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Original Article

The incidence, risk factors and characteristics of pressure ulcers in hospitalized patients in China

Qixia Jiang[1], Xiaohua Li[1], Xiaolong Qu[1], Yun Liu[1], Liyan Zhang[2], Chunyin Su[3], Xiujun Guo[4], Yuejuan Chen[5], Yajun Zhu[6], Jing Jia[7], Suping Bo[8], Li Liu[9], Rui Zhang[2], Ling Xu[10], Leyan Wu[11], Hai Wang[12], Jiandong Wang[12]

[1]Wound Care Center, Outpatient Department of Jinling Hospital, Nanjing University School of Medicine, Nanjing 210002, China; [2]Nursing Department of General Hospital of Armed Police Forces, Beijing 100039, China; [3]Nursing Department of Wuxi People's Hospital Second Hospital Affiliated to Nanjing Medical University, Wuxi 214002, China; [4]Nursing Department of Nanjing Municipal Hospital of Chinese Medicine, Nanjing 210001, China; [5]Department of Nursing, Changshu No.2 People's Hospital, Changshu 215500, China; [6]Department of Nursing, The People's Hospital of Jingjiang, Jingjiang 214500, China; [7]Department of Nursing, Zhenjiang First People's Hospital, Zhenjiang 212002, China; [8]Department of Burn, The First Affiliated Hospital of Jiangsu University, Zhenjiang 212001, China; [9]Anorectal Department, Jiangsu Province Hospital of Traditional Chinese Medicine, Nanjing 210029, China; [10]Wound Care, Suqian Hospital of Traditional Chinese Medicine, Suqian 223800, China; [11]Department of Burn, Fuzhou Genernal Hospital of Nanjing Military Command, Fuzhou 350025, China; [12]Department of Pathology, Jinling Hospital, Nanjing University School of Medicine, Nanjing 210002, China

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Abstract: Pressure ulcers are very common in hospital patients. Though many studies have been reported in many countries, the large-scale benchmarking prevalence of pressure ulcers in China is not available. The aim of this study is to quantify the prevalence of pressure ulcers and the incidence of hospital-acquired pressure ulcers and analyze risk factors in hospitalized patients in China. A multi-central cross-sectional survey was conducted in one university hospital and 11 general hospitals in China. The Minimum Data Set (MDS) recommended by European Pressure Ulcer Advisory Panel (EUPAP) was used to collect information of inpatients. All patients stayed in hospital more than 24 hours and older than 18 years signed consent form and were included. Data from 39952 out of 40415 (98.85%) inpatients were analyzed. Of the 39952 patients, 631 patients (including 1024 locations) had pressure ulcers. The prevalence rate of pressure ulcers in 12 hospitals was 1.58% (0.94-2.97%). The incidence of hospital-acquired pressure ulcers (HAPU) was 0.63% (0.20-1.20%). The most common locations developed pressure ulcers were sacrum, heels, and iliac crests. The common stages of pressure ulcers were stage I and II. Patients in Intensive Care Unit, Geriatric and Neurological Department were easier to develop pressure ulcers. The prevalence and incidence of pressure ulcers in China was lower than that reported in European and other countries. The stages of pressure ulcers in China were different than that reported in European countries. Our study provides with a baseline value for intensive research on pressure ulcer in China.

Keywords: Pressure ulcer, prevalence, cross-sectional survey, China

Introduction

Pressure ulcer is a localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction [1-3]. Pressure ulcers are frequently occurring in inpatients all over the world. Pressure ulcers will distress and discourage the patients, provide a route for infection, complicate recovery, greatly increase nursing time, effort and costs, significantly delay discharge from the hospital, and may contribute to mortality in certain patients. As pressure ulcers can develop in a very short time, prevention is the preferred management strategy for people judged to be at risk for pressure ulcers. Pressure ulcer prevalence is one of the important indicators of evaluation effect of pressure ulcer prevention, especially prevention of hospital-acquired pressure ulcer. Prevalence of pressure ulcer has been included in the Nursing Quality Indicators. It is important to identify the factors associated with pressure ulcers development so that pre-

Table 1. NPUAP and EPUAP Classification System [16]

Stage	Difiniton
Stage I	Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.
Stage II	Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister.
Stage III	Full-thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, and muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.
Stage IV	Full-thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present on some parts of the wound bed. Often includes undermining and tunneling.
SDTI	Purple or maroon localized area of discolored intact skin or blood- filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, and warmer or cooler than adjacent tissue.
Unstageable	Full-thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green, or brown) and/or eschar (tan, brown, or black) in the wound bed.

ventive measures may be taken. The prevalence studies from different countries have been carried out [4-16]. Risk factors for pressure ulcers have been studied in many countries. But have not been researched yet in China. The occurrence rate and management of pressure ulcer greatly depend on population, health care condition, and resources of country. Though many studies have been reported in many countries, the large scale prevalence of pressure ulcers in China is not available, except one study on a teaching hospital in China [11]. The aim of this study is to quantify the prevalence and incidence of pressure ulcers and analyze risk factors in hospital patients in China.

Methods

Data collection instrument

Minimum Data Set (MDS) for which had high inter-rater reliability made by European Pressure Ulcer Advisory Panel in 2005 was used [16]. The form includes five categories:

1. General information contains the type of hospital, the number of beds of the hospital and the location.

2. Patient information includes the patient's gender, the age, the expected length of stay in hospital and the care group.

3. Risk assessment: The vulnerability of each patient to develop pressure ulcers was assessed using the Braden Scale. The Braden Scale consists of six sub-scales: sensory perception, moisture, activity, mobility, nutrition, friction and shear. The total score ranges from 6 to 23. In the EPUAP study and many others, patients with a Braden score <17 are a cut point for prevention. However, it does not specifically measure continence. The continence score of Norton score was used. It contains Doubly Incontinence, Usually-urine, Occasional, Not and the scores was from 1-4 scores.

4. The skin observation gives details about the skin observations. All patients signed consent form and admitted to be examined from head to toes. Recognition of pressure ulcer used the classification system made by National Pressure Ulcer Advisory Panel (NPUAP) and EPUAP in 2009, including stage I to Stage IV and the category of "unstageable" and "Suspected Deep Tissue Injury" (SDTI) (**Table 1**).

5. The prevention category includes two parts: equipment and repositioning in bed and in the chair according to the EPUAP methodology. The equipment was defined as being no special equipment, non-powered device or powered device. Repositioning was documented as not planned/irregular or at frequencies of every 2, 3, or 4 hours.

Sample and setting

A cross-sectional survey design was used to calculate the point prevalence in China. Eleven general hospitals and a university hospital participated in the survey. All wards of these hospi-

Table 2. General and patient data of all surveyed patients by 12 hospitals (*n*=39952)

	Jiangsu Province (n=31640) n (%)	Bejing (n=3463) n (%)	Guangdong (n=2252) n (%)	Fujian (n=2597) n (%)	Total (n=39952) n (%)
Hospital					
Teaching hospital	1				1
Patients	3830 (9.59)				3830 (9.59)
General hospital	8	1	1	1	11
Patients	27810 (69.61)	3463 (8.68)	2252 (5.64)	2597 (6.50)	36122 (90.41)
Gender					
Male	17980 (45.00)	2133 (5.34)	1433 (3.59)	1750 (4.38)	23296 (58.31)
Female	13660 (34.19)	1330 (3.33)	819 (2.05)	847 (2.12)	16656 (41.69)
Age (years)					
18-39	5556 (13.91)	912 (2.28)	939 (2.35)	460 (1.15)	7867 (19.69)
40-59	10464 (26.19)	1364 (3.41)	726 (1.82)	915 (2.29)	13469 (33.71)
60-69	6277 (15.71)	564 (1.41)	249 (0.62)	525 (1.31)	7615 (19.06)
70-79	5483 (13.72)	428 (1.07)	222 (0.56)	362 (0.91)	6495 (16.26)
80-89	3345 (8.37)	179 (0.45)	106 (0.27)	305 (0.76)	3935 (9.85)
>89	515 (1.29)	16 (0.04)	10 (0.02)	30 (0.08)	571 (1.43)
Ward					
ICU	945 (2.37)	90 (0.23)	34 (0.08)	25 (0.06)	1094 (2.74)
Surgical	13776 (34.48)	1842 (4.61)	1119 (2.80)	1156 (2.89)	17893 (44.79)
Medical	12518 (31.33)	870 (2.18)	693 (1.73)	1028 (2.57)	15109 (37.82)
Neurology	1790 (4.48)	139 (0.35)	169 (0.42)	126 (0.32)	2224 (5.57)
Geriatrics	1598 (4.00)	402 (1.01)	107 (0.27)	201 (0.50)	2308 (5.78)
Chronic care	1013 (2.54)	120 (0.30)	130 (0.32)	61 (0.15)	1324 (3.31)
Braden score					
At risk (<17)	3674 (9.20)	312 (0.78)	312 (0.78)	412 (1.03)	4710 (11.79)
No risk (≥17)	27966 (70.00)	3151 (7.89)	1940 (4.85)	2185 (5.47)	35242 (88.21)
Length of stay in hospital					
<6 d	1464 (3.66)	232 (0.58)	117 (0.34)	103 (0.26)	1916 (4.79)
6-30 d	25402 (63.58)	2752 (6.89)	1559 (3.90)	2035 (5.09)	31748 (79.47)
>30 d	4774 (11.95)	479 (1.20)	576 (1.44)	459 (1.15)	6288 (15.74)

tals were surveyed with the exception of emergency, day care and maternity wards where limited number of pressure ulcers would be expected. All patients admitted before midnight on the pre-determined day, meaning stayed in hospital more than 24 hours from each hospital and older than 18 years were included. Each patient or relative was asked to consent to participation in the survey. Patients who refused to do so were asked to indicate this on a consent form. The procedure was approved by the Medical Ethical Approving committee of the University Hospital and of each participating hospital.

Procedure

Twelve hospitals from 9 cities in 4 provinces of China, which have 600-1900 beds and totally have 14,240 beds, participated in the survey. Regional distribution was that one hospital of a city in northern of China had 1,300 beds, two hospitals in two cities in southern of China had totally 3,000 beds, nine hospitals in nine cities in middle-eastern of China had a total of 9,940 beds. Twelve hospitals had 14,240 beds in total which three hospitals had 600-1000 beds, six hospitals had 1001-1500 beds and the last three hospitals had 1501-1900 beds.

Researcher training and qualification

To ensure the consistency of methodology and the accuracy of participated nurses recognizing pressure ulcers, the research team designed the staff training according to EPUAP methodology combining research programs and content. It included research objectives, methods,

Table 3. Inter-rater reliability (Cronbach's a) of the Braden Scale in 12 hospitals

	n	Cronbach's a	Average Measure Intraclass Correlation	95% CI	
				Upper	Lower
hospital 1	5931	0.916	0.786	0.778	0.794
hospital 2	3463	0.936	0.787	0.785	0.806
hospital 3	2252	0.940	0.796	0.784	0.810
hospital 4	2597	0.898	0.780	0.767	0.793
hospital 5	3220	0.934	0.793	0.782	0.804
hospital 6	2197	0.949	0.801	0.788	0.813
hospital 7	3753	0.889	0.777	0.766	0.788
hospital 8	3830	0.917	0.787	0.777	0.798
hospital 9	4627	0.932	0.791	0.782	0.800
hospital 10	4031	0.927	0.788	0.778	0.798
hospital 11	2798	0.916	0.787	0.775	0.799
hospital 12	1253	0.894	0.774	0.754	0.793
Total	39952	0.922	0.789	0.785	0.792

research time, tools, processes and the method of skin from head to toe examination. Two weeks before the survey, each hospital coordinators trained the registered nurses for pressure ulcer care or wound care team to apply the processes and methods of MDS data collection. Twenty photographs of pressure ulcers at different stages (I-IV stage, suspicious deep tissue injury and unstageable) were identified and described the criterion (**Table 1**). According to the accuracy of recognition to score, ≥90 scores were qualified as participating in the study. Four hundred and sixty-one registered nurses were trained in 12 hospitals, of which 457 were qualified as data collection.

This study was determined to survey four consecutive times from April-July in 2011. Thursday of the second week began the monthly survey from 8:00 am to 18:00 pm.

All inpatients hospitalized ≥24 h and older than eighteen were admitted on research day in 12 hospitals of China, excluding children, day care, and psychiatric patients. The coordinators in 12 hospitals determined the number of nurses, grouping, giving research tools, patient informed consent and record sheets based on the total number of patients on the survey day. Two trained registered nurses were grouped. On research day, all researchers used the same procedures and methods to explain and obtain patients' informed consent before research. They inquired and observed the patients from head to toes to check skin integrity whether having pressure ulcers. If patient was recorded as skin integrity on admission assessment, and researchers found having pressure ulcers, the patient was defined as HAPU. Two trained registered nurses and one registered nurse in ward assessed the Braden score and incontinence score on-site to bed and wheelchair patients. After the investigation, two nurses signed and confirmed the results. Within 7 days of the research, the survey record sheets were sent by courier or by hand side to research team.

Statistical analysis

All analyses were done with the software package SPSS 16.0. The data were described as frequencies and percentages. Pressure ulcer prevalence=the total inpatients with pressure ulcers/the total inpatients in survey×100%; HAPU incidence=the new inpatients with HAPU/the total inpatients in survey×100%.

Results

General data of patients

Table 2 shows general data of patients. Data were collected on 40415 patients in 12 hospitals. Four hundred sixty-three patients were excluded because of invalid data (efficiency was 98.85%). Six hundred thirty-one patients had pressure ulcers (1024 locations), of which 251 patients had HAPU (323 locations). Pressure ulcers prevalence was 1.58% (0.94-2.97%) and HAPU incidence was 0.63% (0.20-1.2%). Approximately half of the patients were aged 40-69 years. 27.54% were aged over 70 years. Intensive care unit (ICU) was the most severe department in pressure ulcer and hospital-acquired pressure ulcer.

The prevalence of pressure ulcers and incidence of hospital-acquired pressure ulcers

Data from 39952 out of 40415 (98.85%) inpatients were analyzed (**Table 3**). Of the 39952

Table 4. Demographic data and prevalence results of pressure ulcers

	Total (n=39952) N (%)	Pus (n=631) n (%)	HAPUs (n=251) N (%)	PUP (%)	HAPUP (%)
Gender					
males	23295 (58.31)	475 (75.28)	184 (73.31)	1.19	0.46
Females	16657 (41.69)	156 (24.72)	67 (26.69)	0.39	0.17
Age					
18-39	7867 (19.69)	39 (6.18)	19 (7.57)	0.49	0.24
40-59	13469 (33.71)	128 (20.28)	49 (19.52)	0.95	0.36
60-69	7615 (19.06)	87 (13.79)	36 (14.34)	1.12	0.47
70-79	6495 (16.26)	172 (27.26)	76 (30.28)	2.65	1.18
80-89	3935 (9.85)	161 (25.52)	58 (23.11)	4.09	1.47
>89	571 (1.43)	44 (6.97)	13 (5.18)	7.71	2.28
Ward					
ICU	1094 (2.77)	130 (20.60)	49 (19.52)	11.88	4.48
Surgical	17893 (44.79)	149 (23.61)	71 (28.29)	0.83	0.39
Medical	15109 (37.82)	222 (35.18)	91 (36.25)	1.47	0.60
Neurology	2224 (5.57)	52 (8.24)	13 (5.18)	2.34	0.59
Geriatrics	2308 (5.78)	76 (12.04)	27 (10.76)	3.29	1.17
Chronic care	1324 (3.31)	2 (0.31)	0	0.15	0
Braden score					
At risk (<17)	4710 (11.79)	555 (87.96)	207 (82.47)	11.78	4.39
No risk (≥17)	35242 (88.21)	76 (12.04)	44 (17.53)	0.22	0.12
Length of stay in hospital					
<6 d	1916 (4.79)	14 (2.22)	5 (1.99)	0.73	0.26
6-30 d	31748 (79.47)	294 (46.59)	126 (50.20)	0.93	0.40
>30 d	6288 (15.74)	323 (51.19)	120 (47.81)	5.14	1.91

Pus: pressure ulcers; HAPUs: hospital acquired pressure ulcers; PUP: pressure ulcers prevalence; HAPUP: hospital acquired pressure ulcers prevalence.

patients, 631 patients (including 1024 locations) have pressure ulcers. The prevalence of pressure ulcers in 12 hospitals was 1.58% (0.94-2.97%). The incidence of hospital-acquired pressure ulcers (HAPU) was 0.63% (0.20-1.20%). As shown in **Table 4**, the age of people with highest prevalence of pressure ulcer and hospital-acquired pressure ulcer was more than 89 years. Fifty-two percent of the pressure ulcers occurred in participants who were in the age 70-89 groups. Fifty-three percent of the hospital-acquired pressure ulcers occurred in participants who were in the age 70-89 groups too.

Classification and location

There were 64.5%, 83.67% and 51.84% patients with pressure ulcers (Pus), hospital-acquired pressure ulcers (HAPUs) and pressure ulcers on admission (PUOA), respectively, experienced stage I and stage IV, Unstageable and SDTI (**Table 5**). The most common locations suffered pressure ulcers, hospital-acquired pressure ulcers and pressure ulcers on admission were sacral areas (the constitute ratio was 60.22% and 70.52% and 53.42%, respectively).

Prevention

The patients were divided into two groups: group one was considered vulnerable to pressure ulcer development (Braden score <17 or with a pressure ulcer); group two was considered to be at no risk of pressure ulcer (Braden score ≥17). 11.79% of all patients (4710/39952) were considered in need of preventive measures (Braden score <17 or with a pressure ulcer). 61.80% patients of group one has taken preventive measures. Non-powered devices in bed were provided to patients of 19.95%, pow-

Table 5. Classification and Location with PUs and HAPUs and PUOA

	Pus (n=631) N (%)	HAPUs (n=251) n (%)	PUOA* (n=380) n (%)
Classification			
Stage I	181 (28.68)	125 (49.80)	56 (14.74)
Stage II	226 (35.82)	85 (33.87)	141 (37.10)
Stage III	80 (12.68)	11 (4.38)	69 (18.16)
Stage IV	82 (12.99)	15 (5.98)	67 (17.63)
Unstageable	53 (8.40)	10 (3.98)	43 (11.32)
SDTI	9 (1.43)	5 (1.99)	4 (1.05)
Location			
Sacrum	380 (60.22)	177 (70.52)	203 (53.42)
Crista iliac	55 (8.72)	18 (7.17)	37 (9.74)
Heel	47 (7.45)	17 (6.77)	30 (7.89)
Trochiter	40 (6.34)	5 (1.99)	35 (9.21)
Ankle	31 (4.91)	13 (5.18)	18 (4.74)
Scapular	21 (3.33)	2 (0.80)	19 (5.00)
Ischial tuberosity	19 (3.01)	6 (2.39)	13 (3.42)
Spine	8 (1.27)	4 (1.59)	4 (1.05)
Toes	6 (0.95)	3 (1.19)	3 (0.79)
Foot	5 (0.79)	0	5 (1.32)
Shoulder joint	5 (0.79)	0	5 (1.32)
Elbow	5 (0.79)	1 (0.40)	4 (1.05)
Occipital	5 (0.79)	2 (0.80)	3 (0.79)
Others*	4 (0.64)	3 (1.19)	1 (0.26)
Total	631 (100.00)	251 (100.00)	380 (100.00)

*others: Rib and chin where pressure ulcers do not usually occur. PUOA: pressure ulcers on admission.

ered devices were provided to 41.85% of these patients, and 38.20% of patients did not have any device. There were 73.99% of patients took repositioning every 2 hours, 1.15% of patients took repositioning every 3-4 hours and 24.86% did not receive any plans (**Table 6**).

Discussion

Our data show that the prevalence of pressure ulcer was 1.58% and the hospital-acquired pressure ulcer incidence was 0.63% in China. It was similar to reports by Zhao [11]. Zhao reported the pressure ulcer prevalence in a teaching hospital in China was 1.80% and hospital-acquired pressure ulcer incidence was 0.54%. Vanderwee et al did a research in 25 hospitals of the Europe and reported that the prevalence of stage I-IV pressure ulcer was 18.1%. It was reported that the prevalence of pressure ulcer and incidence of hospital-acquired pressure ulcer were 27% and 13.27%, respectively, in Sweden teaching hospitals [12]. Our results indicate the prevalence of pressure ulcers and the incidence of hospital-acquired pressure ulcers in China are lower than that in European countries. This phenomenon can be interpreted with several reasons. Firstly, the institutions participated in survey are different. In European countries, the institutions include therapeutic hospitals, universities, teaching hospitals, long-term care units and nursing homes. In this study, 12 hospitals participated in survey included eleven general hospitals and a teaching hospital. It is reported that patients in long-term care units have a high prevalence of pressure ulcers and incidence of hospital-acquired pressure ulcers because of long time in hospital, chronic diseases, and malnutrition. Secondly, many studies show that the prevalence and incidence can be different in countries having different ethnic people. In Ireland, the prevalence of pressure ulcers in 3 University Teaching Hospitals was 18.5% [17]. It was 21.1% to 23% in the teaching hospitals and general hospitals of Sweden and the British [7, 9, 12]. The prevalence in Italy was 8.3% and in Portugal was 12.5%. Third, it is due to demographic characteristics. Vanderwee reported that the age of 5957 hospitalized adult patients participated were more than 70 years that accounted for 49.1% in 25 hospitals of five European countries, which increased the risk for pressure ulcers [12]. Wann-Hansson et al reported that pressure ulcer prevalence was significantly higher in age over 70 years ($P < 0.001$) on the research in the University Hospital in Sweden [18]. In this study, 11001 out of 39952 patients who age more than 70 years (27.54%) are involved, which having a lower percentage of aged patient.

The results of this study showed that 61.81% of the patients at risk in bed (Braden <17) had been provided prevention equipment. 74.01% of the patients at risk were scheduled for repositioning at frequencies of every 2 hours. The results of the 25 hospitals in five European

Table 6. Prevention data of surveyed vulnerable patients by 12 hospitals

	Braden score <17 (n=4710) N (%)	Pus (n=631) N (%)	HAPUs (n=251) N (%)
Off-loading devices used			
Used nothing devices	1799 (38.20)	130 (20.60)	79 (31.47)
Used non-powered devices	940 (19.95)	104 (16.48)	43 (17.13)
Used powered devices	1971 (41.85)	397 (62.92)	129 (51.40)
Repositioning			
Repositioning with no plans	1171 (24.86)	52 (8.24)	34 (13.54)
Repositioning every 2 hours	3485 (73.99)	575 (91.13)	214 (85.26)
Repositioning every 3 hours	34 (0.72)	3 (0.48)	2 (0.80)
Repositioning every 4 hours	20 (0.43)	1 (0.16)	1 (0.40)
Total	4710 (100.00)	631 (100.00)	251 (100.00)

countries show that patients at risk in bed (Braden <17) had been provided prevention equipment accounted for 71.6%. However, only 15.8% of the patients were turned over every two hours.

Pressure ulcer prevention group or skin wounds care team in the hospital played an important role in the prevention and management of pressure ulcer. Our results proved that using prevention equipment and regular turn over are effective preventive management for pressure ulcers.

In the present study, 55% of the pressure ulcers were in stage II and 23.2% of HAPUP were in stage I, which is consistent with the findings of other studies. Wann-Hansson et al reported that stage I pressure ulcers accounted for 50.7% in Sweden teaching hospital. Vanderwee et al found that stage I pressure ulcers accounted for 42.1% in 25 teaching and general hospitals of the five countries in Europe [12].

The incidence of stage Ipressure ulcers in China was lower than that in European countries. The reason may be due to different populations, preventive measures and different staging criteria of pressure ulcers. In this study, pressure ulcers stage used is the NPUAP update in 2007, which including stage I-IV, adding unstageable and suspected deep tissue injury two kinds of special classification. Wann-Hansson and Vanderwee used the 1999 EPUAP grading system (grade 1-4). Our results indicated that hospitalized patients stage I and II pressure ulcers were major prevention targets in inpatients in China.

Conclusions

The sacrum is the most common site developing pressure ulcers in hospitalized patients in China, which is consistent with the results of other studies in European countries. The heel and the iliac crests were the second and the third locations frequently developing presure ulcers, respectively. Vanderwee et al reported sacrococcygeal, heel, the ischial tuberosity, and ankle were the most happened sites [12]. Eman et al reported the heel and the sacral were the most common sites occurred pressure ulcers in all ICU in the Netherlands [19]. This multi-central survey provided with a baseline value on prevalence of pressure ulcers and hospital-acquired pressure ulcers in China. It can guide how to predict and prevent pressure ulcers in hospitals of China.

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Disclosure of conflict of interest

None to declare.

Address correspondence to: Jiandong Wang, Department of Pathology, Jinling Hospital, Nanjing University School of Medicine, Nanjing, 210002, China. E-mail: jd_wang@outlook.com

References

[1] Bolton L, Girolami S and Hurlow J. The AAWC pressure ulcer guidelines. Am J Nurs 2013; 113: 58-63.

[2] Chou R, Dana T, Bougatsos C, Blazina I, Starmer AJ, Reitel K and Buckley DI. Pressure ulcer risk assessment and prevention: a systematic comparative effectiveness review. Ann Intern Med 2013; 159: 28-38.

[3] Coleman S, Gorecki C, Nelson EA, Closs SJ, Defloor T, Halfens R, Farrin A, Brown J, Schoonhoven L and Nixon J. Patient risk factors for pressure ulcer development: systematic review. Int J Nurs Stud 2013; 50: 974-1003.

[4] Leijon S, Bergh I and Terstappen K. Pressure ulcer prevalence, use of preventive measures, and mortality risk in an acute care population: a quality improvement project. J Wound Ostomy Continence Nurs 2013; 40: 469-74.

[5] Amir Y, Halfens RJ, Lohrmann C and Schols JM. Pressure ulcer prevalence and quality of care in stroke patients in an Indonesian hospital. J Wound Care 2013; 22: 254, 256, 258-60.

[6] Schluer AB, Halfens RJ and Schols JM. Pediatric pressure ulcer prevalence: a multicenter, cross-sectional, point prevalence study in Switzerland. Ostomy Wound Manage 2012; 58: 18-31.

[7] Gunningberg L, Hommel A, Baath C and Idvall E. The first national pressure ulcer prevalence survey in county council and municipality settings in Sweden. J Eval Clin Pract 2013; 19: 862-7.

[8] Moore Z and Cowman S. Pressure ulcer prevalence and prevention practices in care of the older person in the Republic of Ireland. J Clin Nurs 2012; 21: 362-71.

[9] James J, Evans JA, Young T and Clark M. Pressure ulcer prevalence across Welsh orthopaedic units and community hospitals: surveys based on the European Pressure Ulcer Advisory Panel minimum data set. Int Wound J 2010; 7: 147-52.

[10] VanGilder C, MacFarlane GD, Harrison P, Lachenbruch C and Meyer S. The demographics of suspected deep tissue injury in the United States: an analysis of the International Pressure Ulcer Prevalence Survey 2006-2009. Adv Skin Wound Care 2010; 23: 254-61.

[11] Zhao G, Hiltabidel E, Liu Y, Chen L and Liao Y. A cross-sectional descriptive study of pressure ulcer prevalence in a teaching hospital in China. Ostomy Wound Manage 2010; 56: 38-42.

[12] Vanderwee K, Clark M, Dealey C, Gunningberg L and Defloor T. Pressure ulcer prevalence in Europe: a pilot study. J Eval Clin Pract 2007; 13: 227-35.

[13] Uzun O and Tan M. A prospective, descriptive pressure ulcer risk factor and prevalence study at a university hospital in Turkey. Ostomy Wound Manage 2007; 53: 44-56.

[14] Gunningberg L. EPUAP pressure ulcer prevalence survey in Sweden: a two-year follow-up of quality indicators. J Wound Ostomy Continence Nurs 2006; 33: 258-66.

[15] Lahmann NA, Halfens RJ and Dassen T. Pressure ulcers in German nursing homes and acute care hospitals: prevalence, frequency, and ulcer characteristics. Ostomy Wound Manage 2006; 52: 20-33.

[16] Defloor T, Clark M, Witherow A, Colin D, Lindholm C, Schoonhoven L and Moore Z. EPUAP statement on prevalence and incidence monitoring of pressure ulcer occurrence. J Tissue Viability 2005; 15: 20-7.

[17] Gallagher P, Barry P, Hartigan I, McCluskey P, O'Connor K and O'Connor M. Prevalence of pressure ulcers in three university teaching hospitals in Ireland. J Tissue Viability 2008; 17: 103-9.

[18] Wann-Hansson C, Hagell P and Willman A. Risk factors and prevention among patients with hospital-acquired and pre-existing pressure ulcers in an acute care hospital. J Clin Nurs 2008; 17: 1718-27.

[19] Shahin ES, Dassen T and Halfens RJ. Pressure ulcer prevalence and incidence in intensive care patients: a literature review. Nurs Crit Care 2008; 13: 71-9.