

***Article title:***

A Mixed Methods Study on Nightstand Usage in Hospitals

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The Faculty of Medicine Ethics Review Committee at Tübingen University approved our photography and interviews (approval: 346/2023BO2) on July 14, 2023. Respondents provided written consent for review and signature before the start of photography, and verbal consent before the interviews.

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# A Mixed Methods Study on Nightstand Usage in Hospitals

**Objectives:** This study aims to understand the usage patterns, requirements, and user satisfaction regarding hospital nightstands in a German maximum-care hospital, and to derive recommendations for product improvements.

**Background:** Hospital nightstands are crucial for patient care, providing storage and access for personal and medical items. Despite their importance, limited research exists on their functionality, particularly in Germany. Current designs often fail to meet user needs.

**Method:** A convergent mixed-methods design was used, combining photographic documentation of nightstands with item content counting and an online questionnaire for patients, relatives, nursing staff, and other hospital personnel. Data analysis included categorisation and coding in MAXQDA, along with descriptive statistics.

**Results:** Thirty-eight nightstands were documented, revealing variations in use intensity: low, moderate, and intensive. Items included food, personal belongings, and medical supplies, with many loose medications observed. User satisfaction was mixed, with criticism of poor mobility, impractical drawers, and inadequate cable management. Lack of integrated power outlets and privacy features were also noted.

**Conclusion:** Hospital nightstands need significant design improvements to better meet privacy, mobility, and storage needs. Recommendations include better electrification options, more accessible storage, and enhanced privacy features. Future research should focus on smaller, more adaptable designs suited to modern hospital environments.

## Introduction

The nightstand is a central element in the daily care of patients during a hospital stay (Sunder et al., 2020). In terms of product history, this furniture likely evolved from the need to have a place to store the chamber pot – especially when one didn't want to go to the outdoor toilet at night and in the cold (Crown, 2023). Today, especially given the lack of privacy in hospitals and care facilities, the nightstand remains highly important for patients. In Holmberg's qualitative study, based on in-depth interviews and photo documentation, she demonstrates that patients consciously use the nightstand to distinguish themselves from the uniform hospital environment and, in some cases, actively personalise it to express themselves. She concludes that, apart from wardrobes, nightstands are considered the only private spaces available to patients and are used in this way (Holmberg, 2001). The classic design of a hospital nightstand in Germany consists of a moveable, square body with a top drawer, a cupboard in the middle, a large drawer at the bottom, and a pull-out table. The used functions of the nightstand vary depending on the life situation of the individual user. For mobile and independent users, it primarily serves as a storage space for personal items such as books, mobile phone, or a photo of a relative. However, the functions of the nightstand changes as the need for care increases, and users are no longer able to independently access the wardrobe. In such cases, the product requirements may change drastically. All activities of daily living, such as eating and drinking, using the toilet, or personal hygiene, must be carried out while lying down, at the bedside, or next to the bed. Depending on the situation, the nightstand becomes a place for urinal bottles, for bedpans, a dining table, or a spot for inhalations devices, among other things. Sunder et al. grant patients exclusive usage rights for the nightstand, as the furniture, together with the hospital bed, forms the patient's personal space (Sunder et al., 2020) . Nevertheless, medical staff also use nightstands as a place to put blood collection trays, washbasins, and other activities. There are many reasons for this ranging from a lack of storage space, such as due to

space constraints, to negligence or time shortages. The numerous high-touch contacts (Robert Koch-Institut, 2022) from different groups of people make the nightstand a potential risk of infection (Albassri et al., 2019). The nightstand is, in a narrower sense, a furniture that, alongside with the bed, table, chairs, and wardrobe, forms part of the basic furnishings of a patient's room. However, the wardrobe is only accessible to patients if they are mobile enough to reach its shelves. In particular, the nightstand table, which can be pulled in and out, is also used as a storage area for meal trays, dressing materials, oral care kits, and more. This can significantly reduce the private space of patients.

In Germany, scientific research with nightstands is minimal. Neither is there sufficient research on technical advancements, nor on usage from the patients' perspective. Internationally, research is also rather limited, so this study can only draw on a few findings. Against this background, this study addresses the following research questions through a mixed-method approach:

How are patients currently using nightstands in a German maximum-care hospital?

How do patients, relatives, and hospital staff evaluate the nightstand?

What requirements can be derived and recommended for the product development of the nightstand?

### **Nightstands in Scientific Discourse**

At the beginning of the study, in 2023, we conducted a narrative international literature review in the CINAHL database using German and English search terms. The 32 results found were manually reviewed against prior formulated inclusion criteria based on their titles and abstracts. Three studies (Brooks et al., 2011, 2012; Healy et al., 2015) met the inclusion criteria and were read in full text. Additionally, we searched reference lists and book chapters for further relevant publications. This led to the discovery of a nightstand prototype conceptualisation

(Sunder et al., 2020) and a qualitative study (Holmberg, 2001). The amount of literature found is to be rates as low. The American studies address the use of nightstands (Brooks et al., 2011; Healy et al., 2015) and design preferences (Brooks et al., 2012), while Sunder et al. (2020) deals not only with usage but also with aspects of product reprocessing and the materials used. Sunder et al. (2020) addressed the variant of the nightstand with a pull-out table in a clinical setting. In contrast, the studies by Brooks et al. (2011, 2012) and Healy et al. (2015) examined a combination of a nightstand without a table and a mobile bedside table.

### ***Use of the Nightstand***

In their studies, Brooks et al. (2011) and Healy et al. (2015) examined the contents of patients' nightstands in rehabilitation centres and care facilities. Besides the types of items, both studies focused on the specific storage locations of these items. Brooks et al. (2011) found that most items were placed on the top surface of the nightstand, followed by the top drawer. These findings are confirmed by Healy et al. (2015), with the addition that many items were placed on the pull-out tables. Brooks et al. (2011) discovered that the fewest items were stored in the lower parts of the nightstand, which contrasts with the statements of Sunder et al. (2020), who considered the lower part of the nightstand to be easily accessible and the middle to upper parts as difficult to access. Healy et al. (2015) noted that the drawers of the nightstand are generally used less. Overall, Brooks et al. (2011) described a complicated product usage and showed that nightstands often to not meet the diverse usage requirements.

### ***Differences in Nightstand Requirements***

Within the reviewed literature, differences in requirements were found, which are most likely due to the varying complexity of users' needs regarding the nightstand. For example, Brooks et al. (2012) highlighted differing product preferences concerning the size of trash bins attached to nightstands and the overall size of the nightstand itself. While employees of rehabilitative facilities tended to prefer large trash bins and small nightstands, patients expressed exactly opposite requirements. Similarly contradictory product preferences can be

found across studies on the topic of electrifying the nightstand: Brooks et al. (2011) explored the potential advantage of integrating a power source into the nightstand, whereas Sunder et al. (2020) assess a wired nightstand in practice as rather disadvantageous. They justified this assessment with the reduced mobility of the furniture due to cables. Spatial conditions and the extent of required assistance sometimes necessitate repositioning the nightstand. The mobility of the nightstand would be significantly reduced by the need to unplug cables beforehand or by limiting the positioning to only one side of the bed (Sunder et al., 2020).

### ***Lack of Privacy for Personal Belongings***

Under this heading we understand the easy accessibility of the nightstand to strangers. Valuables such as wallets, smartphones, and tablets often must be stored in mostly insecure and non-lockable drawers. Additionally, the visibility of personal items can, especially with very openly designed nightstand models, lead to a reduction of privacy and personal data protection (Sunder et al., 2020).

### ***Hygiene and Reprocessing***

Nightstands are categorised as non-medical products and are therefore subject to different reprocessing requirements (Sunder et al., 2020). However, their significance as a potential source of nosocomial infections is well known (Albassri et al., 2019; Robert Koch-Institut, 2022), which is underscored by the unhygienic nightstands found in Brooks et al.'s (2011) study. The reprocessing requirements also differ depending on the specific usage area. While in clinical settings, a frequent change of users is to be expected, nightstands in long-term care facilities are used by individuals for longer periods of time. In general, nightstands must be designed so that liquids can drain off and that the materials used remain stable even under the use of various cleaning agents and procedures. A seamless nightstand construction with a corresponding reduction of components is therefore, according to Sunder et al. (2020), advantageous.

## **Methods**

A convergent mixed-methods design, employing concurrent quantitative nightstand object counting alongside qualitative online questionnaires, was implemented to explore the research questions and gain a broader understanding. Under a pragmatic paradigm, with a goal-oriented selection of methods and a focus on practical relevance, nightstands were photographed for subsequent object counting, and a questionnaire was developed to capture the user perspective. Both researchers had experience in qualitative and quantitative research, as well as many years of nursing expertise in hospital care. Prior to the start of the empirical research, the study design underwent ethical clearing by the ethics committee of the University Hospital Tübingen and received approval.

### **Nightstand Photographs and Counting the Items**

#### ***Data Collection***

Inspired by the studies of Brooks et al. (2011) , Brooks et al. (2012) , and Healy et al. (2015), we planned a survey of nightstand items through photographic documentation. We conducted this from October to November 2023, focusing on the quantitative representation of nightstand items across the different nightstand levels. The data collection took place in the wards of a cooperating maximum-care hospital in Germany, in the areas of cardiac, thoracic, and vascular surgery; neurology; radiation oncology; urology; and ear, nose, and throat medicine. The recruitment of participants was carried out, following the recommendation of the ethics committee, through the nursing staff of the respective wards. A data collection day was arranged with the ward management, and study information and consent forms were distributed. The wards then selected the participants, asked about their willingness to participate, and provided them with the study information. On the day of data collection, the researchers obtained written consent and addressed any remaining questions. The counting of the respective items was carried out later based on the photographs. Rules were established in

advance, covering fundamental aspects such as data protection compliance and data



Figure 1: Overview of the Different Nightstand Levels

minimisation. The items found on the nightstands was documented through a standardised photography protocol applied across six distinct levels (model-dependent: five) of the nightstand (see Fig. 1). The process included capturing the following views: a bird's-eye image of the top level and pull-out table, referred to as *Top Surface* and *Table*; a side view from above of the first pulled-out drawer, labelled *Drawer1*; a side view of the nightstand, identified as *Cupboard*; a side view of the pulled-out lower drawer or lower compartment with a door, labelled as *Drawer2*, or alternatively, the *Fridge* – a model-specific feature that substitutes the cupboard; and an image of the

lower pulled-out drawer (*Drawer3*), which was present as a shoe drawer in some model variants.

After the photographic documentation was completed, the participants were shown the images onsite. We intended this to provide maximum transparency and offer the opportunity to delete any images. In addition to the photographic documentation, patient data such as age, gender, length of stay, ICD-10 code, and patient positioning at the time of data collection (e.g. lying down, sitting on the edge of the bed, outside the bed) were gathered. At the end of each data



collection day, the research team reflected together, memos were recorded, and the raw data was digital uploaded.

### ***Data Analysis***

Images and patient raw data were catalogued in sequential numbering and entered into MAXQDA 2022 (VERBI Software, 2021). Each nightstand was assigned a document group consisting of six images (or five, depending on the nightstand variant). Images 2 to 6 represent the different nightstand levels, while Image 1 shows the location of the nightstand in the patients' room. We coded Image 1 deductively based on predefined use cases, which included the placement of the nightstand relative to the bed, the visibility of the multimedia tablet, mounted on a swivel arm, and the location of the patient call button. The counting and coding of nightstand items by each level was conducted inductively. In cases of uncertainty regarding item classification, these items were coded as *unidentifiable* and later discussed within the team. The resulting master list of items was kept as specific and aggregated as possible, to avoid losing items and dimensions in abstract terms. The careful development of a categorisation system with 13 main categories was therefore carried out through several consensus-building steps. For the analysis, the documented nightstands were divided into three groups based on the number of nightstand items.

### **Digital Questionnaire**

#### ***Data Collection and Analysis***

To address the research question, an online questionnaire with both qualitative and quantitative questions on the use of nightstand was created using Evasys version 9.1 (Evasys GmbH, 2023). The questionnaire included open-text responses, Likert scales, and multiple-choice options to gather feedback from different user groups (*Patients and Relatives, Nursing Staff, Service Staff, and Other Roles*) across various areas, including five items *Satisfaction with Nightstand Functions* ( $\alpha = 0,787$ ) and single items in, *Working with the Nightstand, Cleanliness*

*and Defects*, and *Requested Additional Features*. We pretested the questionnaire in a pilot phase (n = 7), assessed the content validity of the single items, and subsequently adjusted. To recruit study participants, an informational study flyer with QR code linking to the questionnaire was created. A total of 1,200 flyers were distributed via meal trays and during on-site visits at the cooperating maximum-care hospital, where the photographic documentation had been conducted. Additionally, the survey link was shared within both private and professional networks. The quantitative questions were analysed and processed using descriptive statistics. The qualitative questions included in the questionnaire were evaluated and described through content analysis, following Mayring's (2022) approach.

## **Results**

### **Nightstand Photographs and Counting the Items**

#### ***Study Population***

A total of 38 patients' nightstands (10 female; 1 unspecified) were photographed, and their contents were counted. The patients had a median age of 69 years and a median length of stay of seven days (see Fig. 2). The reasons for their hospitalisation were highly diverse (see Tab. 1). All data collections took place in the morning on a weekday. As the exact time of data collection was unannounced, patients were found in different positions relative to their bed and nightstand and were asked to maintain these positions: sitting on the edge of the bed (n = 8), lying in bed (n = 19), and outside the bed (n = 11).

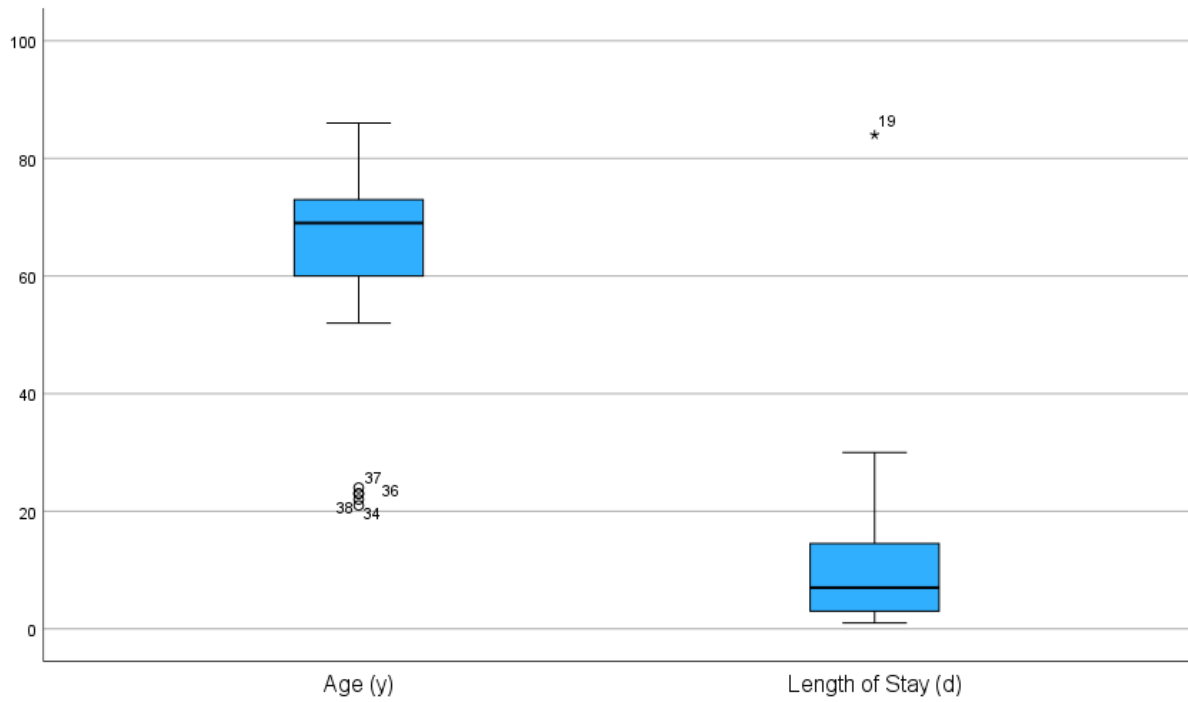


Figure 2: Age and Length of Stay Distribution of the Study Population

Table 1: ICD-11 Coding of the Study Population by Frequency

ICD-11*	Number of Cases (n)
02 Neoplasms	11
08 Diseases of the nervous system	4
09 Diseases of the visual system	3
11 Diseases of the circulatory system	10
12 Diseases of the respiratory system	4
15 Diseases of the musculoskeletal system or connective tissue	1
16 Diseases of the genitourinary system	4
Unknown	1

\* International Statistical Classification of Diseases and Related Health Problems (ICD) 11<sup>th</sup> Revision.

### ***Nightstand Variants, Positioning, and Usage***

In the collection of the nightstand images, three different nightstand model variants were identified (see Fig. 3). While model variants Type 1 (n = 11) and Type 3 (n = 19) were in use across all visited wards, the use of nightstand variant Type 2 (n = 8) was observed exclusively in the Ear, Nose, and Throat (ENT) wards.



*Figure 3: Found Nightstand Variants (left to right): Type 1, Type 2, and Type 3*

It is noticeable that all nightstands included in the study feature various cables, with the cable management appearing disorganised. In addition to the call bell and the patient information system (primarily used for television and internet access), there are also cables – mainly for charging – associated with other electronic devices like smartphones, notebooks, tablets, and medical equipment. None of the nightstand variants had a charging port accessible to patients.

At the time of data collection, 35 out of 38 patients were using the extended pull-out table; however, their positions relative to the bed varied greatly, suggesting that the nightstands were frequently moved to accommodate different storage and usage needs. All nightstand variants were in use by patients at the time of data collection, though with notable differences, which allowed the nightstands to be categorised into three distinct groups: Intensive Use (35-63 items per nightstand), Moderate Use (21-32 items per nightstand), and Low Use (9-19 items per nightstand).

In this regard, 13 nightstands were classified as Low Use, 18 as Moderate Use, and 7 as Intensive Use. Notably, the different levels of the nightstand were used to varying degrees. The Intensive Use group primarily used Drawer1, which holds the highest number of items (121 items), followed by the Top Surface (76 items), and the Table (20 items) (see Tab. 2).

Table 2: Categorised Nightstand Items in the Intensive Use Group

<b>Nightstand Level</b>	<b>Average Number of Items (n)</b>
Top Surface	76
Table	20
Drawer1	121
Cupboard	29
or	
Fridge	4
Drawer2	18
Drawer3	0

\*Only nightstands variants Type 1 & 3.

### ***Location of Items on and in the Nightstand***

The items observed during the data collection were systematically categorised through a multi-step process. Categories were named and assigned inductively during the analysis process. No alignment with systematisations used in other studies was conducted, as they did not appear transferable to the data at hand. The items found were catalogued into 13 categories (see Tab. 3). It is plausible that many items were located on the nightstand, keeping them within the patient's immediate reach. However, there are also items for which an alternative storage space may not have been available, such as trays with bandages or medical devices. This indicates that the nightstand must be considered in the context of other furniture, such as wardrobes, bathroom shelves, or windowsills. If items cannot be stored in these places, it is

understandable that they end up on or in the nightstand, even if they do not necessarily need to be within immediate reach. Additionally, there are items on or in the nightstand that are used by nursing & medical staff or other professionals. In these cases, the nightstand serves as a storage space for others.

In the spread of items across categories, it is noticeable that certain categories stand out quantitatively. Specifically, the categories of Groceries, Sanitary Products, Medications, Personal Belongings, and Electronic Devices and Accessories warrant further description to clarify which items can be distinguished within these groups.

**Groceries.** Groceries represent the largest category by quantity. Most of these were located on the Top Surface and in Drawer1. Many groceries originated from the clinical, such as individually packaged items from meal trays (e.g. bread spreads, sugar packets, and coffee creamers) or desserts like yoghurt/pudding or fruits. Patients also brought their own groceries and stored them in the nightstand. Among the privately brought items, sweets were predominant. Additionally, patients brought spices such as salt, pepper, and mustard. Notably, patients rarely brought beverages, and if they did, they tended to bring products like plant-based milk or soft drinks.

**Medications.** The quantity of medications observed in the nightstands is notable. These include both medications provided by the clinic and those brought privately by patients. Given that patients are sometimes advised in hospital information brochures to bring their own medications, the high number of observed medications is understandable. The medications include ointments, drops, tables, capsules, patches, subcutaneous injections like insulin, powders and effervescent tablets, syringes for flushing intravenous cannulas, and more.

Table 3: Frequency of Items by Category Group and Nightstand Level

<b>Category Group</b>	<b>Top Surface</b>	<b>Table</b>	<b>Drawer1</b>	<b>Cupboard</b>	<b>Fridge</b>	<b>Drawer2</b>	<b>Drawer3</b>
<i>Groceries</i>	104	25	45	10	4	12	1
<i>Sanitary Products</i>	47	8	37	11	0	4	0
<i>Medication</i>	34	21	41	2	0	1	0
<i>Print Media</i>	29	14	21	21	0	4	0
<i>Personal Belongings</i>	28	10	26	1	0	1	0
<i>Electronic Devices &amp; Accessories</i>	19	17	13	3	0	0	0
<i>Medical Accessories (clinical)</i>	25	13	9	2	0	0	0
<i>Containers</i>	12	7	7	10	0	1	0
<i>Waste</i>	13	2	1	2	0	0	0
<i>Silverware &amp; Napkins</i>	9	3	2	1	0	0	0
<i>Therapy &amp; Medical Devices, Exercise Equipment</i>	7	0	2	0	0	1	0
<i>Clothing</i>	1	0	0	4	0	0	0
<i>Unidentifiable</i>	5	2	23	2	0	1	0
<b>Total</b>	<b>333</b>	<b>122</b>	<b>227</b>	<b>69</b>	<b>4</b>	<b>25</b>	<b>1</b>

Privately brought medications are often found in Drawer1, making them invisible, while clinic-provided medications are usually placed on the Top Surface. Some medications were stored in dispensers, others in packaging or blister packs, but many are also found loose, mixed in plastic bags or similar containers. In some cases, medications that regulated under controlled substance laws, like opiates, could also be observed.

**Sanitary Products.** Items related to dental and denture hygiene, nail care, and various creams were primarily observed. By far, the largest quantitative group consisted of disposable tissues.

**Print Media.** A considerable number of private print media items, such as books and magazines, were found. Additionally, there was a relatively smaller yet notable portion of hospital-specific print media (mainly hospital brochures, informational leaflets, and meal menus). Due to their size, printed media tend to occupy a relatively large amount of space.

**Electronic Devices, Accessories and Cable Management.** This section includes smartphones and tablets along with their electronic accessories, such as headphones (wired and wireless) and chargers. Cable Management refers to the connection of cables plugged into wall outlets with the nightstand. Depending on the spatial context, two distinct conditions could be identified, which are influenced by the height of the power outlets in the hospital room (see Fig. 4).

**Personal Belongings.** We defined these items that do not fit into other categories but are clearly identifiable as personal belongings (e.g. tobacco products, cash/wallets, flowers, pictures, cuddly toys, etc.). Generally, relatively few personal items of this nature were found.





Figure 4: Cable Management. Left: High Power Outlet Height. Right: Low Power Outlet Height

## Digital Questionnaire

### *Study Population*

Recruitment took place in two phases. In Phase 1m 300 flyers were distributed during the photo documentation in the respective hospital wards. Additionally, flyers were distributed among bachelor's and master's nursing students and within personal and professional networks. Due to a low response rate, 900 additional flyers were distributed on meal trays at the partner hospital in Phase 2. In total, 87 participants submitted completed questionnaires digitally after the two recruitment phases (response rate 7.25%, mean age = 44 years, SD = 15.9 years; 61 female, 26 male).

### ***Nightstand Users***

Figure 5 shows the distribution of the roles of nightstand users. Multiple responses were possible allowing for a reflection of nightstand use considering different roles. For example, nursing staff can take on different roles: a) as a professional, b) as a patient, and/or c) as a relative.

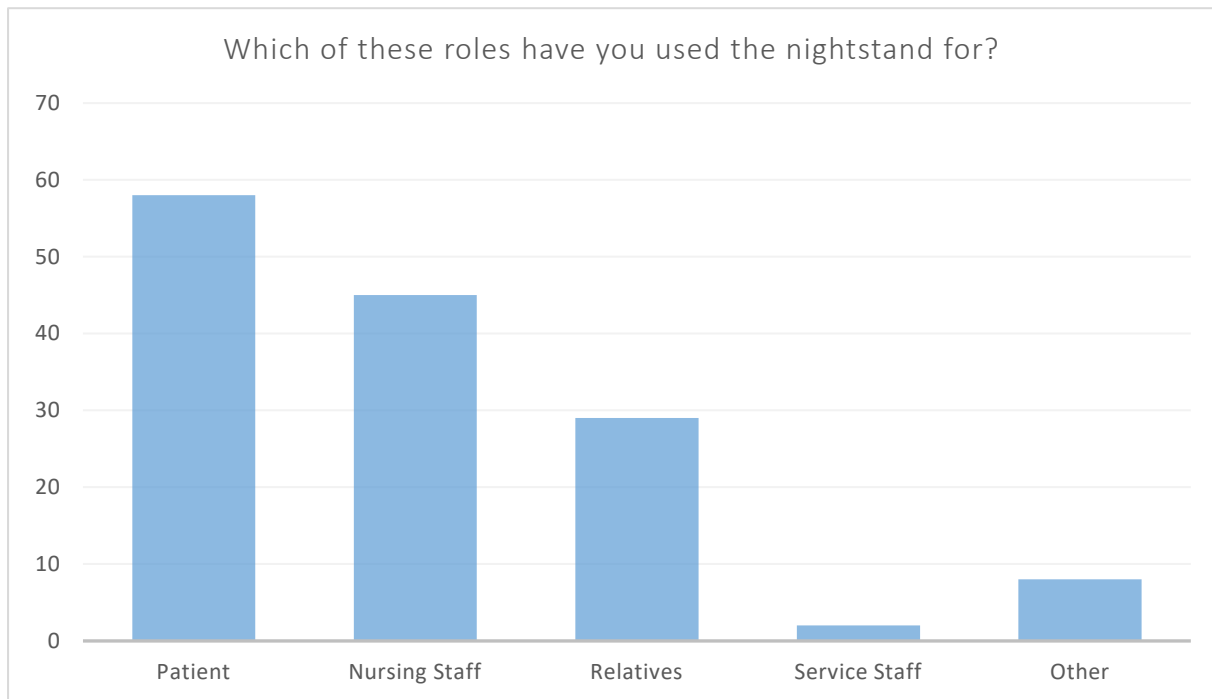


Figure 5: Nightstand Usage by User Roles in Numbers

### ***Patients and Relatives Satisfaction***

58 of the participants identified themselves with the patient role, and 29 experienced the usage as relatives. We considered patients as primary users and relatives as secondary users and asked them about their satisfaction with the nightstand functions (see Tab. 4). Satisfaction was assessed using a four-point Likert scale (1 = very satisfied, 4 = not satisfied).

In addition to moderate satisfaction, particularly low response rates for the functions of sit-to-stand support and attachment options can be observed. Possible reasons for this may be that the functions are not used regularly and/or not known.

Table 4: Satisfaction with the Respective Nightstand Functions

<b>Nightstand Function</b>	<b>Mean (SD)</b>	<b>Number</b>
First Drawer (Drawer1)	2 (1)	30
Second Drawer (Drawer2)	2,4 (1,1)	28
Pull-Out Table	2 (0,8)	32
Sit-to-Stand Support	2,7 (1,3)	11
Attachment Option	2,7 (1,2)	16

### ***Nursing Staff Satisfaction***

Nightstands are integrated into various workflows by nursing staffing, depending on the individual level of support required by the patient. Understandably, nightstands are commonly used to support meal and medication intake. The nightstand is utilised for “...pretty much every task involving multiple materials” (excerpt, open-text response) in daily nursing and medical work. During personal care and clinical care, it primarily serves as an additional workspace and storage surface, for example, to carry out tasks such as washing bowls, sterile wound care, or blood sampling. The integration of the nightstand also depends heavily on the specific care setting. In intensive care units, for example, nightstands are more frequently incorporated into the daily workflows by caregivers. To assess how satisfied professional caregivers are with the integration of the nightstand into their work processes, a four-point Likert scale was used (1 = very satisfied, 4 = not satisfied). Here, 15 nurses reported an average satisfaction level (mean 2.5, SD = 0.7). The causes of dissatisfaction mentioned include nightstand models that are difficult to move, mostly old or broken. It becomes apparent that caregivers primarily criticise the limited mobility and versatility of the nightstands. Issues such as the lack of reversible drawer and cabinet opening directions, the pull-out table tipping easily under light load, accidental activation of the wheel locks, and general lack of space were perceived as problematic. External factors disrupting usage include the large number of cables

and lines, which come from the hospital side (call bell, hospital infotainment system, oxygen and infusion lines) and the patient side (charging cables).

### ***Nightstand Mobility in the Patient Room***

Users appreciated the versatile use of the nightstand. It can be moved around the room as desired and used on either side of the bed. Additionally, due to its dimensions, the nightstand acted as a spatial divider between the bed and the neighbouring bed, providing a bit more privacy in an otherwise open room. The ability to lock the wheels with a brake was viewed positively. However, the nightstand's bulkiness was considered a drawback, with criticism focused on its weight, size, and the difficulty in rolling the wheels. The brakes were seen as too easily activated, and there was a lack of proper instructions how to use them.

### ***Usage and Storage***

The survey participants frequently mentioned the ability to store items in the nightstand as very positive. They also rated the pull-out and height-adjustable table favourably. However, the pull-out table was considered too small and not horizontally swivel able. The top surface of the nightstand had to be loaded with items, as it became unstable when too much was placed on the table. Furthermore, the hospital infotainment system took up a lot of space and sometimes caused beverage bottles to tip over. The top drawer was only visible when seated and often difficult to open. The lower part of the nightstand hard to access, with the bottom drawer or cupboard being unnecessarily high, leading to wasted space. Some participants also criticised the drawer layout. The refrigerators were perceived as unnecessary by some, while others found them very useful. Participants agreed that the dual-sided use of the nightstand was hindered when refrigerators were built in. Additionally, due the cooling from the compressor the top drawer became warmer than expected. Respondents also commented on the design and use of the nightstand, describing it as hospital-like. They suggested rounding and raising the edges, especially because the corners were difficult to clean. The lack of continuous edging made it easier for items to fall off the top surface. The lack of built-in electrification, such as

power outlets and additional charging options, was criticised. Overall, there was a lack of an instruction manual for the nightstand or visible guidance, e.g., on how to pull out the tablet.

### ***Cleanliness and Common Defects of the Nightstand***

Satisfaction with the cleanliness of the nightstand was rated as average on a four-point Likert scale (1 = very satisfied, 4 = not satisfied) (mean = 2.2; SD = 1; n = 85). The most frequently mentioned areas of the nightstand perceived as particularly dirty were the surfaces, the pull-out table, the inside of the drawers, and the wheels. Two main reasons were cited for this. First, the nightstand could not be cleaned to the necessary extent because it was cluttered with items. Second, material and design choices, such as grooves, corners, hard-to-reach mechanisms, like pull-out table and height adjustment, and rough material surfaces made thorough cleaning more difficult. 34.1% of respondents (n = 82) reported a defect in the nightstands they used. Observed defects included malfunctions of the pull-out table (unable to lock, unable to extend, broken height adjustment), issues with mobility due to blocked or not easy rolling wheels, non-functioning brakes, jammed or stiff drawers, broken handles and support, non-removable stains, dented nightstand bodies, and rust formation.

### ***Nightstand Functional Requests***

Participants in the questionnaire highlighted a diverse range of functional requirements for the nightstand to improve usability. Key suggestions included features such as a document or menu holder, lockable storage for laptops or tablets, and a second top drawer installed lower for enhanced accessibility. Many participants emphasised the need for drawers that open sideways rather than towers the bed, as well as the ability to swivel the table to the side without moving the entire nightstand. Practical add-ons, such as power outlets for charging, wireless charging, and smart, secure cable management, were also commonly mentioned. Additionally, requests included a mobile phone holder, integrated reading light, sit-to-stand support, and a call bell, alongside additional storage surfaces near the bed, complete with tray and cup holders. Some respondents proposed features like temporarily expandable storage surfaces, holders for

waste and vomit bags, and an extra table or mounts for attaching medical or nursing trays, A pull-out table with the ability to prop up tablets or smartphones for reading or watching movies was also mentioned. Further desired features included an integrated refrigerator (as not every model has one), brakes operable from the bed, and a simple locking mechanism to prevent the nightstand from rolling away. Other practical requests included a walking stick holder, removeable drawer compartments for easier cleaning, and a colourful design to improve aesthetics.

### **Discussion**

From our perspective, this study strongly encourages rethinking the nightstand as a piece of hospital furniture and using the insights provided here for further development. The nightstand is multifunctional that essentially enables *Storing Inside* (in the nightstand) and *Placing on Top* (on the nightstand). Both functions are important for patients. The ability to store inside is particularly crucial, as only items placed inside the nightstand are protected from the view of others, thereby providing a certain degree of privacy. The (public) act of placing on top on the top surface, the cupboard, or the pull-out table is useful for having items quickly at hand. However, the storage surfaces are also used by other user groups: nurses and physicians use these surfaces for items that are meant to remain with the patients. Whether this is due to a lack of other storage spaces or whether it is in the patients' best interest could not be determined within the scope of this study and remains an open question. So far, there has been no national or international study that comprehensively examines the nightstand. The few existing studies point in a similar direction in terms of results, but due to their lack of recentness and the question of transferability from international to national contexts, they are of limited use. Furthermore, it can be assumed that the significant reduction in the average length of patient stays in hospitals, as well as the modernisation of hospital rooms and furniture (especially the patient wardrobe), have changed usage preferences and requirements. Additionally, technological advancements

such as smartphones, tablets, and e-book readers have increasingly influenced user requirements. The following section summarizes and discusses the key findings.

### **Use of the Nightstand**

The results of our study confirm the findings of Brooks et al. (2011) that the lower levels of the nightstand are used less for storing items and appear to be less accessible. Of the more frequently used levels, it was found that most items are stored in the top drawer and on the top surface. Although the pull-out tables were extended in almost all patients' nightstands during the photo documentation, indicating high usage, noticeably fewer items were placed on them. The cupboard and lower drawer (drawer 2) contained significantly fewer items, while the bottom drawer (drawer 3), if present in the model, was not used for storing shoes. While the top drawer, cupboard, lower drawer, and bottom drawer seem to be reserved for patients, the open surfaces are sometimes used by staff as storage for medical and nursing supplies. This aspect of usage has not been widely discussed in previous studies.

### **Items Placed On and In the Nightstand**

The systematic analysis of the items found in this study highlights different aspects that have been under thematised in the literature. Food, medication, hygiene products, and media are the dominant items found in and on the nightstands in this study. Particularly noteworthy is the large quantity of loosely stored medication. We hardly found any waste on or inside the nightstands. However, there were many cables around the nightstands, as patients used the sockets above the bed to charge their personal digital devices.

### **Aspects of Privacy in Usage**

Surprisingly, there were very few strictly personal items placed on or inside the nightstand. However, it can be noted that most self-brought medications were typically placed in the top drawer, allowing them to be at least somewhat shielded from the view of others. Some food items, particularly sweets, were also stored in the top drawer.

## **Usability of the Nightstand**

The evaluated nightstand models are perceived by study participants as too bulky and impractical to operate or position. As a result, some of the storage levels cannot be fully utilised. In particular, the patients surveyed expressed a desire for more accessible storage space and hassle-free usage. They also wished for a short instruction, such as for pulling out the table. The ability to use nightstands from both sides is seen as essential, but this is currently difficult to achieve. Functions like the bottom drawer remain unnoticed by users due to the lack of indicators pointing out their existence and use.

## **Electrification of the Nightstand**

The electrification of the nightstand reveals a paradox. The main reason cited against the electrification is the restricted mobility due to the reliance on cables (Sunder et al., 2020). However, our findings show that nightstands are already cable-bound and thus hard to move due to attachments such as call bell and infotainment systems. The nightstand models with refrigerators included in this study were all electrified, but not for the users, who had to, sometimes laboriously, access power outlets apart from the nightstand. Respondents expressed a strong desire for further development in this area, requesting dedicated power sources and charging options within the nightstand.

## **Limitations**

The study was conducted in one German maximum-care hospital, focusing on specific departments. This narrow scope limits the generalisability of the findings to other hospital types or departments with differing contexts. Participant recruitment was conducted via nursing staff and flyers distributed on-site. This method might have led to a biased sample, where only patients who were more engaged provided feedback, leaving out potentially less responsive populations. The response rate of the questionnaires is also considered very low. This low



participation rate could impact the statistical validity of the results, as the small sample size may not be representative of the broader population of patients, relatives, and hospital staff.

### **Conclusion**

The mixed-method study design has particularly promoted new insights in the qualitative findings and reinforced previously discussed aspects. Further photo documentation and surveys (in various departments and additional hospitals) are desirable, as the data collected within the given research period were not yet fully saturated. It would also be interesting to examine the nightstand within the context of the respective room concepts. A key question for the future will be whether nightstands can be made smaller. This certainly depends on the overall room concept and the question of where patients and staff can store items, as well as whether manufacturers can make the lower levels of the nightstand more accessible and usable. The nightstand is a place where patients can store items out of sight from others and within close reach. This is especially important for those who are less able to leave their bed.

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