

Cost Comparison of “Pressure Sores in the Last 4 Years and ” Evaluation of the Status of Patients Diagnosed with COVID: Acibadem Healthcare Group Example

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ABSTRACT--- *It was designed as a retrospective study. Between January 2018 and June 2021, 590 patients who developed pressure ulcers from 16 hospitals affiliated with Acibadem Healthcare Group (AHG) were identified and classified as Stage 1, Stage 2, Stage 3, Stage 4 and Unstageable pressure ulcer, suspected of deep tissue damage. The cost of treatment was calculated in each category and the total cost per patient for the company was determined.*

There are two main ways to get data for analysis; 1- Sentinel Event System Reports (for determining the number of patients with pressure ulcers) and 2- Patient Services Pricing Department (for defining the cost of treatment). Costs and costing given by the pricing department with a bottom-up approach are calculated from the patient perspective.

Pressure sore cost calculation for COVID-19 patients covers the period from March 2020 to June 2021.

Data analysis: Two main ways were used to collect data for analysis; 1- Sentinel Event Notification System Reports (for determining the number of patients with pressure ulcers) and 2- Patient Services Pricing Department (for defining the cost of treatment).

Population: All patients who developed pressure ulcers in 16 hospitals affiliated to Acibadem Healthcare Group since 2018

1. INTRODUCTION

Pressure ulcer is an important quality indicator for all healthcare organizations. Despite modern advances in medicine, it is an important complication. The greatest loss in pressure ulcers is the loss of people and quality of life. Prolongation of the patient's hospital stay, antibiotics used, nutritional products, care products, laboratory tests and nurse care costs constitute the main expenses of pressure ulcers.(1)

Hospital Acquired Pressure Ulcers/Injuries (HAPU/I) cause significant patient harm, including pain, expensive treatments, prolonged hospital stay and, in some patients, premature death. It is estimated that more than 2.5 million patients suffer from pressure ulcers/injuries in US acute care facilities each year, and 60,000 die from their complications. The cost of a single pressure ulcer/injury treatment can be as high as \$70,000. The total cost for the treatment of pressure ulcer/injury is estimated at \$11 billion per year in the US (Joint Commission Center for Transforming Healthcare). The Centers for Medicare and Medicaid Services (CMS) Medicare announced that in 2007, each pressure ulcer added \$43,180 to the cost of hospital stay.(2)

In 2008, the Centers for Medicare and Medicaid Services (CMS) announced that it would not pay the additional costs incurred for hospital-acquired pressure ulcers. The development of pressure ulcers is an area that can be prevented with evidence-based nursing practices.

The Agency for Healthcare Research and Quality found a 6% increase in Pressure Ulcers (HAPU) despite a 13% decrease in all hospital-acquired conditions between 2014 and 2017 (The Agency for Healthcare Research and Quality).(2)

Identification of pressure ulcer risk factors is among the most basic interventions to reduce the prevalence and incidence. In order for the risk assessment to be evidence-based, a risk assessment scale should be used. The most well-known of these scales are “Norton”, “Gosnell”, “Braden”, “Knoll” and “Waterlow” scales. Ayello (2001) stated that the Braden scale is the most reliable and valid risk assessment scale that can be used for patient groups with a wide age range in the US. (3)

2. MATERIALS AND METHODS

It was designed as a retrospective study. Between January 2018 and June 2021, 590 patients who developed pressure ulcers from 16 hospitals affiliated with Acibadem Healthcare Group (AHG) were identified and classified as Stage 1, Stage 2, Stage 3, Stage 4 and Unstageable pressure ulcer, suspected of deep tissue damage. The cost of treatment was calculated in each category and the total cost per patient for the company was determined.

Pressure ulcer classification system according to the joint decision of the international pressure ulcer advisory panel (NPUAP) and the European pressure ulcer advisory panel (EPUAP); consists of four phases and two categories determined by NPUAP and EPUAP. Classified as Stage 1, Stage 2, Stage 3, Stage 4 and Unstageable pressure ulcer, suspected deep tissue damage

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3. LIMITATIONS

As Acibadem Healthcare Group, only the treatment cost was calculated due to the scope of the study. The cost of prevention and standard care could not be compared, as the cost of prevention was another study topic.

4. FINDINGS

Table.1. Pressure Injury Development Status by Years

Yillar	Number of Patients Evaluated at Risk of Pressure Injury	Number of Patients Developing Pressure Injury	Pressure Injury Development Rate
2018	83.593	182	%0,22
2019	103.886	172	%0,17
2020	106.787	155	%0,14
2021	78.996	81	%0,10

In our study, the average rate of development of pressure injuries was found to be 0.2% throughout the institution.

Table.2. Number of Pressure Sores by Stage

Wound Stages	2018	2019	2020	2021 (Jan-June)
Stage 1	52	52	37	18
Stage 2	110	110	95	48
Stage 3	6	4	4	0
Stage 4	1	0	2	0
Unclassifiable Stage	10	3	17	13
Deep Tissue	3	3	0	2
Total	182	172	155	81

When the number of pressure injuries according to their stages is examined, it is seen that the highest number is in stage 2 wounds, however, the number of wounds decreases in the distribution by years. It is noteworthy that the number of unclassifiable stage wounds has increased in the last two years. Considering the details of this increase, it has been determined that unclassifiable stage wounds have increased due to the inability of patients to tolerate position change due to frequent prone positioning or low oxygenation in covid patients.

Table.3. Distribution of Patients with Wound Developing Covid according to their Stages

Stages	2020	2021(Jan-June)
Stage 1	2	2
Stage 2	16	9
Stage 3	0	0
Stage 4	0	0
Unclassifiable Stage	8	4
Deep Tissue	0	1

Covid patients accounted for 17% of pressure injuries developed in 2020 and 20% of injuries developed in the first six months of 2021.

Table.4. Comparison of Patient Data with Developing Pressure Injury

	2018		2019		2020		2021(Jan-June)	
	N	%	N	%	N	%	N	%
Age								
0-18 age	9	5%	17	10%	12	8%	4	5%
19-65 age	73	40%	65	38%	63	41%	30	37%
65 age and above	100	55%	90	52%	80	52%	47	58%
Total	182	100%	172	100%	155	100%	81	100%
Wound Developed Section								
General Intensive Care	82	45%	82	48%	83	54%	43	53%
KVCS ICU	28	15%	26	15%	20	13%	10	12%
Coronary ICU	5	3%	2	1%	4	3%	0	
Inpatient Floors	56	31%	53	31%	38	24%	23	28%
Operating room	5	3%	6	3%	7	4%	2	3%
PICU/NICU	6	3%	3	2%	3	2%	3	4%
Total	182	100%	172	100%	155	100%	81	100%
Chronic Disease Status								
Has Chronic Disease	134	74%	111	65%	113	73%	62	77%
No Chronic Disease	48	26%	61	35%	42	27%	19	23%
Total	182	100%	172	100%	155	100%	81	100%
Yara Bölgesi								
sacral region	92	51%	99	57%	95	61%	40	49%
gluteal region	37	20%	24	14%	18	11%	15	18%
Thoracanter	8	4%	3	2%	5	3%	2	2%
Heel/Foot	13	7%	6	3%	4	3%	6	7%
Jaw	5	3%	1	1%	7	4%	5	6%

Leg/Knee	11	6%	10	6%	6	4%	3	4%
Occipital region	4	2%	5	3%	4	3%	0	0
Auricle	4	2%	1	1%	3	2%	3	4%
Nose	4	2%	3	2%	2	1%	0	0
Elbow/Wrist	1	1%	2	1%	1	1%	0	0
Back/Shoulder	3	2%	17	9%	6	4%	6	7%
Lips	0	0	1	1%	0	0%	0	0
Genital area	0	0%	0	0%	4	3%	1	1%

Wound Development Time (Mean/day)	15 day	18 day	15 day	21 day
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Considering the age distribution of the patients who developed pressure injuries, it is seen that the patients aged 65 and over predominate, most of them have chronic diseases, and most of the wounds develop in the sacral region. Considering the development time of pressure injuries, it has been determined that it is between 15-21 days on average.

Table.5. - Year Comparative Cost Chart of Pressure Injuries

STAGE	COST	2018	2019	2020	Jan.-June2021
STAGE 1	Nurse Care Cost	19.920 TL	30.240 TL	29.256 TL	25.202 TL
	Bed and room cost	1.382 TL	1.682 TL		752 TL
	Care Product Usage	18.995 TL	8.447 TL	3.275 TL	5.799 TL
	Total cost	40.296 TL	40.369 TL	32.531 TL	31.753 TL
STAGE 2	Nurse Care Cost	93.252 TL	153.360 TL	154.376 TL	98.898 TL
	Bed and room cost	38.812 TL	7.471 TL	6.464 TL	188.572 TL
	Medicine	20.561 TL	20.625 TL	25.113 TL	6.779 TL
	Lab	4.089 TL	2.857 TL	45.693 TL	49.919 TL
	Use of Wound Care Products	158.392 TL	96.143 TL	110.417 TL	44.214 TL
	Physician Consultation	1.698 TL	5.706 TL	3.604 TL	3.529 TL
	Total cost	316.805 TL	286.162 TL	345.667 TL	391.911 TL
STAGE 3	Nurse Care Cost	6.757 TL	15.975 TL	11.730 TL	-
	Bed and room cost	24.020 TL			
	Medicine	3.593 TL	1.305 TL	3.237 TL	
	Lab	1.400 TL		2.420 TL	
	Wound culture	1.040 TL		666 TL	
	Use of Wound Care Products	7.988 TL	8.867 TL	4.610 TL	
	Physician Consultation	835 TL	495 TL	720 TL	
	Aspirators Usage	2.000 TL	1.652 TL		
	Debridement	1.200 TL	2.646 TL	942 TL	
	Sepsis **				
Total cost	48.833 TL	30.940 TL	24.325 TL		
STAGE 4	Nurse Care Cost	6.170 TL	-	2.898 TL	-
	Bed and room cost				
	Medicine			3.007 TL	
	Lab				
	Wound culture				
	Use of Wound Care Products	1.988 TL			

	Physician Consultation				
	Aspirators Usage	4.300 TL			
	Debridement				
	Graft operation				
	Sepsis **				
	Total cost	12.458 TL		5.905 TL	
Unclassified Stage	Nurse Care Cost	16.350 TL	6.773 TL	73.255 TL	64.925 TL
	Bed and room cost		1.636 TL		38.481 TL
	Medicine	4.159 TL		7.454 TL	5.362 TL
	Lab	218 TL	6 TL	16.836 TL	15.072 TL
	Use of Wound Care Products	17.607 TL	2.194 TL	25.864 TL	21.460 TL
	Physician Consultation		680 TL		7.747 TL
	Debridement		650 TL	8.148 TL	3.891 TL
	Graft operation				4.714 TL
	Sepsis **				
	Multiple Organ Failure				
	Death				
		Total cost	38.334 TL	11.939 TL	131.557 TL
Deep Tissue Damage	Nurse Care Cost	6.170 TL	4.883 TL		2.597 TL
	Bed and room cost				670 TL
	Medicine	75 TL	162 TL		234 TL
	Lab				4.600 TL
	Use of Wound Care Products	4.475 TL	2.377 TL		
	Physician Consultation	400 TL			
	Debridement				
	Graft operation				
	Multiple Organ Failure				
		Total cost	11.120 TL	7.422 TL	
TOTAL COST OF WOUNDS			467.846 TL	376.831 TL	539.985 TL

In the treatment and follow-up of patients who develop pressure injuries, the headings that create costs related to the wound are followed. Accordingly, it was observed that the highest cost occurred in stage 2 wounds. Considering the change in the total cost over the years according to the wound stages, it is noteworthy that the highest increase is in the unclassifiable stage wounds. As of 2020, there is an increase in the number of unclassifiable stage wounds and the associated cost. When looking at the expense items that increase the cost, it is seen that the costs of nurse care and the costs of the care products used have increased since 2020 compared to previous years. Nursing care costs are calculated differently for each wound stage and include many nursing practices such as wound evaluation, care, positioning, education of the patient and their relatives, and taking protective measures. calculated.

Table.6. Cost of Wound Developing Covid Patients by Stage

STAGES	Cost	2020	2021(Jan.-June)
Stage 1	Nurse Care Cost	552 TL	10.653 TL
	Bed and room cost	404 TL	752 TL
	Care Product Usage	531 TL	620 TL
	Total cost	1.487 TL	12.025 TL
Stage 2	Nurse Care Cost	44.160 TL	17.490 TL
	Bed and room cost	8.480 TL	44.403 TL
	Medicine	15.908 TL	1.357 TL
	Lab	48.430 TL	13.800 TL
	Use of Wound Care Products	16.860 TL	12.919 TL
	Physician Consultation	1.451 TL	600 TL
	Total cost	135.289 TL	90.569 TL
Unclassified Stage	Nurse Care Cost	24.794 TL	21.518 TL
	Bed and room cost	0 TL	597 TL
	Medicine	4.064 TL	775 TL
	Lab	1.586 TL	6.812 TL
	Use of Wound Care Products	10.297 TL	18.089 TL
	Physician Consultation		600 TL
	Debridement		0 TL
	Graft operation		0 TL
	Sepsis **		0 TL
	Multiple Organ Failure		0 TL
	Death		0 TL
	Total Cost	40.741 TL	48.392 TL
TOTAL COST			177.517 TL

As of 2020, 33% of the wound costs and 28% of the wound costs between January-June 2021 belong to the wounds in covid patients. The most important items that create cost in Covid patients were the costs of nurse care and the costs of care products. The long hospitalization days of inpatients due to Covid have led to an increase in nursing care costs.

Table.7. Average Cost of Pressure Sores by Years

Average Cost	2018			2019			2020			2021(Ocak-Haziran)		
	TL	\$	€	TL	\$	€	TL	\$	€	TL	\$	€
Stage 1	775	\$ 161	€ 136	776 TL	\$ 136	€ 122	879 TL	\$ 125	€ 109	1.764 TL	\$ 216	€ 181
Stage 2	2.880	\$ 598	€ 507	2.601 TL	\$ 458	€ 408	3.639 TL	\$ 519	€ 453	8.165 TL	\$ 1.001	€ 840
Stage 3	8.139	\$ 1.692	€ 1.435	7.735 TL	\$ 1.364	€ 1.216	6.081 TL	\$ 867	€ 757	0 TL	\$ -	€ -
Stage 4	12.458	\$ 2.590	€ 2.197	0 TL	\$ -	€ -	2.953 TL	\$ 421	€ 367	0 TL	\$ -	€ -
Unclassified stage	3.833 TL	\$ 796	€ 676	3.980 TL	\$ 701	€ 625	7.739 TL	\$ 1.103	€ 963	12.435 TL	\$ 1.525	€ 1.279
Deep Tissue Damage	3.707 TL	\$ 770	€ 653	2.474 TL	\$ 436	€ 388	0 TL		€ -	4.051 TL	\$ 497	€ 416
Total Average Cost	2.571 TL	\$ 534	€ 453	2.191 TL	\$ 386	€ 344	3.484 TL	\$ 497	€ 433	7.326 TL	\$ 898	€ 753

*Annual Average USD and EUR Exchange Rates; It is calculated by taking the arithmetic average of the average exchange rates of the annual working days. Amounts have been prepared for information purposes based on central bank exchange rates.

Increasing drug and care product prices, and increases in service costs have also led to an increase in the treatment and care costs of the wound. While the average cost of a wound in the institution was US\$453 in 2018, this price increased to US\$898 by 2021.

5. DISCUSSION

The total cost of treatment per person in the USA is \$38,000 (4). The average weighted cost of the treatment of pressure ulcers in the UK is £5,600 per case and the average daily cost for each patient is \$211.4. (5) The total average cost of pressure ulcers in AHG was found to be \$898.

As the number of patients with stage II pressure ulcers is higher in the cost analysis performed in AHG, the costs are higher than the other stages. In this study, Wound Development Time was determined as 15-21 days on average. The literature supports it. Large full-thickness pressure ulcers (Nebraska, US Residual pressure ulcers in COVID-19)(6) with a low chance of healing due to a wide variety of health outcomes occurring 4 or more weeks after infection with COVID-19, one of which is polymyopathy, hypermetabolic states, and residual tissue ischemia.

As of 2020, there is an increase in the number of unclassifiable stage wounds and the associated cost. This is because of COVID-19, noninvasive or invasive oxygen therapy is often required (7). As reported in the literature, prone ventilation is used for at least 12 hours a day, possibly to reduce mortality in patients with severe ARDS. (8) However, the prone position increases the risk of medical device-related pressure (10). According to a study by Black et al. (2010),(9) 34.5% of all pressure ulcers developed in the hospital are related to medical devices. There is a high correlation between device-related pressure ulcers (DRPU) and respirators, equaling 68% of all device-related pressure ulcers.

In our study, pressure sores on the chin; In 2018, it was determined as 3% 2019 1% 2020 4% and 2021 6%.

Pressure sores developing in the auricle; In 2018, it was determined as 2%, 2019 1%, 2020 2% and 2021 4%. It was detected in the genital area as 3% in 2020 and 1% in 2021.

When we look at the expense items that increase the cost, it is seen that the costs of nurse care and the costs of the care products used have increased since 2020 compared to previous years. Nursing care costs are calculated differently for each wound stage and include many nursing practices such as wound evaluation, care, positioning, education of patients and their relatives, and taking protective measures.

In our study, it was seen that patients aged 65 and over were predominantly treated in general intensive care units, with a rate of 53% of the patients who developed pressure injuries, most of them had chronic diseases and most of the wounds developed in the sacral region (49%). AHG results are consistent with the literature. The prevalence of pressure ulcers in intensive care units is in the order of anesthesia intensive care unit, internal medicine intensive care unit, stroke intensive care unit and others. Because these units are the first intensive care units used in our hospital during the pandemic period (11). The most pressure sores in Covid-19 patients were seen in the sacrum region, heels, trochanteric regions, scapular region, ears, occipital region and others. The same sequence was observed in patients who developed pressure ulcers after admission to the intensive care unit (12).

6. RESULT

In our study, the rate of development of pressure injuries throughout the institution decreased in the last 4 years and became 0.2% on average. On the US, the tendency for severe pressure injuries has increased (6%) in the last 5 years. Additionally, the COVID-19 pandemic has presented hospitals with high volumes of more complex patients, which has increased demands for patient care staff. Patients in the Intensive Care Unit (CCU) are at 12-24.5 percent higher risk of pressure injury than those not in the CCU. In addition, those who take norepinephrine are three times more likely to develop pressure injuries, and those who are malnourished are twice as likely to develop pressure injuries (Agency for Health Research Quality 2017).

Pressure ulcer reduction in quality of life for patients is a significant cost burden for healthcare providers. The cost here is basically; The average cost of a wound in ABO was US\$453 in 2018, which increased to US\$898 by 2021.

In clinical, prospective, and prevalence studies, the frequency of pressure ulcers is between 1.6% and 26.8%. Pressure ulcer rates were found to be 5.8% and 10.4% in two different studies conducted in Turkey [4]. In a systematic study by Çınar et al., in which they reviewed studies published between 2005 and 2015 to determine the situation in our country, the incidence of pressure ulcers varies between 15-65%. In our study, the average rate of pressure injury development was found to be 0.2% throughout the institution. (13)The use of modern wound care products in the right wound, with the right treatment method, at the right time and when necessary is important in terms of providing financial savings. As prevalence and incidence studies increase at the national level, awareness of the importance of pressure ulcer and

its financial harm to the country's economy will increase. With continuous preventive activities, high costs faced by both patients and health institutions can be prevented in the long run. Detecting the pressure ulcer at Stage 1 and taking the necessary care measures will greatly reduce the cost of treatment.

Conflict of interest: There is no conflict of interest declared regarding the authors or the article.

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