Recommendation of the Commission for Hospital Hygiene
and Infectious Disease Prevention,
located at the Robert Koch-Institute

ROBERT KOCH INSTITUT

Infection prevention in long-term care facilities

1. Introduction

With the constant rise of life expectancy, the number of people with chronic diseases, immunodeficiencies and disabilities increases which leads to a rise in multi-morbidity and need for care. One consequence of the health care reform is the earlier transfer of patients still requiring care from acute care facilities to long-term care facilities (LTCFs), nursing homes, or home. With respect to the different skills and qualifications of care providers (e.g. physicians, geriatric caregivers, nursing staff or trained personnel) it seems to be necessary to work out an own schedule of the requirements for infection prevention.

Such a schedule should help the person in charge to get summarized information on how to prevent infections associated with medical measures.

About 557.000 people lived in LTCFs in Germany in the year 2000, 85% of them being older than 65 years. The need of long-term care accommodations will increase to 800.000 new only in 2030. [1]. Medical care is increasingly shifted from inpatient to outpatient care, and infection risks in outpatient settings can reach those for nosocomial infections in hospitals.

The compliance with the necessary measures aimed to reduce such risks meets the demand of the WHO for an improvement of quality of life for the elderly. In addition these measures would help reducing costs.

Since the essential measures to prevent infections are mainly attributable to the type of medical treatment rather than to the nature of healthcare institution, our readers will find overlaps to other recommendations already published for the use in hospitals [2]. Approved measures are applicable to the situation in LTCFs, this will be noted in the respective headings. For better use in daily practice recommendations of fundamental importance will be mentioned again and differences to other recommendations will be pointed out.

2. Target groups and scope of application

This recommendation addresses mainly to non-hospital facilities offering medical and other related health care services. It could also be helpful for other types of nursing, e.g. home care. However, we would like to point out that this recommendation does not deal with problems and requirements of specialized facilities providing care to mentally, psychologically or other heavily handicapped persons as well as children.

Recommendations mentioned in this paper are addressed to the responsible administrative bodies of health care facilities and to the personnel working in these establishments.

3. Risk of infection

The risk of infection associated with care of elderly and care-needing patients is largely determined by the immunological status but also by the nursing, medical and hygienic measures required. Increased infection risks may result from chronic illnesses (e.g. diabetes mellitus), immobilization, wounds (e.g. decubitus ulcer) or altered states of consciousness (including dysphagia).

But also age-specific aspects have to be considered by each hygiene management to avoid the risk of infections, e.g. a consequent oral hygiene meaning regular tooth brushing and denture cleansing including prostheses to prevent caries, gingivitis and parodontitis. Generally speaking an adequate oral flora helps to avoid significant disseminated infections (e.g. pneumonia, endocarditis) [3].

The requirements of infection prevention may also differ depending on the type of care provided. Risks can be divided into two groups: those related to care “with predominantly social support” of mobile patients and those related to care “with predominantly nursing support” of e.g. bedridden patients.

Health care facilities have many common features: On the one hand there are residents who are still mobile and not predominantly bedridden which means they live independently and are able to supply themselves more or less autonomously. On the other hand there are residents who are unable to manage independently in the community and have a serious persistent individual impairment which requires continuous care and treatments.

Infections are not rare among the latter and can occur either endemically or epidemically (see also table 3) [4-13]. With respect to the free choice of the general practitioner (by residents), it is necessary for facilities to have a common standard to prevent infections, especially for treatments involving an increased infection risk or epidemic potential.

Hygiene standards have to be equally followed during care in outpatient settings, taking into account the individual situation of the patient. This requires flexibility and know-how.

The placement of patients into community facilities increases the risk of disease transmissions [6-7,9]. Acute infections are a common cause of hospitalization among residents of LTCFs contributing to mortality of residents [14-15].

Colonization by multi-drug-resistant pathogens constitutes another growing problem [7,11-12,16-19]. Similar to hospitals there is an increasing occurrence of multi-resistant bacteria selected by usage of antibiotics in LTCFs. Such multi-resistant bacteria can be imported e.g. when residents are transferred from a medical institution back to their LTCF [20-25]. Factors that contribute to increase the risk of colonization or an infection with antibiotic-resistant pathogens (e.g. *MRSA*, *VRE*, enterobacteria) are listed in Table 1. Routes of transmission in LTCFs are often similar to those in hospitals. Again, the hands of the personnel are of major importance.

– Table 1 -

Major risk factors for an infection or colonization by multi-resistant pathogens [16, 17, 18, 19, 38, 107, 125, 126, 127]

Patient factors	**External factors**
• High age • Immobility • Functional disorders concerning ingestion (e.g. dysphagia or excretion (e.g. voiding dysfunction) • Multimorbidity, especially chronic diseases • Diabetes mellitus, need for dialysis • Chronic skin lesions, decubital ulcer, eczemas, weeping dermatitis	• Invasive procedures (vascular catheter, foley catheter, feeding tubes, tracheal cannula/ tracheostomy tube) • Repeated antibiotic therapy (for MRSA: especially quinolones and third-generation cephalosporins) • Frequent hospitalization

An effective infection prevention presupposes the well planned interaction of measures. Every aspect of these levels will be presented in detail below and will provide a basis for a concept of infection prevention in LTCFs.

4. Personnel and organization requirements

In order to provide adequate support and care for the elderly in LTCFs, essential prerequisites have been stipulated in the *German law on long-term care facilities* (Heimgesetz) (see art. § 11 par. 1) [2]. According to named act, the responsibility of the institutional board of each facility is as follows:

- to ensure care according to the general acknowledged medical and care standards as well as medical attendance and health care
- to allow an appropriate life style

- to ensure an efficient protection against infections and to assure the compliance with the relevant hygienic standard by the employees in their field of work
- to assure the professional and personal qualification of the employees for the arising tasks
- to run a quality management

With respect to mentioned rules, the responsible bodies have to make sure that requirements are fulfilled, i.e. employment of adequately trained staff, the creation of suitable organizational conditions and the implementation of internal regulations. As a result there are different requirements depending on the kind of institution and the care needed (see chapter 3). Since all facilities depend on external services (e.g. medical care including the individual choice of the treating physician, external service providers) there is a need to co-ordinate them, considering the aspects of infection prevention (e.g. communication between various physicians).

So far, there haven't been any comprehensive researches on the influence of infection control programs and infection control activities with regard to the increase/ decrease of infections in LTCFs [27-30]. However, some controlled randomized studies confirm the effect of staff education and training on the reduction of infections [31-32]. Hence, the following recommendations regarding the personnel and organizational conditions of infection prevention are essentially derived from the extensive experience acquired in hospitals, as well as from results of individual investigations conducted in nursing homes and conclusive notes about their effectiveness [4-5,8,11-13,33].

4.1 Healthcare professionals (geriatric caregivers and nursing staff)

A substantial basis for adequate infection prevention is the presence of the necessary expertise [34-36]. This affects all relevant fields of activities and may also require permanently employed healthcare professionals depending on the size of institution and on the level of care provided, (see also the German Home Personnel Regulations (Heimpersonalverordnung) allocating specific requirements such as 50% qualified medical employees) [34].

4.2 Infection control staff

The employment of a person in charge of hygienic measures who completed an advanced training in the field of infection prevention, would ensure the proper implementation of this recommendation in facilities [31-32].The German

Association of Hospital Hygiene issued a guideline (Leitlinie der Deutschen Gesellschaft für Krankenhaushygiene) dealing with the required contents of such an appropriate advanced training [37]. The main tasks of infection control staff are conveniently specified in a work instruction description/ guideline (QM/ German law on long-term care facilities- Heimgesetz).

4.3 Hygiene Committee

Infection prevention can only be successful if seen as a duty of the entire institution. In this respect it is necessary to create a suitable forum in which solutions for institution-specific problems get compiled and questions regarding infection prevention involving all partners can be discussed (representatives of the institutional board, administration, physicians and nursing representatives, eventually also residents or members of their family). Thus, it would be useful to form an internal hygiene committee and to hold regular meetings. The mentioned committee shall consist of one representative of each relevant occupational group, including a hospital hygienist, if needed, potentially involving the official advisory counselor(s) designated by law. Functions of this forum would be to define key issues for infection prevention dealing with facilities' respective needs, and to gain major acceptance within the facility, which is a precondition for a successful implementation of preventive measures.

4.4 Cooperation with general physicians

The involvement of the general physician (chosen by the resident) is quite crucial for an efficient and coordinated prevention of infections.

The coordination can be facilitated by cooperating with the local medical associations and the Association of Statutory Health Insurance Physicians (regional). Early and specific diagnostics as well as initiating a rational therapy is decisive for infection control. It's of fundamental importance to have such a cooperation which also helps to prevent spreading of pathogens and to avoid the development of antibiotic resistance or selection of resistant strains.

Beside the individual microbiological findings and therapeutic decisions, the epidemiological evaluation of clinical findings of other residents may be necessary to identify disease outbreaks.

Therefore, a considerate cooperation of physicians involved with the administration board, the internal hygiene committee and the hospital hygienist of the facility is to strive for. Furthermore medical confidentiality but also the statutory established guidelines (*German Infectious Diseases Protection Act /*

IfSG) shall be respected. The general basis of such efforts is the physician's responsibility to ensure the highest possible quality of work.

The attending physician has to ensure a thorough documentation of medical decisions (e.g. choice and duration of antibiotic therapy) and the strict adherence to them by the nursing personnel. The rational use of antibiotics by physicians is just as crucial as the hygiene plan since selection and resistance induction of bacteria are main reasons for the occurrence of infections with multi-resistant bacteria.
Therefore, an "infection control quality circle" could be established, motivating all responsible physicians to ensure a continuous infection control quality management.

4.5 Hygiene plan and infection control concept

Facilities according to the German law on long-term care facilities (Heimgesetz, section § 1, 1a) are committed to specify their internal policies in well-elaborated hygiene plans according to section § 36 of the German Infectious Diseases Protection Act (IfSG) [40] and to the German Technical Rules on Biological Products (TRBA) 250 [41] to minimize infection risks for residents as well as the personnel. The factors to be considered in such a hygiene plan as per IfSG [42] are as follows:

- Infection risk analysis specific to the facility and their different fields of activity
- Assessment of risks for which risk-minimizing measures are compulsory
- Stipulation of specific measures to minimize risks
- Methods of controlling the adherence to infection prevention measures. These methods should demand a reasonable work load.
- Review of the hygiene plan regarding efficiency and possible updates at stipulated periods
- Detailed precision of the hygiene plan and training of the personnel

The hygiene plan should be elaborated by a team (hygiene committee) consisting of employees from different sectors of activities in the institution. Local health authorities may be consulted if necessary. Already existing and approved hygiene plans can be referred to. The German legislature has recognized that "due to the diversity of facilities concerned (...) hygiene plans must be adapted to the different requirements" [42]. Topics to consider and contents of such a hygiene plan are listed in Appendix 1.

The German law on long-term care facilities (Heimgesetz); (§ 11, para. 1 No. 9) calls for the assurance of "a sufficient protection of residents against infections" and "the rigorous observance by the staff of hygienic requirements specific for their field of activity" [26].

Comprehensive concepts elaborated to prevent infections are also part of the quality management (QM) of facilities. In section §135a of the *German Social Security Code* (SGB) V (43), the QM entails the implementation of following elements:

(1) The healthcare providers are obliged to ensure and develop the quality of care and services offered. Care and services must be provided according to the latest scientific findings and with the respective quality.

(2) SHI-authorized physicians, facilities providing medical care, accredited hospitals, healthcare or rehabilitation providers and facilities under contract according to section §111 a, are compelled after sections 136a, 136b, 137 and 137d:

- to participate in interdisciplinary quality assurance measures established by the institution to improve the quality of outcomes, and to join comprehensive measures of quality assurance aiming at the improvement of results

- to introduce and develop an internal quality management.

This can be ensured if geriatric care facilities and nursing homes:

- have adequately trained personnel (Cat. IV, [34])
- assign infection control staff (Cat. III)
- take appropriate measures (hygiene plan) to prevent infections (Cat. IV [42])
- implement a "hygiene committee" or "infection prevention quality circles " (Cat. III).

5. Basic hygiene measures

Healthcare standards, based on recommendations of the respective associations, should be defined dealing with various nursing and medical care concerns. Thereby, hygienic aspects shall be duly considered for all procedures.

5.1 Hand hygiene

(See also recommendation „Hand hygiene“ of the German Commission for Hospital Hygiene and Infectious Disease Prevention [2])

The hands of the personnel are playing an uncontested and decisive role in the transmission of infectious pathogens. Consequently, hand hygiene is considered congruently as **the** pivotal measure of infection prevention. In the context of an

intra-institutional quality management, it has to be ensured that hand disinfection facilities are available at all points of care and nursing. Generally, the same requirements for hand hygiene are applicable for long-term care facilities as in hospitals. "Hygienic hand disinfection" is particularly required in following situations (all Cat. IB):

- Prior to aseptic procedures (e.g. preparation of infusions and medication).
- Before proceeding of invasive measures, even if gloves (sterile or non-sterile) are worn (e.g. insertion of urethral catheters, punctures).
- Prior to any direct contact with residents having a considerable risk for infections (e.g. immunocompromised patients).
- Before and after contact with body areas that should be protected from contamination (e.g. wounds during dressing change, manipulations of IV / urethral catheters, tracheostoma, IV infusion set = “drip”).
- After contact with blood, excretions or secretions (e.g. drainage)
- After contact with residents colonized or infected with germs that can be transmitted and/or are of special hygienic relevance (e.g. MRSA).
- After contact with potentially contaminated articles, liquids or surfaces (urine collecting system, suction devices, tracheal tubes, drainages, laundry).
- After removing disposable gloves in case of a certain or likely contact with a pathogen or an evident contamination.

5.2 Protective clothing

In the legal sense of the *German Technical Rules on Biological Products (TRBA*) 250 [41], a protective clothing is any cloth worn on the job intended for protecting nursing staff during their work against detrimental effects as well as to secure their personal garments from contamination by biological products. Protective working clothes shall be always available to the staff [42]. In addition, wearing protective clothing (e.g. gowns, gloves, mouth and nose covering mask) prevents further spreading of pathogens [44-45]. The selection of suitable protective clothing depends on:

- the type of medical activity / care provided and the associated risk of contamination
- the pathogenicity (or as well resistance) of a germ and its transmission.

This leads to the following recommendations concerning protective clothing:

- A surgical mask should be used if an exposition to infectious aerosols is very likely (e.g. aspiration of residual secretions of tracheostomised residents) (Cat. IV [41]).
- In the case of a possible exposition to body fluids (e.g. blood), secretions or excretions (e.g. change of dressing, handling of urinary drainage system) (Cat. IV [41]) disposable gloves should be worn.
- If a forefront contamination of working clothes by blood, secretions or excretions (urinary drainage system, wound care) is likely, an apron should be worn (Cat. IV [41]).
- If an eventual contamination of arms and clothes by pathogens is expected a protective gown (long arms with cuffs) should be worn (e.g. care measures of residents having diarrhea, large infected wounds or when dealing with resistant germs) (Cat. IV [41]).

In such cases, protective clothing has to be used resident related.

5.3 Processing of medical devices and care items

5.3.1 Medical devices

(See also recommendation: „Hygienic requirements for processing of medical devices" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Processing of medical devices should be performed according to the *Medical Devices Act* (MPG) [46], *German Ordinance on the Installation, Operation and Use of Medical Devices* (Medizinprodukte-Betreiberverordnung) [47] and also taking into account the manufacturer's instructions of agreed and validated procedures. Thus, Medical devices, expected to be free of pathogens or sterile, should be reprocessed properly that the success of each method is guaranteed as well as comprehensible in order to ensure the security and health of patients, users or a third party (Cat. IV [46-47]).

For this reason, a regulation containing extensive details how to reprocess medical devices, a definition of responsibilities and standard operating procedures have to be developed.

5.3.2 (Patient/resident) care items

Depending on the facility and each resident, shared body care articles (e.g. pedicure set, manicure set, shaver) can contribute to the spread of pathogens. Consequently each resident shall possess his/ her own manicure/ pedicure set(s) as well as other personal care articles. Otherwise appropriate disinfection measures shall be taken. In the case that hand- and foot care services are

performed by an external service provider, properly processed instruments shall be used for each resident. Especially electric shavers should be decontaminated personally for each resident or hygienically reprocessed between uses. Please find in the following recommendations referring to selected body care articles. Finally, also corresponding hygiene regulations of the federal states of Germany have to be followed (Cat. IV).

5.3.2.1 Care items (bedpan, urinals, etc.)

Personnel protection and process safety (validated procedures, controls in regular intervals), as well as to facilitate work the reprocessing of care items by washer-disinfectors should be preferred to manual reprocessing (Cat. II).

5.3.2.2 Wash basins, hip bath, shower trays and bath tubs

(See also the recommendation "Hygiene requirements for cleaning and disinfection of surfaces" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

If residents are infected with and/or colonized by pathogens with special resistance/ multi-resistant resulting in a risk of transmission (e.g. diarrhea), bath tubs or wash basins must be cleaned and disinfected prior to their use by other residents (Cat. IB). Additionally, for residents at increased risk of infection (e.g. non-intact skin areas, decubitus), disinfection of bath tub/wash basin has to be performed before and after each use (Cat. II).

5.3.3 Reprocessing of linen and laundry

Although handling and processing of soiled linen has been reported as possible source of transmission of pathogens in hospitals, no relevant observations in long-term care facilities (LTCF) have been published so far [48-49]. However, it seems to be appropriate to disinfect beds properly if there are specific risk factors (see table 2). Mattress maintenance has been facilitated considerably by the use of protective covers which are breathe-active and resistant to disinfectants.

Since linen is generally used by all residents; mixture of laundry during collecting, transporting and sorting processes is unavoidable. Therefore a disinfecting procedure (e.g. boil wash or washing at 60°C, in addition using a disinfectant) must be chosen.
Residents' personal laundry (e.g. clothes) can usually be washed the same way as laundry in private households. During outbreaks of pathogens transmitted by

contact and if persons colonized with MRSA are identified, it is recommended to apply a certain disinfecting procedure while washing underwear, towels, face-cloths as well as bed linen of affected residents.

Soiled linen should be removed at the bedside and collected directly in a designated cloth bag, which can be stored temporarily in appointed laundry storage areas until final processing [41, 49a).

Maintenance of long-term care beds

	Bedframe	Mattress	Bedding/ bedclothes	Linen
Routine methods	Cleaning at regular intervals or if soiled	Normally not necessary to treat. Cleaning if soiled	Normally not necessary to treat. Cleaning if soiled	See point 5.3.3
Contamination with infectious materials	Wiping disinfection	Disinfection of mattress covers if resistant to disinfecting agents. Wiping disinfection	Disinfection (thermal or chemothermic)	See point 5.3.3
Switching of users/residents presenting no particular risks	Cleaning	Cleaning	Cleaning	See point 5.3.3
Switching of users/residents presenting a particular risk [a]	Wiping disinfection	Disinfection of mattress covers if resistant to disinfecting agents. Wiping disinfection	Disinfection (thermal or chemothermic)	See point 5.3.3

[a] Residents with detected infectious diseases or who are colonized by multiresistant pathogens.

5.4 Cleaning and disinfection of surfaces

(See also the recommendation "Hygiene requirements for cleaning and disinfection of surfaces" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Considering issues of infection prevention, surfaces must always be kept clean and dry.

To avoid the spread of microorganisms, cleaning articles (e.g. cloths, cleaning mops) must be available in sufficient number and have to be treated using automatic thermal procedures after use. In addition these articles must be fully dried before reuse. Special situations may require disinfection of surfaces in long-term care facilities. E.g. in the case of contamination with potentially infectious material, the removal shall always be performed using a targeted disinfection method. Details must be described in a hygiene plan considering individual housing conditions (e.g. single rooms).

In facilities or places offering social care, it is usually sufficient to perform a routine cleaning like in households. Should contamination with potentially infectious material occur, targeted disinfection measures may be appropriate for individual cases (e.g. risk for infection transmission).

6. Specific targeted measures to prevent infections

6.1 Prevention of urinary tract infections (UTIs)

(See the recommendation "Prevention of intravascular catheter-associated infections" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

In long-term care facilities and elderly care centers, UTIs are the most frequent infections, largely attributable to the use of transurethral catheters. 5% to 10% of residents in LTCFs are catheterized; however, the rates are even higher in facilities nursing patients in particular need for care and can rise to as much as 50% [11-13]. Because of the high infection risk associated with the use of catheters, practice of urinary catheterization must be reduced to an inevitable minimum. Consequently, strict medical indications are the only reason for inserting an urinary catheter and should exclusively be defined by the attending doctor. In terms of infection prevention, possible alternatives to the use of indwelling urinary catheters (e.g. condom urinal, drip collectors, absorbent pads or diapers; insertion of an artificial urinary diversion if there is a specific indication) should be favored in case of long-standing or permanent incontinence.

Noncatheterized residents having functional disorders or chronic diseases may also have bacteriuria, possibly resulting in UTI.

Organisms causing urinary tract infections usually stem from the body's own bacterial flora.
Furthermore, transmissions between residents (e.g. by hands and/or care items like urinals, bedpans, urine collectors, urometers) can also occur and may be the source of outbreaks [50-54]. Therefore the following points apply to all forms of urinary catheterization [all Cat. IB]:

- Urinary catheters may only be inserted under aseptic conditions strictly following medical indications and should be removed as soon as possible. Only personnel familiar with antisepsis and aseptic procedures and techniques should be in charge of inserting and maintaining catheters.
- Manipulations of urinary drainage systems (e.g. urine collection) are to be performed according to a strict aseptic technique and should be reduced to the necessary minimum.
- A hygienic hand disinfection should be performed before and after each manipulation of indwelling urinary catheters or urine drainage systems.
- Irrigations and instillations should only be performed on special urological indication and not for prophylactic reasons. Irrigations with antiseptics or antibiotics are obsolete.
- In case a long-term urinary drainage is needed (more than 5 days) and considering all contraindications, suprapubic catheters should be preferred.

6.1.1 Catheterization for bladder drainage

6.1.1.1 Transurethral catheter

Urinary catheters are to be removed as soon as possible in order to avoid urethral stricture and other complications (orchitis, epididymitis, prostatitis, urethritis and balanoposthitis).

- The insertion of an indwelling urethral catheter is to be performed under aseptic conditions by trained personnel preferably using a catheterizing kit. (Cat. IB)
- Only use sterile and closed drainage systems (Cat. IA).
- Perform hand disinfection before carefully preparing the necessary material (Cat. IA).
- Antisepsis of the mucosa is done by using sterile cotton pads soaked in a suitable antiseptic solution for mucous membrane (e.g. based on PVP-iodine or octenidine hydrochloride). After application of a fenestrated sterile drape, a sterile lubricating gel is to be instilled; subsequently the catheter is to be inserted into the patient's

bladder (Cat. IB) under sterile conditions (e.g. including sterilized forceps, surgical gloves).

- The position of the catheter is blocked by inflating it with sterile distilled water or, preferably, with a sterile 8-10% aqueous glycerin solution – no NaCl and no tap water (Cat. IB).
- Then a closed drainage tube with anti-reflux valve has to be connected and securely fixed (Cat. IB).
- Daily body care includes cleaning of the genitalia with soap and water without adding of antiseptic substances. Any tugging and pulling of the catheter should be avoided (Cat. IB).

6.1.1.2 Suprapubic catheter

The insertion of a suprapubic catheter is classified as a medical intervention. Suprapubic catheters are favorable as bacterial colonization of the abdominal skin is lower than that of the urethral meatus. With long-term suprapubic catheterization, bacteriuria may occur [55], but usually involves microorganisms of the resident skin flora and not, as with transurethral catheters, the more problematic perianal flora. Further advantages are the simplicity of care at the insertion point, the decreased incidence of urethral strictures and subvesical infections (e.g. orchitis, epididymitis, etc.) but also the easy control of spontaneous micturitions and the residual urine volume.

- A daily inspection of the stoma and skin around the suprapubic catheter is required to recognize infections at its entry point in time. For long-term suprapubic catheters the stoma can usually be left open or may need to be covered just by a small plaster (Cat. IB).

6.1.2 Maintenance of the urinary drainages

- No intermittent clamping of the catheter (so-called “bladder training”) (Cat. IB) is allowed. In addition any bending of the catheter and of the drainage system must be avoided in order to secure the urine flow.
- The urine collection bag must always hang freely, positioned below the bladder and shall never have contact with the ground (Cat. IB).
- The catheter and the drainage tube should not be disconnected (Cat. IA).
- Is a disconnection of the drainage tube not avoidable (e.g. inadvertent brief disconnection), no change of catheter or drainage system is needed. However, the connection between catheter and cone of the drainage tube can only be re-established under aseptic conditions, i.e. after both parts have been treated with an alcohol-based disinfectant (Cat. IB).
- There should be no delay in emptying a urine collecting bag, i.e. prior to contact of urine with the non-return valve. In addition, a new pair of disposable gloves should be worn during named process. (Cat. IB).

- After use the urine collecting vessel should be disinfected (e.g. via using a washer disinfector) (Cat. III).
- Hand disinfection after removing the disposable gloves is mandatory (Cat. IB).
- Replacement of the catheter is not routinely performed at fixed intervals, but should rather take place when required according to individual considerations and indications (e.g. incrustation, obstruction, occlusion, catheter-induced symptomatic UTI) (Cat. IB).

6.1.3 Alternatives to indwelling catheters

6.1.3.1 Intermittent catheterization

Intermittent catheterization has proven to be efficient in reducing infectiological complications when providing care to patients with neurological disorders. Intermittent catheterization requires an aseptic and atraumatic technique but also good patient compliance [55,56]. Consequently, the personnel need to get trained carefully in mentioned technique. Affected people can also perform self-catheterization when adequately trained.

- The intermittent catheterization implies a proper training in aseptic and atraumatic techniques (Cat. IB).

6.1.3.2 Condom urinals

Condom urinals can be used for male residents suffering from incontinence.
In order to avoid local complications (e.g. skin maceration), utilization of condom catheters requires proper care and maintenance. This includes careful and regular application of genitoperineal antiseptics, the use of transparent urinals made of silicone and the removal of urinals for overnight.

6.1.3.3 Maintenance of urostoma (ileum/colon conduit, surgical urinary drainage)

To ensure an optimal stoma care, the entire nursing and maintenance staff as well as the residents themselves should cautiously observe the principles of stoma care and maintenance [57,58,59]. This means that the respective residents (and her/ his partner) have received detailed information as well as practical instructions regarding care and maintenance of an urostoma. In the first place responsibility for the stoma lies with the resident; i.e. other persons should deal with it only in specific cases e.g. if there is need for general care.

Optimal stoma care requires an extensive and complex maintenance. Hygiene-relevant requirements are, inter alia, as follows:

- The ostomy bag must be emptied when filled to one third; otherwise it would become too heavy and does not stick firmly.
- Basically, a leaky drainage must be changed immediately, regardless of the time it has been in place.
- Cleaning of the peristomal skin is to be performed using warm water, a clean cloth (e.g. single-use compress or a freshly washed cloth) and a ph-neutral, non-perfumed soap or wash lotion.
- Stoma cleaning should always be done from the inside to the outside, i.e. move away from the urostoma.
- To prevent skin irritation with subsequent folliculitis due to occasional pulling out of some hair, depilation of the peristomal skin area is recommended.

6.2 Prevention of bacteriaemia and sepsis

Secondary bacteriaemia – i.e. following an existing focus of infection – is one of the most frequent causes of septicemia. About half of all secondary bacteriaemia are caused by urinary tract infections; skin infections and pneumonia attribute to another 10% -15% each [12].

Considering the relative high frequency of vascular catheters among residents in need of complex care, these residents also have a proportionally high risk of catheter-related infections — defined as primary bacteriaemia.

6.2.1 Punctures and injections

(See also the recommendation "Prevention of catheter-related infections" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Prior to every puncture (e.g. taking blood sample) and injection (subcutaneous, intramuscular, intravenous), antiseptic cleaning of the skin using an alcoholic solution and sterilized cotton pads or gauze has to be performed. To avoid contamination of the equipment and accessories as well as drug solutions, aseptic procedures have to be followed strictly [60]. For occupational health purposes, disposable gloves have to be used whenever a blood contact is likely. [41]

- Hygienic hand disinfection should be performed before preparing injection solutions, as well as prior to each puncture and injection (Cat. IB).

- The puncture site should previously be disinfected with an alcohol-based antiseptic solution and sterilized cotton pads or gauze squares (Cat. IB)
- Disposable gloves should be worn whenever blood contact is likely (Cat. IV [41]).
- Single-dose vials (not multidose vials) should be preferred (Cat. IB). In addition special attention should be given to the manufacturer's data, especially if solutions contain lipids and/or proteins (Cat. IV, [46]).
- If a multidose vial is used, the rubber membrane should be disinfected with a suitable alcohol-based antiseptic solution, respecting the effective exposure time (also refer to the manufacturer's instructions) (Cat. IB).
- For each puncture of the multidose vial, a new syringe and cannula has to be used. (Cat. IB).
- Date and time of first utilization must be noted on opened (in use) multidose vials (Cat. IB).
- The preparation of drug/ solution mixtures should take place immediately prior to injection.
- Expiration date and storage conditions are given in the manufacturer's specifications (Cat. IV [46]).

There is no need for skin disinfection for residents who self-administer s.c. insulin injections (with or without pen); however, if insulin is injected by the personnel, a skin disinfection should precede every injection for reasons of legal liability. Needles should be used and renewed as recommended by the manufacturer. Multiple use of cannula is limited to self administration. Personnel should use a new cannula every time. Insulin pens in use may usually not be stored in the refrigerator (please follow the manufacturer‘s instructions).

Previous skin disinfection and the use of a new needle for each injection are compulsory.

• The only exception is resident-related insulin administration:

- a daily needle replacement is requested,
- no need for skin disinfection, if the injection is self-administered ,
- follow manufacturer's instructions concerning storage of the pen in use (usually at room temperature). New insulin vials should also be stored according to the manufacturer's instructions (usually in the refrigerator).

6.2.2 Intravascular catheters and infusion therapy

(See recommendation "Prevention of intravascular catheter-associated infections" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Insertion and maintenance of intravascular catheters should be rigorously done in conformity with hygienic measures and relevant regulations established for hospitalized patients. Hygienic hand disinfection, meticulous skin antisepsis prior to punctures as well as non-touch technique for dressing change are of particular importance.

Hygienic hand disinfection is mandatory before any contact with material that must be handled aseptically, before connecting/ disconnecting an infusion system and injection of drugs/ supplementary injections (Cat. IB).

• Disconnections should be avoided and restricted to an absolute minimum (Cat. IB).

• A new sterile stopper must be used after each disconnection (Cat. IB).
• Dwell-in venous cannulas can remain inserted as long as clinically needed and no sign of complications are recognized (Cat. IB).

6.3 Prevention of respiratory tract infections

Respiratory tract infections including the flu (influenza virus) are the second most common infection among the elderly. Residents in need of complex care are at a considerable higher risk of developing pneumonia not only because of age-related physiological changes in respiratory function but also because of underlying diseases, immobility and/or disorientation [4, 6.12]. It should be emphasized that there is a correlation between drinking water contamination and endemic/ epidemic legionellosis among elderly in facilities [61-63].

Tuberculosis deserves special attention in the elderly since its age peak lies quite high in Germany (age > 69 years according to the 2002 statistics) [64]. Due to the decline of cellular immunity and host defense at an advanced age, elderly in nursing homes belong to a group at increased risk of developing active tuberculosis. Generally, tuberculosis among elderly occur as a reactivation of formerly acquired tuberculosis [65]. Exogenous re-infections are also possible, since many elderly lose their tuberculin reactivity acquired earlier in life [66]. Therefore and according to section § 36 (4) of the German Infectious Diseases Protection Act (IfSG), persons admitted to a LTCF have to submit a medical certification attesting the absence of any signs or symptoms of contagious pulmonary tuberculosis. However, this should not exclude tuberculosis as a potential differential diagnosis when relevant symptoms occur. New tuberculosis cases in long term care facilities require prompt investigation and quick implementation of chemoprophylactic and/or preventive measures in cooperation with the local health authority.

6.3.1 Inhalation

(See the recommendation "Prevention of nosocomial pneumonia" of the Commission for Hospital Hygiene and Infectious Disease Prevention, [2])

Inhalation therapy implies a consistent aseptic working technique. Essential measures to prevent lower respiratory tract infections are: hand disinfection prior to any manipulation of devices, complete aseptic re-processing of nebulizers/ inhalation equipment and devices after each use and exclusive use of sterile liquids, etc. [67]. Please also follow the manufacturer's instructions when processing inhalation equipment and devices.

6.3.2 Care and maintenance of tracheostoma

(See the recommendation "Prevention of post-operative wound infections" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Principles of stoma care and maintenance are differing and depend on the time the tracheotomy was performed (newly operated stoma vs. long-term stoma). Residents who have been tracheostomized during a recent hospital stay and whose wound is not yet healed (e.g. 2-4 weeks after tracheotomy) require the same care like patients with fresh surgical wounds [68]. Of particular importance are previous hand disinfection, use of a new pair of disposable gloves and an aseptic procedure (non-touch technique).

Once healed, the wound and the peristomal area should be cleaned several times a day, always using a new clean cloth (e.g. single-use compress/ cloth, or commercially available cleaning cloth). Crusts shall be removed gently using tweezers or a cloth soaked with physiological saline solution. In order to avoid any skin damage, the stoma must be protected against humidity and mucus. When cleaning and maintaining the tracheostoma, personnel has to wear disposable gloves. Residents who care and maintain their stoma themselves need to wash their hands carefully prior to any manipulation.

6.3.3Replacement of the tracheal tube/cannula

Should secretions accumulate in the tracheal tube, the tracheostomized resident either should cough up or secretions should be suctioned (see also 6.3.4). Afterwards, the tracheal cannula shall be removed gently and put aside (e.g. in a kidney tray). During this process a new pair of disposable gloves has to be used. For patients with a recent tracheotomy (< 2-4 weeks), insertion and fixation of a new sterile cannula must be performed under aseptic conditions. Whereas in

case of a *long-standing* tracheostoma which is already healed and a new tracheal tube does not has to be sterile; it just needs to be cleaned and disinfected. During re-insertion of processed cannulas relevant contamination (e.g. unintentional contact with potentially contaminated surfaces or articles) must be avoided by careful handling.

The personnel providing care to these residents, has to perform hand disinfection after removal of the cannula and prior to the insertion of a new cannula. In addition a new pair of disposable gloves should be put on.

• Hygienic hand disinfection is required before and after manipulation of the tracheostoma and/or tracheal tube (Cat. IB).

• If the tracheotomy is still *recent* (< 2-4 weeks), the change of a new **sterile** cannula must be performed under aseptic conditions (Cat. IA).

• For a long-standing tracheostoma, the re-use of a disinfected cannula to replace the used one would be sufficient (Cat. II).

• Hygienic processing of removed cannulas should be performed according to the manufacturer's instructions (Cat. IB).

6.3.4 Endotracheal suction

(See also the recommendation "Prevention of nosocomial pneumonia" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Endotracheal suctioning to remove secretions (e.g. recently tracheostomized residents) has to be performed under aseptic conditions. In order to facilitate aseptical working it is recommended to perform suctioning in a team of two. To avoid contamination and mucosa injuries, it is important to act cautiously. Mechanical aspiration of tracheal secretions should only be performed if secretions accumulate and obstruct the airway and not routinely at fixed intervals. Since splashing of respiratory secretions is possible, personnel should wear a surgical mask that covers nose and mouth as well as an eye protector.

- Endotracheal suctioning should be performed under aseptic conditions (Cat. IB).
- Hygienic hand disinfection is mandatory before and after endotracheal suctioning (Cat. IA).
- A new pair of disposable gloves should be worn to aspirate endotracheal secretions (Cat. IV [41]).

- Sterile single-use catheters should be used to aspirate in open systems (Cat. IB). During one suctioning session, the same catheter can be applied several times; however, sterile water must be used for rinsing (Cat. IA).

6.4 Prevention of skin and soft tissue infections

Pressure ulcers (Decubitus ulcers)
Pressure ulcers are the most frequent cause of skin and soft tissue infection in long-term care facilities and occur in up to 20% of LTCF residents. Infected ulcers can lead to further complications such as osteomyelitis or sepsis [6,13]. Apart from the well-known risk factors that contribute to the colonization of a wound by pathogens, following factors play a significant role in the development of pressure ulcers: immobility, pressure, extension, shearing forces, humidity, incontinence, corticosteroid therapy, malnutrition [4], as well as dehydration (exsiccosis). Generally, chronic ulcers can be colonized by several organisms and may become a reservoir for multi-resistant pathogens, in particular MRSA, over a long period [11]. Residents at risk of developing a pressure ulcer must be promptly identified and observed. Consequently, everything must be done to avoid pressure ulcers, including all measures to prevent its formation, the early recognition of its development and the interruption of its progression at an initial stage.
Elaboration of standards in nursing wounds on the basis of recommendations established by relevant advisory committees as well as the promptly use of special beds/mattresses are further steps in the prevention of pressure ulcers (see also national guidelines for the prevention and treatment of decubitus ulcers [69]).

Scabies (*Sarcoptes scabiei*)
Particular attention should be paid to itch mites which are infectious agents for diseases like scabies. The contagious parasitic infestation of the skin with the microscopic mite *Sarcoptes scabei* may cause problems in nursing homes and homes for the elderly. In fact there have been repeated reports concerning extended persistence of scabies and outbreaks with a high infestation rate among residents and staff in long-term care facilities (LTCF) the last years [4, 70-71].

If scabies is suspected because of residents complaining of itching skin lesions, appropriate hygiene measures should rapidly be introduced beside the encouragement of a dermatological consultation performed by a specialist. For this purpose, reference is made to the relevant factsheets elaborated by the Robert Koch-Institute and health authorities.

6.4.1 Wound dressings (e.g. decubitus or crural ulcers)

(See also the recommendation “Prevention of postoperative wound infections“ of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Secreting wounds and wounds closed by secondary intention need a sterile dressing for the collection of secretions but also to enhance the healing process. As exogenous contamination is possible on any open wound, dressings must be changed using a precautionary aseptic *non-touch* technique [68,72]. The solution used to rinse the wound must be sterile. Tap water is not sterile, as it contains microorganisms. The expiration date has to be observed when using sterile goods. When finishing the dressing change, opened sterile dressing packages should be thrown away. Wounds infected or colonized by microorganisms can be a potential reservoir for pathogens and require a well placed dressing impermeable for bacteria to collect exudates. In addition, safe and careful working procedures are recommended to prevent direct or indirect contamination of the environment. Therefore, dressings of aseptic wounds shall be changed first, i.e. prior to septic ones.

- If there is a risk of contamination of working clothes, a single-use gown or clothing should be worn when treating large wounds (Cat. IV [41]).
- Before changing dressings, the hands must be disinfected and, if necessary (e.g. in case of soaked dressings), a new pair of disposable gloves should be put on (Cat. IB).
- Gloves should be discarded immediately after the dressing removal (adhesive occlusive dressings should be removed with sterile tweezers), (Cat. IB).
- A further hand disinfection (Cat. IB) should be performed following the steps mentioned above
- Hygienic hand disinfection should always take place prior to any treatment of wounds via an aseptic procedure (non-touch technique), as prescribed by the attending physician, using sterile instruments OR sterile gloves (Cat. IB).
- Only sterile solutions must be used to rinse wounds (Cat. IB).
- Manufacturer’s instructions must be observed regarding storage life of rinsing solutions (Cat. IV [46]).
- Instruments should be safely disposed directly after use to avoid contamination of the surrounding (Cat. IV [41]).

6.4.2 Ostomy

Principles of ostomy care and maintenance (enterostoma, urostoma) are differing and dependent on the time the ostomy has been realized (newly operated stoma vs healed stoma). Wound care of stomata should be performed in a hospital under aseptic conditions, i.e. with the use of sterile instruments, sterile dressing material and adherence to non-touch techniques. Prior to the transfer of a patient

to a long-term care facility (LTCF), the newly stomatized patient should receive a stoma care training and further guidance by a stoma therapist.

Once healed, the wound and the peristomal cutaneous area require meticulous care to avoid skin irritations and subsequent infections [73]. The stoma should be cleaned with a moist clean cloth (e.g. compress soaked with a pH-neutral washing lotion). Mobile and compliant residents can accomplish stoma care by theirselves after having washed her/his hands. Maintenance personnel should provide stoma care to debilitated care-needing residents. Hands need to be disinfected prior, a new pair of disposable gloves has to be used and, if necessary, a waterproof apron should be put on. With respect to bed-ridden stomatized residents and prior to any action, the designated bed must be protected with a drape to avoid contamination (e.g. with intestinal contents).

- For stoma care, the personnel has to wear a new pair of disposable gloves (Cat. IV [41]).
- Hygienic hand disinfection must be accomplished before and after any stoma manipulation (Cat. IB).

6.5 Prevention of gastrointestinal infections

Many elderly experience diarrhea without underlying infection. Nevertheless, diarrhea is often due to infections caused by viral and bacterial pathogens [2,74]. A high proportion of incontinent residents in a long-term care facility facilitate the spread of gastro-intestinal infections [75]. Age-related increase of the gastric juice's pH value makes the elderly particularly susceptible to food-borne gastrointestinal infections, which can result in outbreaks in long-term care facilities [4,11-12]. Thus, attention must be paid to essential hygiene measures, especially during handling (storage, processing) and conservation of food (see also chapter 13).

6.5.1 Tube feeding

Tube feeding represents a good growth medium for many microorganisms. Therefore, hygienic hand disinfection before administration of food and/or before rinsing the feeding tube is mandatory [76,77,78,79,80,81].
Generally, a tube feeding formula should be kept at room temperature — i.e. commercially available formulas should not be stored in the refrigerator — although there are possible exceptions in individual cases. If a warm feeding (in a glass bottle) is wished, the formula can be slowly warmed up at max. 40°C (microwave but preferably in a water bath). It should then be used within the next 4-5 hours. Opened bottles should be stored in the refrigerator but the left over must be consumed within the next 24 hours or otherwise discarded (because of the danger of increasing bacterial contamination). If using an automatic flush

feeding pump, a formula stored in refrigerator can be readily administrated at low rate, since the system will bring it to the ambient temperature in the meantime.

For intermittent feeding (bolus) either a new or an appropriately processed syringe (see also 5.3.1) should be used, since food residuals are a good growth medium for microorganisms. Plastic enteral nutrition bags with pre-attached feeding system should be discarded at the latest after 24 hours. Bed-ridden residents on liquid or puree diet and/or residents with neurologic disorder, mental or functional feeding restrictions who are dependent on external help to be fed are predisposed to food (micro) aspiration. Aspiration and its complications should be prevented by appropriate behaviors and care measures. For instance, the risk of infection following aspiration can be decreased by using boiled water to liquefy pureed food.

Powdered food preparations must be prepared with cooled boiled water (drinking water) in adequate portions, avoiding any contamination, and should be administered immediately. For the preparation of tea or instant tea, boiled water should be used. Shakers, measuring spoons, etc. should be processed using thermal disinfection (e.g. dishwasher at temperature > 60°C) before re-use.

After each food administration, the nasogastric tube (NGT) or percutaneous endoscopic gastrostomy (PEG) tube must be flushed with freshly boiled water or tea, cooled down at body temperature, in order to avoid obstruction. Fruit infusion and black tea can lead to flocculation of food residues and should therefore be avoided. For daily care of the transnasal tube, it is advisable to clean nostrils and the tube with water and soap, if necessary. Application of an ointment and proper adjustment of the tube with a “gentle to the skin”, non-irritating adhesive tape are important care measures for the alar wing of the nose [80].

A new percutaneous gastrostomy (PEG) necessitates daily change of dressings under sterile conditions for approx. 10 days following intervention in all residents (care-needing as well as autonomous residents). Before changing dressings, hands must be disinfected and a new pair of disposable gloves should be put on. To avoid local wound infections, the stoma must be kept under dry and adseptic conditions. In order to avoid mycosis and eczema on the abdominal skin, a too intensive wound care with daily disinfection or frequent application of ointments is to dissuade. The outer skin can be cleaned with water and mild soap. The site of tube insertion must be completely dry before a new dressing is applied, since humidity could favor the development of local infections.

Initial wound healing usually occurs 7-10 days after the gastrostomy has been performed, thereafter dressing changes can be performed every 2-3 days. Once granulation of the fibrous tract has formed and healing is complete (about 2 - 4 weeks after implementation), the application of a dressing is not compulsory, if precautious care and critical handling of the tube system are ensured. Basically,

all articles used for the application of the enteral tube are single-use items and should be renewed after 24 hours.

A regular tube change is not necessary; a carefully manipulated and well maintained PEG tube can remain operational in situ 2 to 5 years. It is recommendable that the attending physician evaluates the status of the tube insertion site at critical moments: daily immediately after implantation of the PEG tube, after healing and at the beginning of the formation of a fibrous tract every 2-4 weeks. Afterwards longer intervals are possible depending on occurrence of skin changes. If the resident or the nursing personnel notices any redness, formation of pustules, purulent secretions or if the stomatized resident complains about local pain, the treating physician should be contacted immediately. For information on material, care and maintenance of the tube as well as use of application systems, refer to the guidelines on long-term care and support of patients with enteral tube systems [80].

- Mouth care of residents fed with an enteral or PEG tube should be accomplished with freshly boiled and cooled down water, freshly prepared tea (see above) or sterile distilled water (Cat. I B).
- Hands should be hygienically disinfected before any administration of food and/or flushing of the tube (Cat. I B).
- For each intermittent feeding (bolus), either a new or a hygienically processed syringe should be used (Cat. I B).
- Change of plastic enteral nutrition bags (with pre-attached feeding system) should be performed according to manufacturer's instructions (Cat. IV [46]).
- Unless otherwise stated in manufacturer's recommendations, opened (in-use) enteral food bottles should be stored in the refrigerator; unused left-overs should be thrown away at the latest after 24 hours (Cat. IB). Enteral tube feeds are set by the *German regulations on foods for special dietary uses* (Diaetverordnung 2003; Cat. IV [82]).
- Tea should be prepared with boiling water (Cat. I B).
- For the preparation of enteral food, manufacturer's instructions must be followed.
- Shakers, measuring spoons, etc. should be duly processed with thermal disinfection (e.g. dishwasher at temperature > 60°C or washer-disinfector) before being re-used (Cat. I B).
- For residents with nasogastric tube, daily cleaning of both nostrils and tube is recommended (Cat. III).

6.6 Mouth hygiene

Residents should be educated in a good mouth hygiene and care of prosthesis. Teeth should be brushed at least twice a day, ideally after each meal. The denture also requires special care. Cleaning habits already adopted by the resident can be maintained; if the resident is not able to accomplish an adequate dental/prosthesis care, assistance should be provided or the entire care should be taken over by the staff. Prostheses should be regularly examined for plaque or fungal deposition and professional cleaning should be arranged if necessary.

7. Clusters or outbreaks of infections

(See also the following recommendations: "Recommendation outbreak-management and scheduled occurrence of nosocomial infections", "Surveillance of nosocomial infections" as well as "Detection and evaluation of pathogens with special resistances and multi-resistances" of the Commission for Hospital Hygiene and Infectious Disease Prevention, [2])

Clusters or outbreaks of infections, most notably those with respiratory tract infections and gastrointestinal infections have been associated with high morbidity and mortality among susceptible residents in nursing homes [4,83].

Influenza

Highly contagious viral illnesses of the respiratory tract are particularly threatening for the elderly. Influenza outbreaks are frequent in long-term care facilities (LTCF) and may have disastrous consequences: they may affect between 25% -70% of residents and the clinical course can be severe for some of them, i. e. a lethality of more than 10% [84-87]. Since residents and personnel of long-term care facilities (LTCF) constitute a group at risk, it is strongly recommended that they all receive annual influenza vaccination (see Vaccination Recommendations of the Robert Koch Institute's Standing Vaccination Commission (STIKO)) [88].

Norovirus

Simplified microbiological procedures to detect noroviruses have played a significant role in institutional infection control, allowing information to limit the spread of infection and the epidemic potential. Outbreaks of gastrointestinal disease caused by norovirus have been reported, especially in Germany, other European countries and in North America. Women and persons aged > 69 years seem to be at particular risk. 85% of outbreaks occurred in hospitals, nursing homes and homes providing care for the elderly [74].

Other illnesses and/or pathogens frequently causing outbreaks in long-term care facilities (LTCF) are listed in the following table.

outbreaks among LTCFs
Respiratory tract • Influenza [84,85,86,87] • Other respiratory viruses [89,90]
Gastrointestinal tract • viral gastroenteritis (noro-, rotavirus) [74,91,92] • salmonella infections [93] • S. aureus- food intoxication [93]
Other infections • virus conjunctivitis, epidemic adenovirus keratoconjunctivitis [94] • streptococcal infections (group A) [95] • scabies [70,71]

When infection rates increase in an institution, it is recommended to analyze and evaluate the situation (surveillance), focusing on the infections and/or specific pathogens of particular epidemiological importance (e.g. *MRSA, VRE, C. difficile*) in order to reorient the activities purposefully and, if necessary, to adopt adequate measures of infection control [96].

8. Notification of communicable diseases

(According to the German Infectious Diseases Protection Act - IfSG)

According to section § 6 of the German Infectious Diseases Protection Act (IfSG), it is obligatory to notify certain infections as well as outbreaks of nosocomial infections (see also chapter 7).

Basically, the treating physician is obliged to comply with the restrictions and requirements contained in section § 8 of the German Infectious Diseases Protection Act *(*IfSG) and to notify without delay to the local health authorities any confirmed or suspected transmissible illness cited in section § 6 IfSG art. (1) and (2) of named *Law*. In case the infection have not been notified by any physician, the notification procedure is incumbent upon the manager of the concerned

institution according to section § 8 par. (1) no. 7 or upon a nursing staff member (e.g. nurse, care provider) of the institution according to section § 8 par. (1) no. 5. According to section § 6 par. (1) no. 5, this also applies when 2 or more cases of an identical disease occur, in case of a food-borne infection or if an epidemiological relation is assumed.

Any evidence of an outbreak of infection must be immediately reported to the local health authorities in an anonymous form, in accordance with section § 6 par. (3) of the German Infectious Diseases Protection Act *(*IfSG) to enable the public health service (ÖGD) getting involved into outbreak management as soon as possible. In addition, a consulting hospital hygienist/ public health specialist can be involved [40].

9. Measures to be taken in case of the occurrence of pathogens with special characteristics

Unlike hospitals, assisted living facilities, long-term care facilities (LTCF) and nursing homes constitute a permanent home for the elderly. This implies two main aspects which have to be considered and weighed depending on the situation: A) restriction versus freedom of movement and B) protection of residents. With respect to the responsibility of avoiding the spread of pathogens with special characteristics it is advisable for a facility to specify pathogen-specific preventive measures in a detailed hygiene plan.

Medical interventions and underlying diseases may influence the infection risk of a resident and her/his co-inhabitants. Contact between a resident affected by shingles (Varicella-zoster virus infection) with another resident can lead to a generalized *Herpes zoster* infection of the contact person when he/she is currently immunocompromised even if he/she had acquired adequate immunity in earlier years. Hence, in collaboration with the treating physician, the risk of possible spread of pathogens should be evaluated for each resident and co-inhabitant, taking in consideration pre-existing medical conditions or medical interventions. Specific preventive measures to be taken should be documented. The treating physician may also request advice and/or support of the local health authorities.

Further information on relevant pathogens and/or communicable diseases which are easily spread in community facilities (e.g. *norovirus* infection, Scabies), can be obtained from local health authorities and state or federal health authorities. Specific preventive measures inherent to each institution should be defined and documented (hygiene plan), in cooperation with the treating physicians as well as the advisory hospital hygienist /public health specialist or local health authority.

9.1. Multiresistant pathogens (e.g. Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin resistant enterococci (VRE), etc.)

Investigations conducted in Germany on the occurrence of MRSA among elderly living in long-term care facilities (LTCF) showed a prevalence between 1.1 % to 2.4 % [20,21,97]. Both high (Great Britain, up to 17%) and very low (Netherlands, < 1%) prevalences have been reported in European countries [13, 18, 98-99]. The incidence of MRSA in long-term care facilities (LTCF) likely reflects the increasing occurrence of these organisms in hospitals, since there is a close relationship between MRSA-colonization of residents and past hospitalizations [20,100]. According to Bradley et al. [101], transmission of antimicrobial resistant strains from one resident to another rarely occur (identical genotypic strains have seldom been found among next-door neighbors in long-term care facilities). Outbreak situations constitute exceptions [83,102].

Each institution providing care and services to persons (i.e. hospitals, rehabilitation centers, nursing homes, etc.) should be able to admit and treat individuals colonized or infected by multi-resistant pathogens. Transmissions are rare in long-term care facilities and nursing homes and usually result in colonization of another resident rather than infection [97,100], thus the refusal of colonized or infected persons (no matter if in a home for the elderly or an institution for very debilitated patients) is neither reasonable with organizational nor with medical arguments, and is in no way legally justified [4,100, 102,103,104]. That means, that it is not justified to request three negative culture results (e.g. MRSA) — whether it is MRSA, VRE, ESBL or another pathogen. Instead, all facilities should implement measures to prevent transmission of pathogens. These specific hygiene measures are listed in chapter 5 and constitute exact precautions to be taken when providing care for residents and/or patients, regardless of whether a potentially harmful pathogen has been identified or not.

If the presence of a multi-resistant pathogen has been confirmed, any specific measures to be taken in order to prevent its further spread should include considerations regarding the individual risk as well as the type of support and care provided to the residents. Consistently maintaining standard hygiene measures is usually sufficient to avoid pathogen transmission in these contexts. Still, these measures have to be adapted to the individual situation if risk factors are present, i.e. supplemented if necessary. Special measures to apply in presence of multi-resistant pathogens such as MRSA are summarized below (see also table 3). With regard to the residents' right of self-determination, restrictions of this or of the therapeutic options, only measures which are proven from a hygienic point of view or which are expected to reduce the transmission risk in care facilities for the elderly and nursing homes at a high probability can be recommended.

Among the measures that contribute to avoid the transmission and further spread of identified multi-resistant pathogens, all staff members should be sufficiently informed about the concerned pathogens, their routes of transmission and the necessary precautions when providing support and care to persons colonized and/or infected with those pathogens.

-Table 3-

Basic information about measures to be taken in case of MRSA colonized residents depending on type and intensity of care required (see also chapter 9)		
Type of care provided to affected residents	Social care	Nursing care
MRSA-colonized resident	• accommodation: as at home (see also 9.1.2) • hand hygiene: disinfection of hands prior to community activities • decontamination: not routinely; dependent on the epidemiological situation and individual risk (see also 9.3)	Special measures are to be taken to prevent any transmission of MRSA, including accommodation provided in single rooms or cohorting of affected residents • decontamination: not routinely; dependent on the epidemiological situation and individual risk (see also 9.3)
Co-habitants a) without risk factors b) with risk factors (see table 1)	• accommodation: generally, no restrictions needed (see also 9.1.2) • accommodation: individual determination of measures to be taken considering the risk assessment (see also 9.1.2) • hand hygiene: disinfection of hands prior to community activities	Co-habitants must not be exposed to potential transmission and infection risks In case of co-habitants with open wounds or skin defects, tubes, catheters, tracheostoma; special measures are to be taken. (see also 9.1.2)
Personnel	• Hand hygiene: Disinfection of hands has to be performed directly after contact with MRSA-colonized residents as well as after	• Hand hygiene: • Disinfection of hands after direct contact to residents, especially before and after specific nursing

	taking off disposable gloves • Disposable gloves: If any contact with contaminated material is likely • Protective clothing: - protective gown/ apron in case of intensive nursing service (e.g. transfer to another bed) - use of face mask if contact with infectious aerosols (e.g. care of tracheostoma) is likely to occur	interventions, e.g. wound care, urinary catheter, PEG tube, tracheostoma, other stomata - before leaving the room - after removal of disposable gloves Disposable gloves: If any contact with contaminated material is likely • Protective clothing: - protective gown/ apron in case of intensive nursing service (e.g. transfer to another bed) - use of face mask if contact with infectious aerosols (e.g. care of tracheostoma) is likely to occur
Visitors	Hand hygiene: washing of hands is usually sufficient	Hand hygiene: Disinfection of hands before leaving the room.
Environment	• Surface cleaning/ disinfection: • Usual cleaning; specific disinfection if required (see also 9.1.1.2) • Laundry: see chapter 5.3.3 • Beds: see table 2 and chapter 5.3.3 • Tableware: routine (machine) processing	• Surface cleaning/ disinfection: - According to cleaning and disinfection plan - Specific disinfection if required • Disinfection of surfaces which show frequent hand / skin contact [a] • Laundry: see chapter 5.3.3 • Beds: see table 2 and chapter 5.3.3 • Tableware: routine (machine) processing

See chapter 9.2 concerning screening, see chapter 9.4 concerning surveillance, see also the recommendation C.2.1 "Hygiene requirements for cleaning and disinfection of surfaces" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2]

9.1.1 Measures adopted for the relocation and transportation of residents

Hospital staff and physicians should get informed if residents currently colonized/infected with MRSA, with a history of MRSA-colonization/infection or direct contact persons of MRSA colonized/infected residents are referred to their institution. Personnel in charge of the patient's transportation has to wear disposable gloves and protective clothing when having close contact with MRSA positive persons (e.g. changing of patient's position). Following the transport, all surfaces with direct contact to the patient (e.g. stretcher) must be disinfected (wiping disinfection). The accompanying staff members must perform hygienic hand disinfection. Special protective clothing/ overalls are not necessary and not recommended to transport MRSA positive persons, both for hygienic reasons and because of unnecessary and uncertain irritation this kind of clothing may cause.

9.1.2 Implementation of institution's internal measures, based on the individual risk

9.1.2.1 MRSA-colonized residents <u>without</u> any particular risk

Co-inhabitants of MRSA-colonized residents **without** chronic skin lesions such as eczema or wounds and without catheters (e.g. urinary catheter, PEG) have an infection risk comparable to that of persons living in private households. Nevertheless, precautions can be appropriate in individual cases. For instance, roommates of colonized person should not have any open wound, catheter, tube or tracheostoma [97,98,100,105,106]. If this is not possible, individual barrier nursing is necessary. Except for the information related to the MRSA status and, if relevant, to an uncompleted or prolonged decontaminating treatment (see below), there are no restrictions regarding the admission of a colonized person into a LTCF.

9.1.2.2 MRSA-colonized residents with a particular risk (e.g. invasive catheter, open wounds, etc.)

Single rooms are not stringently necessary but may be considered also taking into account possible negative effects for the rehabilitation of the concerned resident. Roommates of MRSA-colonized residents should not be at increased risk of MRSA infection after a possible colonization – i.e. they should have **no** open wounds, catheter or tracheostoma. Cohorting of several MRSA-colonized residents is possible (100, 106,107,108,109).

Social contacts to relatives, visitors and co-inhabitants are not restricted. Visitors do not have to wear protective clothing or gloves. Mobile residents can participate in community life, if skin lesions/open wounds/tracheostoma are well covered and protected. If there is a medical indication for a urinary catheter it must be linked to a closed collection system. Visitors and residents should wash their hands regularly. .

Practice of primary care must be organized considering the risk of transmission. Medical care of MRSA-carriers should not be provided by personnel with chronic skin diseases, since these employees are at increased risk for MRSA-colonization. Care of MRSA-carriers must be performed in the resident's room, if possible after all other co-inhabitants have been provided with care. Hands must be disinfected after any care given to a person who is MRSA-colonized and/or infected. Hand disinfection must also be performed before and after providing care to residents with wounds, catheters and tubes, and always after taking off disposable gloves. Disposable gloves, protective clothing and, eventually, an apron must be worn as needed, depending on the care activities (e.g. handling contaminated bed linen, manipulating urinary catheters or changing dressings). To protect employees and to avoid self-contamination, a surgical mask covering mouth and nose (face mask) is recommended when suctioning endotracheal secretions, whether there is presence of MRSA or not. Care products and accessories are intended for personal use of each resident and should be left in the room. Articles shared with other residents must be disinfected before being re-used.

In principle, the **daily cleaning** of all surfaces in a MRSA-carrier's room should not differ from the one practiced in other rooms, except that it should preferably be done at last to avoid further spreading of organisms (the cleaning personnel should receive respective instructions). Purposeful disinfection is only necessary if contamination with blood, secretions or excretions has occurred. Laundry, cutlery, dishes and wastes are treated as usual.

- Single-room accommodation for MRSA-colonized residents is not stringently required (Cat. II).
- Risk-adapted accommodation (Cat. IB).

9.1.2.3 Measures to take in nursing homes, facilities nursing debilitated and profoundly debilitated patients

To define “situation-specific” measures that should be adopted in facilities where residents are predominantly in need of care and require similar medical care as provided to patients in hospitals, it is recommended to refer to the recommendation „Prevention and control of MRSA-strains in hospitals and other medical facilities “of the Commission for Hospital Hygiene and Infectious Disease Prevention [2].

9.2 Microbiological screening tests

Routinely conducted swabs as measure of control for residents and personnel in nursing homes and long-term care facilities (LTCF) are not recommended. Nevertheless, if the incidence of MRSA infections increases significantly (outbreak), a screening test of any resident and/or employee suspected of being the source of infection can become necessary after examination of the epidemiological situation [4, 100, 102, 110].

• Screening of residents and personnel only if MRSA infections occur frequently (Cat. III).
• Screening if there is a justified suspicion of further spreading by personnel member(s) or resident(s) (outbreak) (Cat. I B).

9.3 Antiseptic decolonization of pathogen-carriers

The decontamination of MRSA carriers is *epidemiologically* desirable; however it cannot be generally requested. The decision for decontamination within a nursing home should be made considering the epidemiological situation and the individual risk of the affected person. Finally, the success of decontamination depends on the presence of certain risk factors.

Results using decolonization regimes including mupirocin nasal ointment and antiseptic mouth rinse used for 5 - 7 days have been reported. An antiseptic body washing can be considered as well. Repeated decontamination trials are not purposeful. If an adequate decontamination attempt has been unsuccessful in another institution, further efforts are usually not more effective. Recurrence of MRSA is particularly expected when residents have chronic skin lesions and indwelling devices [97,111,12,113,114,115,116,117,118].

Decolonization is to be performed as prescribed by the attending physician and requires sufficient follow-up.

• Decontamination measures after analyses of resident's risk and the epidemiological situation. **No** repeated decontamination attempts (Cat. II).

9.4 Increase of MRSA infections

(See also "7, Frequently occurring infections" and "8, Notification of communicable diseases")

Staff responsible for hygiene has to react promptly if there is an increase in MRSA infections including an epidemiological investigation. In addition existing hygiene procedures need to be verified. Observed cases must be notified immediately to the local health authority (Section §6, par. (3) IfSG). A microbiological screening of residents and personnel may be required. Appropriate procedures must be followed in case of other multiresistant pathogens.

10. Further hygiene measures

10.1 Handling of drugs and care products

(See also the recommendation „Prevention of intravascular Catheter-related infections" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Residents accommodated in apartments for assisted living are self-responsible for taking their medication. Consequently, drugs are stored in the respective apartments. In facilities where residents are in need of care, specifications apply as those adopted in medical facilities, i.e. central storage of medicine administrated by the personnel. Medicines must be stored as specified by the manufacturer. If refrigerator storage is required, correct temperature settings of the refrigerator (+2°C - +8°C) must be guaranteed by regular controls [119].

Use of medication must be adapted individually to each resident, i. e. they must be marked and stored in such a way as to be easily identifiable and to avoid any confusion. For this purpose, personalized compartment-pill boxes (marked with each patient's name) are recommended. Pill boxes must be clean (e.g. regular cleaning in dishwashers).

In the context of the internal quality management of the institution, central storage of medications requires a regular monitoring, including the control of expiry dates for all preparations and all infection-relevant tools and materials (e.g. sterile

dressings). It is recommended to regulate facility-internal procedures within the hygiene committee and record them in a hygiene plan.

• The storage of drugs should be realized according to the manufacturer's instructions (Cat. IV [46]).

10.2 Domestic animals

Domestic animals can be beneficial to health and well-being. With respect to long-term care facilities it is quite possible to keep animals as long as accidents and infection risks are prevented but also as long as there are no co-inhabitants allergic to pets. Criteria for admitting and keeping animals should be specified in written regulations by the facility management. For further information see also the Federal Health Report, issue no. 19, Robert Koch Institute [120], on chances and health risks related to domestic animals.

To protect residents against infections, some basic rules must be followed:

- pets should be sufficiently and adequately vaccinated and regularly dewormed
- when showing signs of diseases, they should be examined by a veterinarian
- their living, drinking/feeding and sleeping areas should be regularly cleaned
- ectoparasites such as fleas, ticks, lice and mites should be quickly recognized and eliminated

11. Hygienic-microbiological surveillance

(See also the recommendation „ Hygienic requirements and standards for medical devices" of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

Each responsible of the institutional board has to stimulate hygienic procedures corresponding to the quality management (QM). It is not necessary to control surface disinfection (by contact slides) as a matter of routine.

11.1 Mechanical reprocessing of medical devices

- In Germany the *Medical Devices Act* (Medizinproduktegesetz) [46] and the German Ordinance on the Installation, Operation and Use of Medical Devices (Medizinprodukte-Betreiberverordnung)[47] rules the reprocessing of medical devices and all equipment used in institutions (e.g. cleaning and disinfection of devices, sterilization). (See also the recommendation „ Hygienic requirements

and standards for medical devices“ of the Commission for Hospital Hygiene and Infectious Disease Prevention [2])

- According to DIN 10510, inspection and performance tests using suitable bio-indicators to examine multi-tank dishwashers are recommended once a year.

11.2 Decentralized antiseptic dispensers

(See also the comments on „Requirements for the organization, characteristics and operation of decentralized antiseptic dispensers” and the “Guidelines of the Federal Institute for research and test material” of the Robert Koch Institute and the Commission for Hospital Hygiene and Infectious Disease Prevention) (121)

- For decentralized antiseptic dispensers, it is recommended to proceed an annual inspection of these devices [121].

12. Vaccination

Vaccination is one of the most important preventive measure against infection in medicine, and a particularly effective instrument to avoid outbreaks in community facilities. This implies appropriate vaccination of **all** residents and staff members.

12.1 Residents

The latest vaccination status of all home inhabitants should be established and regularly revised in co-operation with the treating physician (see also chapter 4.4.) on the basis of the current national recommendations (STIKO) [88]. Besides booster infections for tetanus and diphtheria, recommended every 10 years for all adults, an influenza vaccination – with the current WHO-recommended antigen combination – should be offered annually to all residents of geriatric and nursing facilities in autumn. An additional vaccination against pneumococcal diseases is indicated for all residents older than 60 years and those with chronic illnesses (revaccination every 6 years).

12.2 Personnel

According to the sections §15, §15 A and appendix IV “Biological products” (BioStoff V) [122], the employer has to organize preventive medical examinations and has to offer hepatitis A and B-virus vaccination for personnel prior to any care activities unless an existing sufficient immune protection can be assumed. This examination is conditional to any work in a healthcare institution. Consequently, for other activities which represent any risk for specific infections (e.g. influenza), a risk assessment is recommended as well as additional preventive medical

examinations and, if necessary, a vaccination. Effective and registered vaccines are listed in national vaccination recommendations (STIKO) [88]. The employees of healthcare facilities should be informed to have a regular control of their immunity status; the latter should be refreshed via e.g. revaccination for diphtheria and tetanus according to the STIKO recommendations [88].

13. Food and kitchen hygiene

Foodborne infections and related outbreaks are usually consequences of errors in hygiene during cooling, preparation or storage of food. The regulation for food hygiene (LMHV) applies also to kitchens in nursing homes and in long-term care facilities [123]. Generally, no documented HACCP concept is required for facilities, i.e. it is sufficient to elaborate a hygiene plan in order to avoid adverse effects on food. Important requirements for activities of the personnel in the kitchen are as follows:

- special instructions should be given by local health authorities in accordance with section §43 of the German Infectious Diseases Protection Act (IfSG) before starting activities

- an annual recapitulation of instructions by the employer as well as its documentation

In accordance to section § 6 par. (2) of the *Law* (IfSG), it is obligatory to notify „suspected“ or “confirmed” microbial food poisoning or acute infectious gastroenteritis, if :

• a person who practices an activity stipulated in section § 42 par. (1) is affected,
•or if two or more similar diseases occur, for which an epidemiological relation is probable or assumed.

If a kitchen employee suffers from diarrhea, a bacteriological and virological stool analysis is recommended in order to quickly introduce – if positive – specific preventive measures related to the pathogen identified. Not only residents but also relatives and visitors should be informed about the rules of proper food storage.

Vermin infestation in connection with food can be avoided with simple cleaning measures and regular kitchen controls (see LMHV; see also chapter 5). Qualified technical personnel (external if necessary) must be assigned to prevent vermin in kitchens.

- Development of a hygiene plan for kitchens (Cat. IV [123]).

- Instruction by health authorities in accordance with section §43 IfSG prior to any activity (Cat. IV [40]).
- Annual recapitulation of the instructions by the employer with appropriate updated documentation (Cat. IV [40]).
- Obligation to notify suspected as well as proven microbial food poisoning or acute gastro-intestinal infection among kitchen personnel, in accordance with section § 6 par. (2) of the *Law* IfSG (Cat. IV [40]).
- Bacteriological and virological investigation of members of the kitchen personnel suffering from diarrhea (Cat. IB).

13.1 Dishes

Just like in households, spoiled dishes of residents can be cleaned in an automatic single-tank dishwasher (standard household dishwasher run with a 65°C program). If a large number of dishes have to be cleaned, a multi-tank dishwasher might be useful.

14. Waste disposals

The garbage produced in care facilities is not commercially and therefore subject to local community waste regulations. For this reason, an institution-specific concept should be developed in the form of a disposal plan that should follow the local regulations (LAGA) [124].

15. Request for external service providers

Services from external providers (e.g. cleaning enterprise, laundries, kitchen, manicure, pedicure, hairdressing, etc.) must be contractually regulated. Firms offering these services should adhere to the hygienic measures specified in the hygiene plan of the institution. Self-defined rules are possible but have to meet the institutional requirements in order to implement an infection prevention concept.

16. Construction requirements and hygienic measures for building renovation and reconstruction

Institutional buildings, rooms and equipments have to meet certain rules and regulations: the minimum building regulations for nursing homes [Heimmindestbauverordnung,128], the respective federal building legal requirements, regulations of the employers' liability insurance association [Berufsgenossenschaftliche Vorschriften 129], the workplace regulations [130], the fire protection regulations as well as the standards for barrier-free and handicapped-friendly installations (DIN 19024 and 18025). Particularly in nursing homes for the elderly, construction measures can represent a relevant infection

risk for immunocompromised residents, e.g. by release of fungal spores. Thus, adjustment to resident's accommodation and also to their treatment needs must be coordinated with the treating physician and by consulting a hospital hygienist, if necessary.

Appendix 1: Topics of a hygiene plan, exemplary listing modified by P. Bergen [131]

- Hygiene management and organization
  - Organization of the personnel
  - Hygiene representative/ Infection Control Personnel
  - Quality control circles/ committees "Prevention of infections"
- Hygiene of personnel
  - Hand hygiene
  - Protective clothing
  - Occupational health
- Hygienic measures related to medical care
- Handling of medical and care products
- Surface cleaning and disinfection
  - Cleaning and disinfection plans
- Behavior in the event of infection
  - Notification of communicable diseases
  - Measures to be taken in case of specific pathogens
  - Outbreak control
- Dealing with the deceased
- Kitchen hygiene
  - Hygiene of personnel
  - Self-control concept
- Laundry services and disposal
- Hygienic environment
  - Maintenance and examination of building service equipment and devices
- Water hygiene
- Waste
  - Waste management
- Miscellaneous
  - Pest control
  - Pet keeping

The previous recommendations were made without the influence or control of commercial groups of interests, on behalf of the Commission for Hospital Hygiene and Infectious Disease Prevention. They have been the work of: H.M. Just (Nuremberg, director of the working group), M. - E. Höpken (Hannover), Ith Kappstein (Munich), E. Kunoth (Munich), Daniels Haardt (Münster), A. Kramer (Greifswald), M. Exner (Bonn), G. Unger (Bad Elster), N. Wischnewski (Berlin), M. Mielke (Berlin) and of the members of the Commission for Hospital Hygiene and Infectious Disease Prevention.

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