Pad per day usage, urinary incontinence and urinary tract infections in nursing home residents

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Abstract

Background: many elderly suffer from urinary incontinence and use absorbent pads. Pad use per day (PPD) is a frequently used measure of urinary incontinence. Nursing home residents are often dependent on help from nursing staff to change pads. This study was performed in order to determine whether PPD is a reliable method to quantify urinary incontinence in nursing home residents. Furthermore, the association between urinary tract infections (UTIs), PPD and fluid intake was studied.

Methods: data were retrieved from a multicentre, prospective surveillance among nursing home residents. Data on the use of absorbent pads, fluid intake and incontinence volumes were collected during 48 h. During a 1-year follow-up period, data on UTIs were collected.

Results: in this study, 153 residents were included, of whom 118 (77%) used absorbent pads. Residents who used absorbent pads were at increased risk of developing UTIs compared to residents who did not use pads (41 vs 11%; \( P = 0.001 \)). Daily fluid intake was not associated with UTIs \( (P = 0.46) \). The number of pad changes showed no correlation with the risk of developing UTIs \( (P = 0.62) \). Patients with a given PPD presented a wide range of incontinence volumes.

Conclusion: the use of absorbent pads is associated with an increased risk of developing UTIs. PPD and daily fluid intake are not correlated with the risk of developing UTIs. PPD is an unreliable measure of urinary incontinence in nursing home residents.

Keywords: nursing home, incontinence, urinary tract infections, absorbent pads, elderly

Introduction

Urinary incontinence is defined as involuntary leakage of urine [1]. It is common among nursing home residents, with reported prevalence ranging from 30 to 70% [2–5]. In incontinence care, different kinds of absorbent products, such as diapers or pad and pant combinations, are used [6, 7].

It is important to use objective measures to compare different forms of treatment for urinary incontinence. Pad use per day (PPD) and the 24 h pad-weighing test are frequently used tests to quantify urinary incontinence. PPD is an easier and a less time-consuming method than the 24 h pad-weighing test, in which all absorbent pads have to be weighed before and after use during a 24 h period. Although the 24 h pad-weighing test is preferred, PPD is often used and has shown to be a reliable measure of incontinence volumes in an ambulatory setting [8]. However, the majority of nursing home residents are dependent on help from nursing staff for toileting and help to change soiled absorbent pads [2, 9]. It is therefore unclear whether PPD is also a reliable measure for the quantification of urinary incontinence in this population.

Urinary tract infection (UTI) is a common problem in nursing home residents that can cause significant morbidity [10, 11]. The prevalence of bacteriuria in nursing home residents, including asymptomatic bacteriuria, is approximately 30% [12, 13]. Physiological changes related to ageing, co-morbidity, malnutrition, cognitive deficits, urinary and faecal incontinence, use of indwelling catheters and immobility are factors that increase the risk for devel-
for UTI in the elderly [10, 12]. Transmission of bacteria during incontinence care has also been associated with UTI [14, 15]. Improving hand hygiene among nursing home staff is one of the most important and effective methods to reduce hand born transmission of pathological microbes [14, 16]. Some authors have suggested that absorbent pads might play a role in the pathogenesis of UTIs in incontinent persons [17].

The objective of this study was to determine whether PPD is a reliable measure of incontinence volumes in nursing home residents. Furthermore, the association between UTI, PPD and fluid intake was studied.

Patients and methods

Residents from six different nursing homes in Norway were included in the study. All nursing homes were situated in the county of Nord-Trøndelag. Homes from rural and urban areas were included. All residents aged 65 years and older were evaluated for inclusion. Residents who were terminally ill were excluded from participation. Participants who were treated with antibiotics at baseline or had a permanent catheter were excluded from the current analyses.

The study was approved by the Board of Research Ethics in the area where the study was coordinated. All patients gave informed consent prior to participation in the study. For those patients who were unable to give informed consent themselves, for instance due to dementia, a close family member was allowed to sign the consent. The study complies with ethical rules for human experimentation as stated in the Declaration of Helsinki [18].

Data on gender, age, activity of daily living (ADL), co-morbidity, faecal incontinence, urinary incontinence, postvoiding residual volume (PVR), fluid intake, incontinence volumes and mortality were collected. Part of this study, including data on the association between PVR and UTIs, has been published elsewhere [13].

At baseline, the Barthel ADL scale was used to estimate the patients’ physical function level [19, 20]. Fluid intake was measured and registered on a form for a period of 48 h. The average fluid intake during these 2 days was used in the analyses. Nurses were instructed to follow normal routines for voiding residual volume (PVR), fluid intake, incontinence volumes and mortality were collected. Part of this study, including data on the association between PVR and UTIs, has been published elsewhere [13].

At baseline, the Barthel ADL scale was used to estimate the patients’ physical function level [19, 20]. Fluid intake was measured and registered on a form for a period of 48 h. The average fluid intake during these 2 days was used in the analyses. Nurses were instructed to follow normal routines for pad changes in each patient during the time the registration took place. In patients who used absorbent pads, the total number of pad changes was registered during the same period. Incontinent residents all used the same type of pads. Different pads for day and night were used. The maximum number of pads was not limited. The amount of leakage was measured by weighing the pad before and after use and recorded in a bladder diary. The 24 h leakage was calculated by dividing the leakage in 48 h by two. The 24 h pad-weighing test has been shown to produce a reliable and reproducible measure of urinary incontinence [21].

Midstream urine was collected at baseline. The urethral area was washed with sterile water prior to collecting the urine. In some cases, when it was difficult to collect midstream urine, the nurse was allowed to use urethral catheterisation to retrieve the urine samples. This is a reliable method of collecting urine samples in incontinent patients [22]. Each urine sample was collected in a sterile bowl [2, 22].

During the 360-day follow-up period, urine was collected when a UTI was suspected. In accordance with the definition of UTI proposed by the Centre for Diseases and Prevention, a UTI was suspected when two or more of the following symptoms were present: fever, pain related to voiding, deliria, reduced general condition, new or worsened urinary incontinence or urinary frequency, foul-smelling urine or muddy and concentrated urine [22]. A UTI was diagnosed when patients showed two or more of the symptoms and a urine culture with more than 105 colony-forming units per ml of a single type of bacteria [23]. The number of UTIs was recorded prospectively after 60, 180 and 360 days from baseline.

Analyses were performed using SPSS, version 15 (SPSS Inc. Chicago, IL). Bivariate associations between UTI and independent variables were tested with Pearson’s chi-square test of independence. The relation between PPD usage and the 24 h pad-weighing test was analysed with linear regression. P < 0.05 was considered statistically significant.

Results

One hundred and fifty-three residents were included in the current analysis. Of the included residents, 105 were female and 48 were male. The mean age of the included residents was 83 (±8.2) years. ADL scores were registered in 149 of the residents (98%). The mean score on the Barthel Index was 8. This indicates that this population, on average, had a high grade of dependency. Of the included residents, 66 (43%) suffered from dementia. Mortality during 1-year

### Table 1. Patient characteristics

<table>
<thead>
<tr>
<th>Gender</th>
<th>Men (n = 48)</th>
<th>Women (n = 105)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agea</td>
<td>81 (±8.7)</td>
<td>85 (±7.7)</td>
</tr>
<tr>
<td>Barthel ADL scoreb</td>
<td>13 (28)</td>
<td>33 (32)</td>
</tr>
<tr>
<td>&lt; 5</td>
<td>19 (40)</td>
<td>31 (30)</td>
</tr>
<tr>
<td>5–11</td>
<td>20 (43)</td>
<td>31 (30)</td>
</tr>
<tr>
<td>&gt; 11</td>
<td>14 (30)</td>
<td>38 (37)</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Co-morbidityb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dementia</td>
<td>22 (46)</td>
<td>44 (42)</td>
</tr>
<tr>
<td>Stroke</td>
<td>19 (40)</td>
<td>31 (30)</td>
</tr>
<tr>
<td>Parkinson</td>
<td>3 (6)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8 (17)</td>
<td>21 (21)</td>
</tr>
<tr>
<td>BPH</td>
<td>11 (23)</td>
<td></td>
</tr>
<tr>
<td>Estrogens</td>
<td></td>
<td>8 (8)</td>
</tr>
<tr>
<td>Constipation</td>
<td>23 (49)</td>
<td>43 (45)</td>
</tr>
<tr>
<td>Fecal incontinence</td>
<td>15 (31)</td>
<td>35 (33)</td>
</tr>
<tr>
<td>Use of pads</td>
<td>36 (75)</td>
<td>82 (78)</td>
</tr>
<tr>
<td>Mortality during follow-up</td>
<td>14 (29)</td>
<td>21 (20)</td>
</tr>
</tbody>
</table>

BPH, benign prostate hyperplasia; std, standard deviation.

a Mean (std).
b co (%).
follow-up was 23%. Characteristics of the residents are shown in Table 1.

During the 1-year follow-up period, 52 residents (34%) experienced one or more episodes of UTI. The amount of fluid intake was registered for all residents during a 48 h period. The average fluid intake was 1242 ml (range 138–2425 ml) per day. The prevalence of UTIs in residents with a fluid intake of <1200 ml per day was 69% (95% confidence interval (CI) 59–80). No association between UTIs and fluid intake was found (69 vs 31% in residents with fluid intake <1200 ml and ≥1200 ml, respectively; P = 0.7).

One hundred and eighteen of the participants (77%) used absorbent pads. Of the residents who used pads, 48 (41%; 95% CI 32–50) developed one or more UTIs during 1 year. Of those who were continent, only 4 (11%; 95% CI 1–22) experienced one or more episodes of UTIs (P = 0.001).

On average, absorbent pads were changed 2.3 times a day in women (range 0.5–8.0) and 3.1 times a day in men (range 1.0–9.0) (P = 0.09). Among residents in whom pads were changed less than 3 times a day (n = 50), 22 (44%; 95% CI 30–58) were subject to one or more UTIs. In residents with 3 or more changes (n = 66), 26 (39%; 95% CI 28–52) developed UTIs during the follow-up period (P = 0.62). In women, we found no difference occurrence of UTIs in the group with less than three changes compared with those who changed absorbent pads three or more times a day (50 vs 50%; P = 1.0). The same was true for men (27 vs 18%, respectively; P = 0.47). (For details on number of pad changes and UTIs, see Table 2).

PPD accounted only for 67% in men and 53% in women of the variance in pad weight in this population (see Figure 1). PPD was found to be an unreliable measure of urinary incontinence in the nursing home population.

### Discussion

A high number of residents (77%) in the current study are incontinent and use absorbent pads. The reported prevalence of incontinence in older people living in nursing homes varies

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**Table 2. Use of absorbent pads, fluid intake and number of pad changes vs UTI**

<table>
<thead>
<tr>
<th>UTI during follow-up</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>(n = 52)</td>
<td>(n = 101)</td>
</tr>
<tr>
<td>Absorbent pads</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>48 (41)</td>
</tr>
<tr>
<td>No</td>
<td>4 (11)</td>
</tr>
<tr>
<td>Fluid intake &lt;1200 ml</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50 (69)</td>
</tr>
<tr>
<td>No</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Number of pad changes</td>
<td></td>
</tr>
<tr>
<td>&lt;3</td>
<td>22 (44)</td>
</tr>
<tr>
<td>≥3</td>
<td>26 (40)</td>
</tr>
</tbody>
</table>

Data are given as n (%).

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**Figure 1.** PPD usage versus 24 h leakage.
widely [2, 9, 24]. Different definitions of urinary incontinence, various characteristics of the population or different study designs can explain this variation. This study was performed in six different nursing homes in both rural and urban areas of the county of Nord-Trøndelag. The patient population is representative of the country’s population. However, results might not be generalisable to other countries, with different customs with regard to pad changes and incontinence care. When compared to other studies, prevalence of incontinence in our population was high, which can be explained by characteristics of our population. Nursing home residents are a vulnerable population with a high grade of dependency and functional decline in ADL. Our results showed a low average score of ADL function. Other authors found a reciprocal relation between urinary incontinence and UTIs and moderate to severe functional impairment in nursing home residents [17, 24]. Also, cerebrovascular diseases were common in our study population. These conditions affect the continence mechanisms both cognitively and physically. Demented residents may, for example, have problems with basic sanitary practices such as hand hygiene and might therefore be at a higher risk of developing UTIs [10]. Good cognitive function is also associated with a lower risk of urinary incontinence [4]. Forty-six percent of the residents in this study were affected by constipation, which is known to be a reversible cause of urinary incontinence. Constipation can also cause faecal incontinence, which is a risk factor for development of UTIs [2]. Other factors that might explain the high prevalence of urinary incontinence in our study population are use of medication, which may interact with continence mechanisms and neurological disorders such as diabetic neuropathy.

Low fluid intake is generally thought to be a risk factor for UTIs [25]. The hypothesis is that a frequent flow of urine can prevent bacterial growth in the urinary tract. However, some authors have concluded that there is no association between mild dehydration and the risk of UTIs [26]. In our study, no relation between the amount of fluid intake and UTIs was found.

Of the residents in our study, 77% used absorbent pads and most of the residents needed help to use the toilet and to change pads. Several studies show that incontinent residents in nursing homes often use absorbent pads [3, 4, 7, 27]. Some authors are concerned about the indiscriminate use of absorbent pads in the nursing home population and the decrease in use of other treatment of urinary incontinence, such as for example behavioural interventions, new surgical procedures and drug therapies [3]. Ouslander and Schnelle recommend avoiding using pads as the sole solution to avoid skin irritation in incontinent nursing home residents [2]. Hampton [6] recommends that resident’s individual needs for pads should be considered in incontinence care.

Rutchik and Resnick [28] suggest that quantifying number of pads is an important variable when studying urinary incontinence in the nursing home population. In the present study, the total number of pads shifted during 48 h was, for each resident, registered on a form. Our results show a significant increase in the occurrence of UTIs in incontinent residents using pads. The number of changes is not associated with the risk of developing UTIs in either women or men. Other studies have shown similar results. Aggazzotti et al. [17] reported a 55% prevalence of urinary incontinence in a cross-sectional study among institutionalised elderly. All patients who suffered from incontinence used pads on a regular basis. The studies in question found that urinary incontinence was significantly associated with UTIs. It is difficult to establish whether such high occurrence of UTIs is caused by concomitant factors associated with urinary incontinence or with the use of absorbent pads per se. There are some possible explanations for the high occurrence of UTIs in patients who use pads. The use of absorbent products causes temperature and humidity to rise. This may cause irritation of the skin. Maintenance of skin integrity in the elderly population should be a focus of attention [4]. Irritated skin and ulcers are one of the most common causes of infection in the nursing home population [29]. Berg et al. [30] studied diaper dermatitis, skin wetness and skin pH in 1601 infants and found that both wetness and a higher pH were significantly associated with diaper dermatitis.

Another explanation for the high occurrence of UTIs in incontinent nursing home residents is a lack of hand hygiene in staff–resident interaction. Several studies focus on transmission of pathological microbes during pad changing [14–16]. It is recommended to use gloves in interactions where health carers come into contact with secretions of patients. It is important to use hand rubs and change gloves before and after interaction with the resident. This can reduce hand contamination and cross contamination by 70–80% [10]. Thompson et al. [15] observed staff interactions in different activities where residents needed assistance, such as changing of incontinence pads, wound care and change of soiled linen. They focused on hand-washing practices and use of gloves in interactions between staff and residents and concluded that hand washing and glove use were often inadequate. Loeb et al. [14] concluded that an increase in hand-washing localisations and use of antimicrobial soap reduce antimicrobial-resistant bacteria in nursing homes. Adequate staffing and greater emphasis on hand hygiene may also be important in limiting the spread of microbial agents in nursing homes.

In our study, the pad-weighing test was performed for a 48 h period. Although a 24 h period is thought to be valid, a longer period is associated with enhanced reliability [8]. A limitation of the study is that pad changes due to faecal incontinence were not identified, which may have led to an overestimation of the number of pads used due to urinary incontinence. However, average PPD usage in our population was low compared with reported PPD usage in the ambulatory elderly patient [21]. This may be caused by the fact that many nursing home residents are dependent on help to change soiled pads. The number of pad changes in nursing home residents is not only influenced by routines of the resident, but also by those of
the caregivers. Inclusion of a resident in the study may have altered these routines. No data was collected on residents that were not included. As expected in the elderly nursing home population, mortality during the 1-year follow-up period was high. However, data of patients that died during the follow-up period were included in the analyses, which reduces the problem of attrition.

The accuracy of PPD usage to quantify urinary incontinence has not been studied in institutionalised elderly. In the ambulatory setting, one study has shown it to be a reliable test [8]. In our study involving nursing home residents, we found PPD usage to be unreliable for the quantification of urinary incontinence.

Conclusion
The use of absorbent pads is associated with an increased risk of developing UTIs. PPD and daily fluid intake are not correlated with the risk of developing UTIs. PPD is an unreliable measure of urinary incontinence in nursing home residents.

Key points
- The use of absorbent pads is associated with an increased risk of developing UTIs.
- PPD and daily fluid intake are not correlated with the risk of developing UTIs.
- PPD is an unreliable measure of urinary incontinence in nursing home residents.

Conflicts of interest
None declared.

Funding
This study was financially supported by the Research Committee of the Nord-Trøndelag Health Trust, Pharmacia & Upjohn and the Norwegian nurses’ organisation. Astra Tech supplied a bladder scan for the period during which the research project was conducted. None of the sponsors played any role in the design, execution, analysis and interpretation of the data. They had no influence on the content of this article.

References


The palliative care needs of acute stroke patients: a prospective study of hospital admissions

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Abstract

Background: despite a mortality rate of approximately 30% in acute stroke, little is known about the palliative care needs of this group of patients.

Design: prospective study of 191 acute stroke patients admitted to hospital in England. Biographical, medical and stroke-related data were collected. Participants completed the Sheffield Profile for Assessment and Referral to Care (SPARC), a screening tool for referral to specialist palliative care.

Findings: over 50% reported moderate to significant fatigue-related problems. Approximately 50% reported symptom-related problems (e.g. pain) or psychological distress (e.g. anxiety). Approximately 25% had concerns about death or dying, and 66% had concerns about dependence and disability. Over 50% were worried about the impact of stroke on family members. There were significant main effects of dependence (Barthel Index) ($F^{123} = 12.640, P = 0.001$) and age ($F^{4123} = 3.022, P = 0.020$), and a significant three-factor interaction between dependence, age and co-morbidities ($F^{9123} = 2.199, P = 0.026$) in predicting total SPARC scores.

Conclusions: acute stroke patients have a high prevalence of palliative care needs. Acute stroke services should use the SPARC for needs assessment. Priority for assessment should be given to patients with a score of <15/20 on the Barthel Index, a tool already used in most stroke services.

Keywords: stroke, palliative care, needs assessment, elderly