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Original Article

# The impact of malnutrition and nutrition-related factors on the development and severity of pressure ulcers in older patients receiving home care☆

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SUMMARY

*Background & aims:* To investigate the impact of nutritional status and nutrition-related factors on the development and severity of pressure ulcers acquired in the home care setting.

*Methods:* Two hundred and seven home care offices in Japan were selected at random and 290 patients with home-acquired pressure ulcers and 456 patients without pressure ulcers were analyzed. Data on nutritional status, caregiver knowledge, and health professional's nutritional management were collected. Pressure ulcers were categorized as superficial or full-thickness.

*Results:* Malnutrition was significantly and most strongly associated with higher rate of the pressure ulcer after adjusting for other risk factors (OR, 2.29; 95% CI, 1.53–3.44). Assessment of the patient's nutritional status and adequate dietary intake by a health professional were significantly associated with lower odds for developing pressure ulcers (OR, 0.43, 0.47; 95% CI, 0.27–0.68, 0.28–0.79, respectively). Malnutrition was also significantly and most strongly associated with more severe pressure ulcers (OR, 1.88; 95% CI, 1.03–3.45). Assessment of a caregiver's nutritional knowledge by a health professional was a significant preventive factor for severe pressure ulcers.

*Conclusion:* The quality of home care for risk factors such as pressure redistribution has improved, making nutritional management a more crucial factor in pressure ulcer prevention.



## 1. Introduction

Pressure ulcers (PUs) are common in frail or bed-ridden older people and are associated with increased mortality and decreased quality of life.[1–3] Recently, the home-acquired PU is becoming one of the serious problems as the number of older patients receiving home care was increasing. The prevalence of home-acquired PUs was estimated to be 9.1% and was associated with higher mortality.[4,5]

Malnutrition is one of the well-known factors for PU development in hospitals and nursing homes.[6–8] In the home care setting, however, there have been few studies on the relationships between malnutrition and the PU development although the prevalence of malnutrition was as high as approximately 50%.[9] Previously, one study on home-acquired PU prevalence did not investigate the nutritional status.[4] Another study reported that there was no significant association between nutritional risk using the subcategory of the risk assessment tool and PU development in the home care setting.[10] However, this study did not examine the influence of nutritional status in relation to other preventive cares for PU. In more recent years, it is possible that the quality of nutritional management remains as issue of PU management because the quality of other general PU prevention such as the use of pressure redistribution mattresses is improving. Therefore, malnutrition may have greater relative influence on the development of home-acquired PUs under this conditions.

Furthermore, it was reported that 27.0–48.8% of home-acquired PUs were full-thickness PUs,[4,11] which is greater than the proportion in hospitals where the approximate prevalence is 10%.[1,12] Full-thickness PUs tend to be accompanied by undermining or infection, they do not heal easily and require extended care once they occur. While the majority of patients with full-thickness PUs were malnourished even in the hospital,[13] the association between malnutrition and the development of severe PUs remains uncertain in the home care setting.

*Abbreviation:* PU, Pressure ulcer.

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In addition, one of the reasons for the higher prevalence and severity of PU and malnutrition in the home care setting is insufficient preventive nutritional care.[11] For example, the nutritional guidelines for PU care were used less frequently in the home care setting than in hospitals or nursing homes.[14] This could be attributed to a limited continuity of care by health professionals and a lack of knowledge on the part of the family caregivers in the home care settings. Therefore, in order to promote effective nutritional managements which was proved to reduce the risk of PU development in hospitals or nursing homes,[15] it is necessary to investigate the association of caregiver's and health professional's roles in nutritional management with the development and severity of PUs in the home care settings.

The aims of this study were 1) to describe the characteristics of nutritional status and nutrition-related factors related to PU prevention and 2) to investigate the impact of these factors on the incidence of PUs by their severity after adjustment for other risk factors in the home care setting.

## 2. Methods

### 2.1. Participants

This case-control study was conducted in the home care setting in January 2008. All 2688 home care offices registered to the Home Care Nursing Associations in Japan were stratified according to prefecture, and 20% of the offices were selected ($n = 537$) using a random number table. After questionnaires were mailed to the selected offices, each office identified all patients with home-acquired PUs (PU group) as well as one or two control patients without PUs (non-PU group) who were similar to the patients with PUs in terms of age and sex. Because there were a limited number of patients in any particular office, strict matching, such as complete agreement of care level, was not possible within each office. Inclusion criteria were 1) age of 65 years or older, and 2) no history of PU in the non-PU group, or a history of at least one home-acquired PU in the PU group. Patients were excluded if their age, sex, or care level were unknown. Patients in the PU group with unknown PU status (incidence location, depth, or other status) or without documentation about their situation before PU development were also excluded. The study protocol was approved by the Institutional Review Board of Kanazawa University.

### 2.2. Questionnaire

The questionnaire was developed by conducting a semi-structured interview of 10 health professionals who had engaged in home care for patients with PU. Five nurses, two physicians, and three caseworkers were selected. Twenty-one key factors for PU incidence were obtained and divided into four categories: patient factors (11 factors), caregiver factors (5 factors), health professional's home care process (5 factors), and PU management (13 factors). A draft questionnaire was prepared based on both this interview and the literature review. After face and content validity were confirmed by a multidisciplinary research team and a pre-test was conducted, the questionnaire was finalized. The primary nurses for each patient answered or asked caregivers to answer items on the questionnaire. These items included demographic characteristics, general risk factors, and nutrition-related factors for the development and prevention of PUs. The primary nurses also reported PU status and location. For the PU group, the statuses of variables were determined for the period preceding the development of PUs, whereas patients in the non-PU groups were asked to respond regarding the preceding one month.

### 2.3. Demographic characteristics

Primary nurses were asked about the patient's age, sex, independence level, comorbidities, family, and caregiver's age. Independence level was evaluated according to the certified care level in Japan: not certified, support level 1–2, and care level 1–5. Care levels 1–5 were divided into two groups: care level 1 or 2 (patients have difficulty in moving independently) and care level 3–5 (patients are almost bed-ridden and require continuous care). Family type was categorized as living alone or not. Caregiver's age was categorized as "65 years of age or older" or "younger than 65 years".

### 2.4. Risk factors for PU development

To determine risk factors for PU development, nurses were asked about the patient's mobility in a bed and chair and the presence of extreme bony prominence, joint contracture, edema, excess moisture on skin, and urinary and fecal incontinence, which are listed in the Japanese PU care plan by the Ministry of Health, Labor, and Welfare.

To evaluate variables about PU prevention, questions regarding the caregiver's knowledge about the frequency of position changes and the use of a pressure-redistributing mattress were asked. In addition, nurses were asked whether they had conducted risk assessments for each risk factor. The type of mattress used was also determined and the variable about the use of an air-cell mattress was used for analysis.

### 2.5. Nutritional status and nutrition-related factors

Primary nurses in each office reported on patient nutritional status. Malnutrition was determined by the presence of at least one of the followings based on the previous studies in hospitals or nursing homes: body mass index of 18.5 or lower, serum albumin of 3.0 g/dl or less, or hemoglobin of 11.0 g/dl or less.[16,17] The cut-off points were lowered to reduce the false-positive rate for thin Japanese older people. Because the above objective nutritional assessments were not required by the Japanese long-term care insurance in the home care setting, following statuses were also assessed subjectively to evaluate malnutrition in addition: weight loss, edema, or inadequate energy intake. Due to these current institutional limitations in the home care setting, we assumed that it was difficult to collect the full set of nutritional data in this study. Therefore, malnutrition was evaluated comprehensively based on the above signs by each nurse rather than using the single specific indicator.

In addition, primary nurses reported on caregivers' knowledge about nutritional management for PU prevention and the subjective and objective degree of dietary intake on an average day.

Nutritional management by health professionals, consisting of nutritional assessment and nutritional intervention, was also evaluated by the questionnaire. Regarding nutritional intervention, primary nurses reported whether the patients received nutrients by any route. Nutritional route was categorized as oral, enteral, or parenteral. The absence of nutritional intervention was if the patient received neither regular food intake nor nutrients by any route. For nutritional assessment, primary nurses were asked whether they conducted risk assessments for patient's nutritional status, caregiver's knowledge of nutritional preventive strategies, the degree of dietary intake, and whether they had consulted with a registered dietician.

### 2.6. Outcome measures

Data regarding PU status, including depth, sites, and the number of home-acquired PUs, were collected from the medical charts in