon. The different contamination rates influence the reprocessing.

Bed frame and additional parts affixed to the bed. The design always has to allow a complete cleaning and disinfection of and on all components, including removable and additional components. Components that do not allow such a cleaning and disinfection, e.g. non-water-proofed electric motors, electronic control panels etc., must not be used. Components in which liquids might form a deposit are also inadmissible. Hollow parts have to be liquid-proof. The bed frame’s surface has to be smooth, fast-drying and resistant to the disinfection procedures provided for.

Mattress and mattress “encasing”. The recommendation for a manual sanitation of the mattress is a disinflectable, liquid- and pathogen-proof but breathable encasing that at least covers the lying surface and sides [23]. This makes it necessary to sanitize the mattress when there is a visible stain, e.g. if the encasing is damaged. It is a hygienic advantage that with synthetic encasings, in contrast to cotton encasings, there was no significant increase in the concentration of mite antigens. The mould and bacteria colonization rate was also much lower [24, 25].

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Bed linen: The bed linen, including all incontinence pads, pillows and duvets, has to be breathable. Sheets and duvet covers are thermally or chemo-thermally disinfected with every wash cycle [1,7,8]. However, to provide more comfort, the sheets are, as a rule, not waterproof so that, if need be, the fillings also have to be sanitizable. Such filling materials have to be suitable, i.e. no plant fibers, animal hairs, thermo-labile or slow-drying plastics may be used.

Pillows and duvets In case of visible stains, of a use in risk-prone areas (ICUs, patients suffering from contagious diseases, MRSA), of patients with wounds,
3. Organization of bed reprocessing

Reprocessing of beds can be organized in a centralized or decentralized manner (see annotation 10.2). If organized centrally, the reprocessing procedures have to be validated. If organized in a decentralized manner, the reprocessing procedures have to be standardized, documented as instructions (e.g. in the hygienic plan or as a standard instruction) and to be randomly checked. Either organizational mode has to make sure that the beds are properly sanitized, that is, all visible stains are removed, and industrial safety regulations are being complied with.

The centralized mode is increasingly being dispensed with in favor of a decentralized organization for reasons of costs (bed washing system, bed transport, space requirements, transport covers, staff) [2].

Reprocessing of beds can be assigned to the nursing, transportation or cleaning service. The most cost-efficient way is to have it done by the cleaning service [2], in which case the cleaning companies are responsible for a hygienically perfect hand-over of the beds and the hospital hygiene specialist for giving pertinent instructions and monitoring the cleaning staff's work.

4. A daily reprocessing when there is no change of patients

Cleanliness in visual terms aside, infection chains are also to be interrupted and a re-colonization to be prevented.

The cleaning service will disinfect and clean stains on the bed and the bed side table once a day and all the patient's bedside objects and surfaces will be wiped clean and thereby be disinfected (wipe disinfection, see annotation 10.3). The nurses, when caring for the patients, will also subject all visible contaminations, e.g. through excrements, blood and other bodily fluids, to a cleaning wipe disinfection.

When the patients do not suffer from a known colonization or infection with critical pathogens, the bed linen, pillows and duvet fillings are only exchanged if there are visible stains. Patients with a known critical colonization or infection require a daily exchange of their bed linen [26]. For immuno-compromised patients (e.g. in ICUs, high-dose chemo patients) it is recommended that the bed be changed once a day.

If a patient is colonized or infected with multi-resistant pathogens, the pillows will be put in a encasing, which will be wipe-disinfected once a day and whenever there is a stain. Alternatively, the entire pillow is sanitized once a day. The mattress encasing is also wipe-disinfected once a day.

For patients who do not stay long, only a few hours (e.g. outpatients, day clinic patients, dialysis patients), the recommendation is to use stretchers with washable and disinfectable surfaces. However, stretchers have to provide sufficient comfort. If the lying surface is covered whenever a new patient is lying down on it, the stretcher only has to be wipe-disinfected when stained or, otherwise, once a week.

5. Bed and bed linen sanitation upon discharge and transfer

From hygienic point of view, you can, of course, sanitize the beds in an occupied hospital room. After all, the dust and pathogen spread is no different from what happens when the beds are made in the ordinary manner. The precondition is that during the sanitation process no nursing is done and no medical care is given.

The wards' halls should not be used for sanitation purposes since their normal use is disrupted and visitors get a bad impression [2].

When a patient has been discharged, the bed linen is completely removed and put in the laundry bag forthwith. The bed frame (if within the patient's reach), encasings, bedside table and closet are disinfected (see annotation 10.3). Mobility aids at the bed are also wipe-disinfected. Positioning aids are sanitized. The bed will then be changed and covered in a dust-proof film (unless the bed will be re-occupied shortly). The cover will later be disposed of or sanitized.

When disinfecting the encasing it has to be visually checked if it is defective, wet or soiled. If so, it will be removed and disposed of and a new encasing used.

The patient's telephone and other vertical panels will also be wipe-disinfected.

To ensure a smooth process, the sanitation team has to be notified on a daily basis of the number of discharge beds that will have to be sanitized. There also has to be staff on call to sanitize discharge beds the team's plans have not provided for.

6. Sanitation of pillows and duvet fillings upon discharge or transfer, in accordance with the risk of infection

(see annotation 10.4)

There are two sanitation categories:

A. Patients without critical colonization or infection;
B. Patients with high infectivity or critical colonization and/or contagious infections with nosocomial critical pathogens, e.g. CJD or suspected CJD or a variant.

The respective sanitation processes require different disinfectants (e.g. sporidical disinfection in cases of Clostridium difficile-associated diarrhea, virucidal disinfection for non-virus diseases [27], different protective clothes, a different handling of the pillows and duvet fillings and different forms of disposal. The protective clothes are provided on the ward.

In category A, pillows and duvet fillings are not routinely exchanged but checked for stains, moisture, sweat, odor and damage and only exchanged if need be.

In category B, the pillows and duvet fillings are exchanged. Pillow encasings, if applicable, are wipe-disinfected and/or, if soiled, removed and sanitized.

How to break down the discharge beds in terms of the above categories is the respective shift's head nurse's responsibility. The head doctor of the ward is in charge. The beds are labeled, giving the category and, if need be, the pathogen.

For a patient-related sanitation, the cleaning service has to be notified of the bed's respective category.
10. Annotations

10.1 Terms

The patient’s bed includes:
- the bed frame, which can be rigid as such or flexible in parts. The flexible parts can be moved manually, hydraulically, electrically or in a combination of the above modes.
- additional parts affixed to the bed frame, e.g. motor rails, holders, positioning aids and hitches for the extension treatment of fractures, assist rails, IV holders, urine bottle holder etc.,
- electric and electronic re-positioning parts,
- the mattress and incontinence pads,
- pillows, duvet and bed linen,
- the bedside cabinet as a mostly not bed-integrated additional part.

10.2. Centralized vs. decentralized sanitation

While in 1991, the Lehrbuch der Hygiene [3] (hygiene textbook) only described the centralized reprocessing process, pertinent paperbacks of the 1990s refer to hospital hygiene guidelines and infection prevention policies of the then BGA (federal health authority) and thus to the possibility of using a decentralized or partly decentralized bed sanitation process [4,5], with a clear preference for a centralized mode, however. Arguments against the decentralized or partly decentralized sanitation process included the assignment of such non-nursing jobs to the staff on the ward, a possible spread of pathogens in combination with a risk of infection on the part of the patients when beds are being sanitized in the patient’s rooms, a lack of storage facilities for sanitized beds for a fast availability and the uncontrollable disinfection of the bed frame.

Given the streamlining of hospital processes and also the technical complexity of patient’s beds, over the past few years a question mark has been put behind the centralized bed sanitation process and here particularly behind automated bed frame cleaning and disinfection processes. The lack of validated data meant that rather emotional arguments were employed whereas decisions had to be taken on which process to use [6]. As the result of a comprehensive efficiency analysis of all three bed sanitation processes it was not only found that a decentralized mode was economically beneficial but clear standards for an implementation of such a measure were also come up with [2].

The major cost categories are construction costs, investment costs, maintenance and repair costs, material costs, equipment costs, staff costs and bed transportation costs. Every sanitation mode incurs different costs. Staff costs form the bulk of the sanitation process cost total (up to 89 percent). For a centralized sanitation, the bed transportation costs are the most significant costs. Regarding centrally automated sanitation, the equipment costs also form a significant part of the cost total (up to 45 percent). It is no wonder then that these two categories provide the most cost reduction potential, too. Staff costs can be reduced by selecting the group of workers to run the sanitation service. By comparison with the decentralized mode, the costs of a centralized manual and automated sanitation are 2.9 and 4.5 times as much respectively - at identical sanitation results. Since regardless of the sanitation process employed, the staff costs form the bulk of costs in terms of percentages, assigning sanitation to the most cost-efficient occupational group, that is, the cleaning service, in combination with clear instructions regarding the beds’ risk category after a discharge or transfer of patients and pertinent sanitation requirements makes for a savings potential of up 61 percent [2].

10.3 Diagram of the scope of the disinfecting cleaning [28].

Illustration 1: daily sanitation with no change of patients - red = required disinfecting cleaningic desinfizierende
11. Legal bed sanitation regulations

As medical products, beds are subject to the Medical Devices Act (Medizinproduktegesetz, MPG) and the Medical Devices operator Ordinance (Medizinprodukte-Betreiberverordnung, MPBetreibV). Land-specific bed sanitation regulations in § 23 of the Hospital Establishment and Operating Ordinance (Verordnung über die Errichtung und den Betrieb von Krankenhäusern, Krankenhausbetriebs-Verordnung - KhBetrVO) may also apply [9].

11. References

The "guidelines" of the Scientific Medical Societies are systematically developed supports for
decision making of physicians in specific situations. They are based on scientific knowledge and
practically proofed procedures and care for more security in medicine, but also shall take
economic aspects into account. The "guidelines" are non-obligatory for physicians and have
neither liability-establishing nor liability-liberating effects.

AWMF enters and publicates the "guidelines" from the specialty societies with maximal attention. Nevertheless no
warranty can be token for the accuracy of the content - especially not for instructions of dosage.