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The International Pressure Ulcer Prevalence™ Survey: 2006-2015

A 10-Year Pressure Injury Prevalence and Demographic Trend Analysis by Care Setting

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ABSTRACT

PURPOSE: Measurement of pressure injury (PI) prevalence allows benchmarking within and across facilities; the International Pressure Ulcer Prevalence™ (IPUP) Survey includes a variety of care settings. The purpose of this study is to present 10 years of US prevalence and limited demographic data (2006-2015) by care setting.

METHODS: Facilities volunteer to participate in the IPUP Survey. Internal clinical teams collect data during a predetermined 24-hour period that includes pressure injury prevalence, demographics, and other pertinent clinical information. Aggregate data was analyzed for this study.

RESULTS: The sample for this study was 918,621 patients in the United States; data collection spanned 2006 to 2015. The overall prevalence (OP) of PI in all facilities declined from 13.5% (2006) to 9.3% (2015). Facility-acquired prevalence (FAP) declined from 6.2% (2006) to a range of 3.1% to 3.4% (2013-2015). Acute care OP was 13.3% in 2006 and declined to a range of 8.8% to 9.3% (2012-2015). Facility-acquired prevalence in acute care declined from 6.4% (2006) to 2.9% in 2015, with 2008-2009 showing the most aggressive decline. Long-term acute care (LTAC) had the highest OP at 32.9% in 2006; it declined to 28.8% in 2015. The LTAC-FAP was 9.0% in 2006; it declined to 5.6% in 2015. Recently, the long-term care (LTC) FAP rose from 3.8% in 2013 to 5.4% in 2015. The rehabilitation facility FAP was 2.6% to 2.8% over the last 3 years. Average patient age declined in all care settings with the exception of LTAC and LTC. Braden Scale risk scores remained constant and weight increased in all care settings with the exception of LTC.

CONCLUSIONS: The OP and FAP in acute care and rehabilitation have declined significantly over this 10-year period. Analysis of OP and FAP in LTC and LTACs varied without any clear-cut directional trends. General facility demographic trends indicate that mean patient age has decreased, Braden Scale scores for pressure injury risk has remained constant, and weight has increased in most care settings.

VIDEO ABSTRACT available for more insights from the authors (see Supplemental Digital Content 1, http://links.lww.com/JWOCN/A37).

KEY WORDS: Nosocomial pressure ulcer, Patient demographics, Pressure injury, Pressure ulcer prevalence, Pressure ulcers, Risk assessment.

INTRODUCTION

Pressure injuries (PIs) are a significant clinical complication for patients and a financial and quality issue for health care facilities. There have been many national initiatives aimed at reducing PI. In 2006, the Joint Commission has placed health care-associated PIs in their list of patient safety goals (Goal #14), although initially applicable only to long-term care.[1] The Institute of Healthcare Improvement's "5 Million Lives Campaign"[2] had many acute care facilities working on PI prevention as their primary quality improvement initiative during 2006-2008.[3] In 2007, the Centers for Medicare & Medicaid Services (CMS) announced that acute care payments would be discontinued on October 1, 2008, for the ancillary care of hospital-acquired PIs.[4,5] Additionally, the Agency for Healthcare Research and Quality (AHRQ) began data collection on facility-acquired PIs in 2006[6] and the American Nurses Association identified facility-acquired PI prevention as a quality indicator of good nursing care.[7]

Given the national attention, PI prevention efforts have intensified. These efforts include investments in changing clinical practice by frequent assessments of risk, strengthening turning and repositioning efforts, and application of advanced support surfaces for patients identified at risk for PI or who have pressure injuries, in an effort to prevent or arrest the progression of PIs to higher stages.

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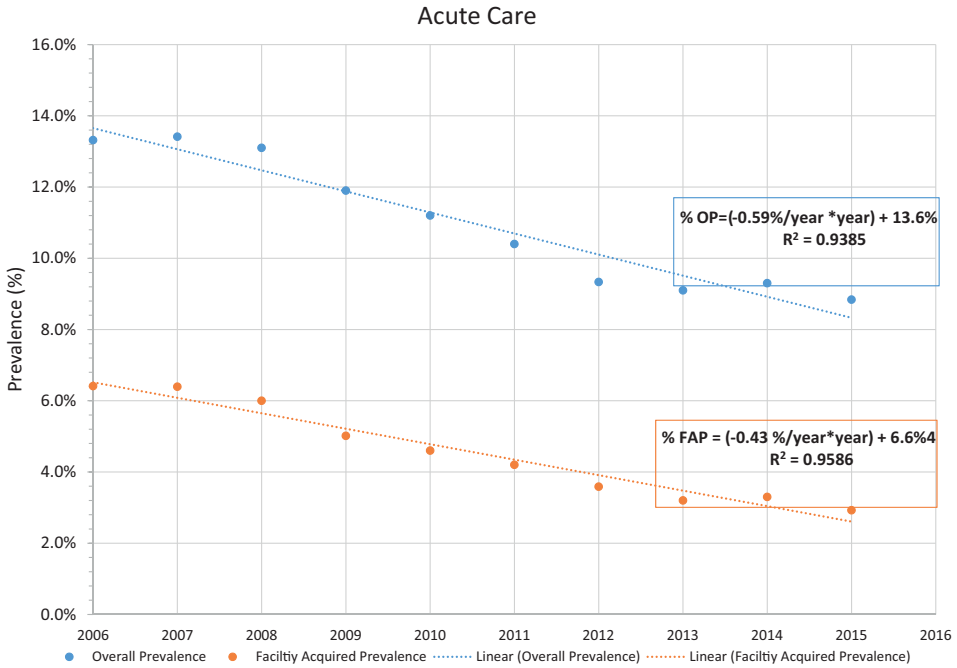

Figure 1. Overall prevalence declined at a rate of 0.59% per year. Facility acquired prevalence declined at a rate of 0.43% per year.

Acute Care

Reports have documented substantial progress in the acute care setting, demonstrating the efficacy of PI prevention efforts. Lyder and colleagues[8] reported a 4.5% hospital-acquired PI (HAPI) rate based on combined 2006-2007 data for Medicare beneficiaries. They noted a 2.81 odds ratio for in-hospital mortality, and a 1.33 odds ratio for 30-day readmission for HAPI patients versus patients without HAPIs. The mean length of stay increased from 4.8 days for non-HAPI patients compared to 11.2 days for patients with HAPI.

He and colleagues[9] published a report from National Database of Nursing Quality Indicators (NDNQI) using 2004-2011 data (n = 733 US hospitals) demonstrating an overall decline in HAPIs from approximately 7.25% in 2004 to approximately 3% in 2011 for all stages of injuries. If Stage 1 pressure injuries were excluded, the prevalence rates declined from 4.25% in 2004 to around 1.75% in the last quarter in 2011. These data are largely from not-for-profit, Magnet-designated larger hospitals. He's group also noted a seasonal increase in PI prevalence in first quarter data demonstrating a

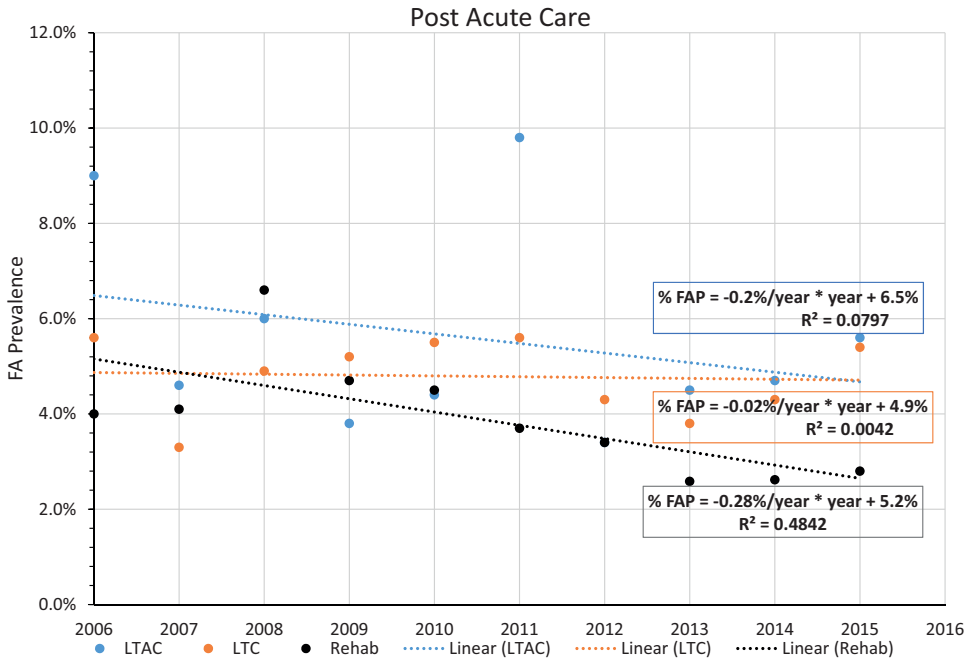

Figure 2. LTAC: FAP is variable with overall reduction in 0.2% per year (p = 0.937); LTC: There was almost no change in FAP over the 10 year period. Slope = -0.02%/year. (p = 0.43). Rehab: FAP significantly declined by 0.28% per year (p = 0.025).

1.18 odds ratio for 2004-2008 data; the lowest prevalence occurred in the third quarter of each year. This trend declined to 1.04 odds ratio in 2009-2011 data.

Padula and associates[10] published a 2008-2012 assessment of hospital discharge data from academic medical centers in the United States for the incidence of Stage 3/4 or unstageable PI. They reported that health care-associated pressure ulcer injury (HAPI) rates declined from 11.8/1000 cases in 2008 to 0.8/1000 cases in 2012. Other key findings included average length of stay increase of 20 days for HAPI patients compared to non-HAPI cases. Patients with HAPI underwent more surgery, had a higher case mix index, and experienced greater mortality. The key limitation of this report was the possibility of missing PI occurrences because inclusion required a PI code be among the top 10 *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) codes for each patient.

The AHRQ published a relatively recent report demonstrating a 28.0% reduction in pressure injuries from 2011 to 2014, which was the second largest reduction in hospital-acquired conditions overall during this time period (the first was adverse drug events).[11] This report uses data from Zhan and Miller[12] to estimate mortality associated with the development of Stage 3/4 pressure injuries of 72 deaths per 1000 patients; they estimated that 42,716 patients were saved during the 2010-2014 time period. The excess acute care cost of $17,286 for Stage 3/4 pressure injury formation reported by a study by Kandilov and colleagues[13] was rounded to $17,000 and used to estimate the $10.030 billion reduction in costs associated with less Stage 3/4 pressure injuries that formed during 2011-2014. These combined reports indicate substantial reductions in pressure injury formation in the acute care setting.

Long-Term Care Background

The quality of care delivered in long-term care (LTC) facilities that accept patients receiving Medicare or Medicaid benefits has been monitored by the CMS since 1965 through state survey process aimed at assessing standard care practices.[14] A focus on PI prevention was heightened in 2004 when the CMS released "Guidance to Surveyors for Long-Term Care Facilities."[15] This interpretative guidance document communicated to state surveyors how to assess whether or not the intent of the F314 42 CFR 483.25(c) federal requirements was being followed at a particular facility. It stated that the facility must ensure that (1) a resident who enters the facility without pressure sores does not develop pressure sores unless the individual's clinical condition demonstrates that they were unavoidable; and (2) a resident having pressure sores receives necessary treatment and services to promote healing, prevent infection, and prevent new sores from developing. Deficiencies are reported at different Levels 1 to 4, with Level 4 being the worst offence demonstrating that the surveyors found failure to comply in multiple areas of care.[14,16] If residents develop a Stage 1 to 2 PI that is considered avoidable, the facility can be sited at Level 2. Level 3 applies for an acquired Stage 3 avoidable PI, and Level 4 for an avoidable acquired Stage 4 PI.[17]

The 2013 National Healthcare Quality Report reported a fall in the percentage of residents with PI in long-term care from 2000 to 2009. Data for comparison with the current study period 2006-2009 showed a decrease of 21% (2006) to 19% (2009) for short-stay residents and long-stay 13% (2006) to 11% (2009).[17] The purpose of this study was to provide an overview analysis of the PI prevalence and patient demographics and trends by care setting over the last 10 years (2006-2015). Acute care 2006-2009 overall prevalence (OP) and facility-acquired prevalence (FAP) have been previously described.[19,22]

METHODS

The International Pressure Ulcer Prevalence™ Survey (IPUP) generates an observational, cross-sectional cohort database that is designed to determine the frequency and severity of pressure injuries in various populations. The IPUP Survey, facilitated by Hill-Rom, Inc, (Batesville, Indiana), has been assisting facilities to measure and benchmark their PI prevalence rates to similar facilities or units since 1989. The database is unique in that it includes a mix of facility types: (1) acute care (AC) facilities include academic medical centers as well as community-based hospitals, (2) postacute facilities include long-term acute care (LTAC), long-term care (LTC), and (3) rehabilitation (Rehab) facilities. Survey data is directly collected by clinical teams who assess patients who are admitted to or reside in the facility on a specific preselected 24-hour period within a 2- to 3-day window. The 2006-2015 surveys were performed around the last week in February, with the exception of 2008, which was performed during the first week of March.

Methods for data collection via participation in the IPUP Survey have been previously described.[19-22] Briefly, facilities sign up to participate on the Hill-Rom® Web site (http://www.hill-rom.com/ipup/); participation is available to all facilities regardless of whether or not they purchase or rent products from the company. The facility registers to participate as an AC (acute care), LTAC (long-term acute care), LTC (long-term care), or Rehab (rehabilitation) institution. A coordinator designated by the facility receives study materials. Survey teams assess patients over a predetermined 24-hour period within a preselected 2- to 3-day window. The goal of the survey was to perform assessments on all admitted patients/residents; however, 100% patient inclusion was not mandated for participation.

Prevalence is calculated based on guidance from the National Pressure Ulcer Advisory Panel (NPUAP).[23]

(Number of Patients with PIs / Number of patients surveyed) × 100 and reported as a percentage.

OP includes both preexisting and PIs acquired during facility admission. Facility Acquired Prevalence (FAP) includes only those patients who had ulcers developed while admitted, or if the ulcer was not documented as present on admission.

Demographic Data

Age was reported in years with the exception of patients/residents who were 90 years and older, where it is reported in the 90+ category to avoid the collection of protected health information. All other demographic data was reported and aggregate analyses will be performed by care setting. Study procedures were reviewed by the Schulmann Institutional Review Board (Reference #201602908) who determined this study to be exempt from individual informed consent because it analyzes existing data and data collection performed in a manner in which subjects cannot be identified.

Data Analysis

Descriptive statistics were applied to selected fields. Changes in year-to-year prevalence were compared using χ^2 analysis with

Yates correction with alpha set...; set at 0.05. Overall trends in selected variables were assessed using linear regression with the α-level again set at 0.05.

RESULTS

A total of 918,621 patients were surveyed in facilities in the United States over the 10-year period. Acute care contributed 92.2% of all patients with around 750 facilities each year for the last few years; this cohort represents 13.2% of the American Hospital Association's 5686 licensed acute care facilities (2015 AHA Hospital Statistics).[24] Long-term care contributed 36,115 patients (3.9%), LTAC facilities accounted for 15,713 patients (1.7%), and Rehab facilities comprised 12,708 patients (1.4%).

Data for all US care settings indicate a decline in OP from a high of 13.7% in 2007 to a low of 9.3% in 2015 (Table 1). There are significant decreases year to previous year for OP 2008-2012 and in 2015. Significant decreases in FAP begin when comparing 2009 to 2008 data and consistently declined except for 2013 versus 2014 comparison, where there was a small increase.

Demographic regression slopes were in many cases significantly different from zero, indicating either an increasing or decreasing trend. There was a significant decrease in mean age of 0.127 years of age per year ($P = 0.016$) (Table 2, Figure 3). Patients' mean weight increased from 176.2 lb in 2006 to 183.8 lb in 2015 (slope = 0.74 lb/year; $P < .0001$) and this trend was seen in all care settings except for LTC (Table 2, Figure 4). Similarly, body mass index (BMI) increased from 28.9 kg/m^2 in 2006 to 29.6 kg/m^2 in 2015, an increase of 0.08 kg/m^2-year ($P = .01$). Mean Braden Scale scores remained between 18.1 and 18.3; they neither rose nor fell over the period ($P = .946$). The percentage of females in the sample decreased significantly by 0.21% per year ($P = .012$).

TABLE 1.
Prevalence by Care Setting

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
All US care settings										
Facilities, n	702	638	765	855	886	882	931	892	917	906
Patients Surveyed, n	88,743	79,193	90,398	92,197	98,078	97,294	97,768	91,087	91,745	92,118
Patients with Pressure Injuries (PI)	11,968	10,827	12,204	11,344	11,279	10,508	9,492	8,744	8,899	8,535
Patients with > Stage 1 PI	8,253	7,523	8,678	8,298	8,435	7,978	7,333	6,923	7,248	6,909
Overall Prevalence	13.5%	13.7%	13.5%	12.3%	11.5%	10.8%	9.7%	9.6%	9.7%	9.3%
P value for OP vs. previous year	NA	.2709	.3074	<.0001*	<.0001*	<.0001*	<.0001*	.4271	.4735	.0039*
Overall Prevalence > Stage 1	9.3%	9.5%	9.6%	9.0%	8.6%	8.2%	7.5%	7.6%	7.9%	7.5%
Patients with Facility-acquired PIs	5,483	4,861	5,424	4,605	4,512	4,184	3,531	2,915	3,119	2,813
Facility-acquired Prevalence	6.2%	6.1%	6.0%	5.0%	4.6%	4.3%	3.6%	3.2%	3.4%	3.1%
P value for FAP vs. previous year	NA	.7390	.2388	<.0001*	<.0001*	.0014*	<.0001*	<.0001*	.0176†	<.0001*
FA Patients with > Stage 1 PIs	3,060	2,782	3,254	2,907	2,942	2,822	2,378	2,095	2,294	2,098
Prevalence FAPU > Stage 1 PI	3.4%	3.5%	3.6%	3.2%	3.0%	2.9%	2.4%	2.3%	2.5%	2.3%
P value FAP > Stage 1 vs. previous year	NA	.3097	.3061	<.0001*	.0006*	.0015*	<.0001*	.2394	.0170†	.0024*
US acute care										
Facilities, n	562	541	654	743	766	753	772	727	749	748
Patients Surveyed, n	76,199	72,490	83,914	87,004	92,375	91,678	90,660	83,030	84,127	85,822
Patients with Pressure Injuries (PI)	10,148	9,724	10,993	10,355	10,346	9,535	8,463	7,556	7,824	7,585
Patients with > Stage 1 PI	6,805	6,606	7,720.1	7,524	7,575	7,151	6,416	5,895	6,141	6,050
Overall Prevalence	13.3%	13.4%	13.1%	11.9%	11.2%	10.4%	9.3%	9.1%	9.3%	8.8%
P value for OP vs. previous year	NA	.5899	.0689	<.0001*	<.0001*	<.0001*	<.0001*	.0931	.1599	.5146
Overall Prevalence > Stage 1	8.9%	9.1%	9.2%	8.6%	8.2%	7.8%	7.1%	7.1%	7.3%	7.0%
Patients with Facility-acquired PIs	4,886	4,634	5,035	4,362	4,249	3,850	3,253	2,657	2,776	2,511
Facility-acquired Prevalence	6.4%	6.4%	6.0%	5.0%	4.6%	4.2%	3.6%	3.2%	3.3%	2.9%
P value FAP vs. previous year	NA	.8860	.0014	<.0001*	<.0001*	<.0001*	<.0001*	<.0001*	.2560	.0025*
FA Patients with > Stage 1 PIs	2,645	2,623	3,021	2,732	2,771	2,475	2,158	1,827	2,019	1,851
Prevalence FAPU > Stage 1 PI	3.5%	3.6%	3.6%	3.1%	3.0%	2.7%	2.4%	2.2%	2.4%	2.2%
P value FAP > Stage 1 vs. previous year	NA	.1282	.8571	<.0001	.0899	<.0001	<.0001	.0129*	.0068†	.0011*
US long-term acute care										
Facilities, n	44	33	42	38	32	33	35	38	35	36
Patients Surveyed, n	1,840	1,604	2,031	1,473	1,487	1,417	1,408	1,606	1,462	1,385
Patients with Pressure Injuries (PI)	605	465	648	432	430	529	429	514	466	399
Overall Prevalence	32.9%	29.0%	31.9%	29.3%	28.9%	37.3%	30.5%	32.0%	31.9%	28.8%
P value for OP vs. previous year	NA	.080	.178	.249	.886	.001†	.008*	.536	.985	.208
Patients with PU Stage 2 +	501	417	554	379	397	478	396	491	453	387
Overall Prevalence > Stage 1	27.2%	26.0%	27.3%	25.7%	26.7%	33.7%	28.1%	30.6%	31.0%	27.9%
Patients with Facility-acquired PIs	165	73	122	56	65	139	48	72	69	77
Facility-acquired Prevalence	9.0%	4.6%	6.0%	3.8%	4.4%	9.8%	3.4%	4.5%	4.7%	5.6%
P value for FAP vs. previous year	NA	<.0001*	.078	.006	.510	<.0001†	<.0001*	.176	.832	.378
FA Patients with > Stage 1 PIs	108	57	89	44	55	118	42	64	60	69
Prevalence FAPU > Stage 1 PI	5.9%	3.6%	4.4%	3.0%	3.7%	8.3%	3.0%	4.0%	4.1%	5.0%
P value FAP > Stage 1 vs. previous year	NA	.003*	.258	.049	.347	<.0001†	<.0001*	.180	.945	.324

(*continues*)

TABLE 1.
Prevalence by Care Setting (*Continued*)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
US long-term care										
Facilities, n	47	33	46	33	48	49	54	57	55	49
Patients Surveyed, n	5,203	2,795	3,650	2,061	2,705	2,927	4,010	4,865	4,590	3,309
Patients with Pressure Injuries (PI)	628	320	427.05	246	324.6	316.116	380	481.635	463.59	375
Overall Prevalence	12.1%	11.4%	11.7%	11.9%	12.0%	10.8%	9.5%	9.9%	10.1%	11.3%
P value for OP vs. previous year	NA	.489	.813	.846	.977	.214	.111	.560	.794	.127
Patients with > Stage 1 PI	476	225	303	199	246	272	318	423	431	325
Overall Prevalence > Stage 1	9.1%	8.1%	8.3%	9.7%	9.1%	9.3%	7.9%	8.7%	9.4%	9.8%
Patients with Facility-acquired PIs	290	92	179	107	149	164	172	185	197	180
Facility-acquired Prevalence	5.6%	3.3%	4.9%	5.2%	5.5%	5.6%	4.3%	3.8%	4.3%	5.4%
P value for FAP vs. previous year	NA	<.0001*	.002†	.695	.696	.929	.019	.288	.268	.028†
FA Patients with > Stage 1 PIs	213	60	113	78	100.1	137.6	146	156	184	145
FA Prevalence > Stage 1 PI	4.1%	2.1%	3.1%	3.8%	3.7%	4.7%	3.6%	3.2%	4.0%	4.4%
P value FAP > Stage 1 vs. previous year	NA	<.0001*	.027†	.205	.939	.079	.037*	.304	.049†	.466
US rehabilitation										
Facilities, n	13	22	22	40	39	47	70	70	78	73
Patients Surveyed, n	575	709	707	1,588	1,413	1,272	1,690	1,586	1,566	1,602
Patients with Pressure Injuries (PI)	94	133	137	302	223	167	220	167	186	176
Overall Prevalence	16.3%	18.8%	19.4%	19.0%	15.8%	13.1%	13.0%	10.5%	11.9%	11.0%
P value for OP vs. previous year	NA	.384	.858	.912	.056	.103	.981	.056	.309	.517
Patients with > Stage 1 PI	60	92	104	232	162	123	160	133	160	143
Overall Prevalence > Stage 1	10.4%	13.0%	14.7%	14.6%	11.5%	9.7%	9.5%	8.4%	10.2%	8.9%
Patients with Facility-acquired PIs	23	29	47	74	64	47	58	41	41	45
Facility-acquired Prevalence	4.0%	4.1%	6.6%	4.7%	4.5%	3.7%	3.4%	2.6%	2.6%	2.8%
P value for FAP vs. previous year	NA	.246	.455	.956	.029*	.195	.915	.352	.120	.288
FA Patients with > Stage 1 PIs	13	15	33	49	35	31	32	33	31	33
FA Prevalence > Stage 1 PI	2.3%	2.1%	4.7%	3.1%	2.5%	2.4%	1.9%	2.1%	2.0%	2.1%
P value FAP > Stage 1 vs. previous year	NA	.862	.015†	.09	.384	.948	.387	.801	.943	.975

Note: * indicates "decreased in prevalence"; † indicates "increase in prevalence".
Abbreviations: OP, Overall Prevalence, FAP, Facility-acquired prevalence, FA, Facility-acquired, PI, Pressure Injury.

Acute Care Prevalence and Demographics

Overall prevalence in the acute care setting declined 34.3% from a high of 13.4% in 2007 to a low of 8.8% in 2015 (Table 1). Significant year-over-year decreases in OP occurred each year from 2008 through 2012 ($P < .0001$). Although there was a further decline from 9.3% in 2012 to 8.8% in 2015, this decline was not statistically significant.

Facility-acquired PI prevalence ranged from 6.4% in 2006 and 2007 to a low of 2.9% in 2015, yielding a 45.6% reduction from 2007 to 2015. There were significant year-over-year reductions in FAP beginning with the comparison of 2007 to 2008 data ($P = .0014$) through 2015 ($P < .0001$), with the exception of the 2013 versus 2014 comparison, when FAP rose from 3.2% to 3.3%. The highest decrease occurred between 2008 and 2009, with a full 1.0% decline. Regression analysis for the entire 2006-2015 period yields a decline in OP of 0.59%/year and a 0.43% decline in FAP. (Figure 1).

Excluding Stage 1, OP was highest in 2008 at 9.2% and was reduced to 7.0% in 2015, while FAP was 3.6% in 2007-2008, and came down to 2.2% in 2015. There were significant declines between 2008 and 2009 and 2010 through 2015 ($P < .0001$) with the exception of the 2013 versus 2014 comparison, where there was a significant increase in greater than Stage 1 FAP.

The mean patient age in the acute care setting (2006-2015) showed a significant decline from approximately 64.9 to 64.4 years; however, interpretation of these data is limited by the categorization of age 90 years or less (for PHI reasons). Additional analysis indicated that the proportion of patients who were 65 years or older decreased by 0.324% per year ($P = .0041$, Table 1).

The mean body weight of patients cared for in the acute care setting significantly increased by 0.76 lb per year ($P < .00001$); it was lowest in 2006 at 177.5 lb as compared to 184.5 lb in 2015. The BMI significantly increased from 29.0 to 29.7 kg/m^2 ($P = .0001$), with a mean increase of 0.088 kg/m^2 per year. Braden Scale for Pressure Sore Risk scores did not significantly change. There was a small but significant increase in the proportion of males who were admitted to acute care of 0.18% per year ($P = .0161$).

Long-Term Acute Care Prevalence and Demographics

As noted earlier, 15,713 patients were surveyed over the 10-year period. The OP ranged from 28.8% in 2015 to 37.3% in 2011. The FAP was highest in 2011 at 9.8% and lowest at 3.4% in 2012. Excluding Stage 1, OP ranged from 25.7% (2009) to 31% in 2014, and FAP varied from 3.0% to 8.3%. Trends of reduction in prevalence were not apparent in this care setting (OP p = 0.93); FAP p = 0.43).

Patients cared for in LTAC facilities were at higher risk for PI (mean Braden Scale scores varied from 15.0 to 16.2) and were heavier (weight ranges 181-187 lb) than any other care setting. The mean age of patients in LTAC varied from 65 and 69 years, but there was no net change over the period of observation. Weight increased by 0.57 lb per year ($P = .038$) and BMI also increased significantly (slope = 0.14 kg/m^2; $P = .031$). The mean Braden Scale score was lower than acute care, but the change over the observation period was very slight (−0.08 points per year; $P = .033$). The relatively equal proportions of males and females did not change significantly over the period.

TABLE 2.
Patient Demographics[a]

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	*P* Value	Slope/y
All care settings												
Mean age, years	66.2	65.5	65.3	64.7	64.7	64.5	64.7	64.8	64.7	64.8	.0160	−0.1267
Mean weight, lb	176.2	178.2	178.1	180.0	181.0	181.2	181.6	181.9	182.5	183.8	.0000	0.74
Mean BMI	28.9	29.0	28.9	29.4	29.5	29.5	29.5	29.6	29.5	29.6	.0010	0.08
Mean Braden	18.1	18.1	18.1	18.2	18.3	18.2	18.2	18.1	18.1	18.1	.9460	NA
Gender—male	46.8%	47.1%	46.7%	46.9%	46.8%	47.7%	47.4%	47.6%	48.5%	48.9%	.0012	0.21%
Gender—female	53.2%	52.9%	53.3%	53.1%	53.2%	52.3%	52.6%	52.4%	51.5%	51.1%	.0012	−0.21%
Acute care												
Mean age, y	64.9	64.8	64.8	64.4	64.3	64.1	64.1	64.1	63.8	64.4	.0046	−0.09758
Mean weight, lb	177.5	178.9	178.8	180.2	181.4	181.4	182.1	183.3	183.8	184.5	.0000	0.7600
Mean BMI, kg/m^2	29.0	29.1	29.1	29.4	29.6	29.6	29.6	29.8	29.7	29.7	.0001	0.0880
Mean Braden	18.3	18.2	18.2	18.2	18.4	18.3	18.3	18.2	18.3	18.2	1.0000	NA
Gender—male	47.1%	47.0%	46.3%	46.4%	46.4%	47.2%	47.1%	47.4%	48.4%	48.4%	.0161	0.18%
Gender—female	52.9%	53.0%	53.7%	53.6%	53.6%	52.8%	52.9%	52.6%	51.6%	51.6%	.0161	−0.18%
Patients >65 y	53.4%	52.6%	52.6%	51.7%	51.0%	50.3%	50.4%	50.5%	49.7%	51.4%	.0041	−0.32%
Long-term acute care												
Mean age, y	68.0	68.9	66.8	67.2	65.9	69.2	67.7	64.9	66.1	65.8	.0824	NA
Mean weight, lb	183.2	182.9	181.1	183.8	182.5	183.5	190.0	186.5	184.8	187.0	.0380	0.57
Mean BMI, kg/m^2	28.6	29.1	28.1	29.4	29.0	28.9	30.3	29.7	29.3	29.9	.0311	0.14
Mean Braden	15.4	16.2	15.8	15.5	15.7	15.1	15.4	15.2	15.0	15.3	.0330	−0.08
Gender—male	57.4%	53.1%	56.9%	49.4%	55.4%	48.7%	50.3%	53.1%	49.3%	50.7%	.0550	NA
Gender—female	42.6%	46.9%	43.1%	50.6%	44.6%	51.3%	49.7%	46.9%	50.7%	49.3%	.0550	NA
Long-term care												
Mean age, y	77.0	76.2	76.4	74.7	77.1	73.9	76.2	75.2	77.2	75.4	.5770	NA
Mean weight, lb	164.4	164.4	162.6	173.9	168.2	173.3	169.9	164.6	165.9	170.0	.4040	NA
Mean BMI, kg/m^2	26.3	26.6	26.3	27.0	27.3	27.7	27.4	27.2	27.6	27.8	.0008	0.16
Mean Braden	16.9	16.8	17.2	17.2	17.1	17.1	17.1	16.7	16.9	16.6	.2320	NA
Gender—male	51.8%	52.5%	52.6%	65.1%	54.8%	62.8%	51.6%	50.1%	49.8%	57.6%	.9110	NA
Gender—female	48.2%	47.5%	47.4%	34.9%	45.2%	37.2%	48.4%	49.9%	50.2%	42.4%	.9110	NA
Rehabilitation												
Mean age, y	71.3	69.8	68.3	67.9	67.8	67.6	66.6	69.0	67.7	66.8	.0186	−0.338
Mean weight, lb	168.3	171.5	179.7	174.4	183.5	181.6	182.4	174.7	179.0	185.3	.0353	1.228
Mean BMI, kg/m^2	28.3	28.2	29.2	28.8	29.2	29.4	29.5	28.2	29.2	29.2	.1935	NA
Mean Braden	17.1	16.7	17.1	17.0	17.4	17.2	17.5	17.2	17.3	17.6	.0143	0.0636
Gender—male	39.1%	41.6%	39.1%	43.6%	45.5%	49.4%	48.4%	48.8%	46.9%	52.8%	.0003	1.38%
Gender—female	60.9%	58.4%	60.9%	56.4%	54.5%	50.6%	51.6%	51.2%	53.1%	47.2%	.0003	−1.38%

Abbreviation: BMI, body mass index, y=year, lb. = pounds.
[a]Data were limited to age: 18 to 90 years old (if patients are ≥90 years, it is reported as ≥90), allowable weight and height ranges for data were: weight: 75 to 1200 lb, height: 48 in (4 ft) to 96 in (8 ft); all not collected information excluded in calculations. Regression analysis was performed and *P* values and slope are listed at the far right. Slope represents the change per year in the value listed (age slope = change in age per year: weight slope = change in lb per year, etc.)

Long-Term Care Prevalence and Demographics

Of the 36,115 patients surveyed in LTC facilities over the last 10 years, 3962 (11.0%) had PIs. The OP ranged from 9.5% in 2012 to 12.0% in 2010, and did not show a declining trend as compared to AC prevalence rates. The FAP ranged from 3.3% in 2007 to 5.6% in both 2006 and 2011; it rose from 3.8% in 2013 to 5.4% in 2015; FAP excluding stage 1 was 4.4% in 2015, which was higher than AC or Rehab 4.4%. By regression FAP decreased only 0.02% per year and was not significant (see Figure 2).

Patients receiving care in LTC facilities were older than those managed in all other care settings; their average age ranged from 74.7 to 77.2 years. Their mean body weights were lower ranging from 162.6 to 173.3 lb. Braden Scale score trends were lower than AC but higher than LTAC ranging from 16.6 to 17.2, and there were slightly more males than females in most years. The only significant trend was the increase in BMI of 0.16 kg/m^2 per year ($P = .0008$).

Rehabilitation Prevalence and Demographics

A total of 12,708 patients were surveyed; 1805 (14.2%) had a PIs. The annual OP ranged from 19.4% in 2009 to 11.0% in 2015. The annual FAP ranged from 6.6% in 2008 to a low of 2.6% in 2013 and 2014, with recent data (2015) showing a 2.8% prevalence rate. Excluding Stage 1 PIs, the OP ranged from 14.7% in 2008 to 8.4% in 2013. Excluding Stage 1 pressure injuries, FAP was also highest in 2008 at 4.7% and lowest in 2014 at 2.0%. The only year-to-year significant decrease was found when comparing FAP decrease from 4.7% in 2009 to 4.5% in 2010. There was a significant increase in FAP greater than Stage 1 when comparing data from 2007 to 2008 data. Over the 10 year period, FAP declined by 30% and regression analysis demonstrates a 0.28% decline per year in FAP (p = 0.025) (see Figure 2).

Mean age and BMI were similar to patients in AC, but patient Braden Scale scores indicated higher risk for PI (17.0-17.6 over the 10-year period). The mean age of patients in Rehab

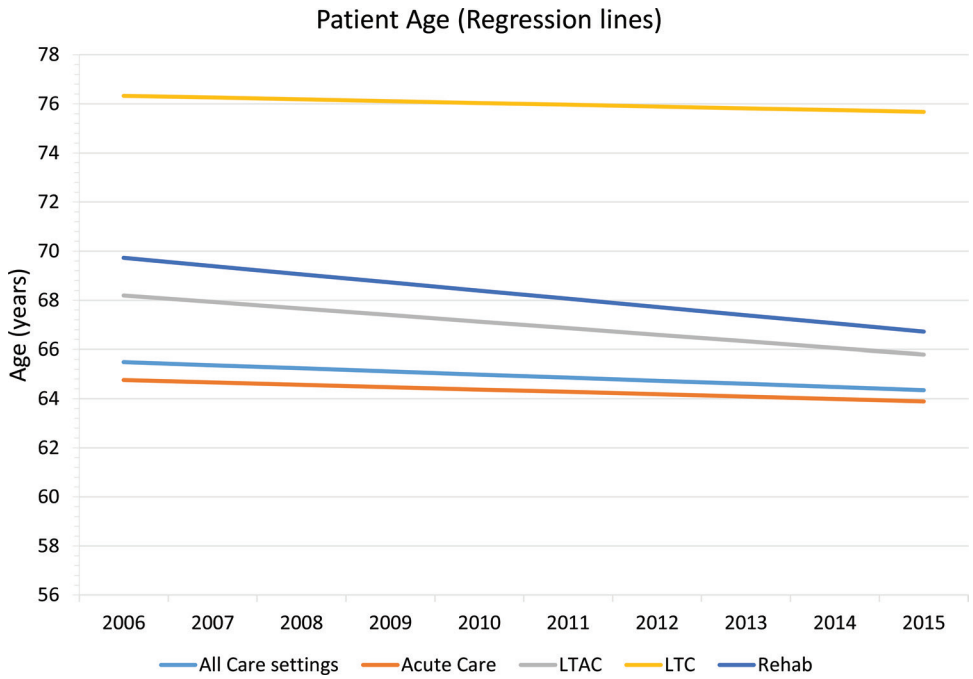

Figure 3. Average age declined in all care settings. This trend was confirmed by assessing percentage of patients older than 65 years, which also declined. Average decrease in age ranged from −0.66 years (LTC) to 3.0 years (Rehab). *Note*: Patients older than 90 years are averaged at 90 years, but this is consistently across all years. Regression equations: Acute care: y = −0.0976x + 260.55; R^2 = 0.654; LTAC: y = −0.2673x + 604.4; R^2 = 0.3299; LTC: y = −0.0733x + 223.37; R^2 = 0.0406; Rehab: y = −0.3331x + 737.92; R^2 = 0.5164. Abbreviations: LTAC = Long-Term Acute Care, LTC = Long-term care, Rehab = Rehabilitation facilities.

decreased from 71.3 to 66.8 years; the slope of the regression line was statistically significant at −0.338 years of age per year (P = .0186). Patients managed in the Rehab setting had the largest increase in weight over the 10-year period (11 lb); this difference was statistically significant (1.338 lb/y; P = .0353), while BMI, which is less sensitive, did not show a significant net change. Rehab patients had mean Braden Scale scores increase slightly (0.0636 points per year; P = .0143). Finally, the proportion of males in Rehab increased significantly over the observation period by 1.38% per year (P = .0003).

DISCUSSION

A 50% reduction in FAP was observed in overall PI prevalence in all care settings in the United States from 2006 to 2015 (6.2%-3.1%). There was a 36% decrease was seen in FAP excluding Stage 1 injuries (3.6% in 2008 to 2.3%). Overall prevalence declined 31% over the 10 year period. Acute care represents the majority of the data set; we found a 34% decline in OP (2007-2015). FAP showed a 54% decrease in 2007 to 2015, and a 39% decrease in FAP for all injuries excluding Stage 1 over the years 2008 to 2015. The largest drop, 1.0%, occurred between 2008 and 2009, which immediately followed the CMS no-payment ruling.

Comparing to the reported NDNQI hospital-acquired PI rate of 3% (2011) for all stages, the current data set value of 4.2% is 1.2% higher, and if Stage 1 injuries are excluded, the NDNQI report was 1.75% compared to a 2.7% rate in 2011 in our study—a 0.95% difference. NDNQI facilities may have lower rates due to the increased quality efforts to maintain Magnet status. We did not break out PI stages, which would allow AHRQ data comparisons; however, this may be a future research effort.

Rehabilitation facilities demonstrated a reduction in both OP and FAP, although the year-to-year comparisons did not reach significance, and generally followed the AC reductions LTC and LTACs did not show the same trends. During the time of these AC prevalence declines, Braden Scale scores remained stable at around 18, indicating that care practices were likely the reason for the decline as the population's Pl risk did not significantly change.

Patients in LTAC facilities had the highest PI risk and the highest OP and FAP of any care setting. Their patients also had higher average body weights when compared to other care settings. The age of LTAC patients was similar to AC and Rehab, and younger than LTC.

Patients in LTC were older and tended to be deemed at higher risk levels than AC. In comparison to data from our previous reports (2003-2005), where LTC OP ranged from 13.2% to 14.4% and FAP 4.2% to 6.0%, analysis of OP in the present study did show a decrease from previous years, but FAP rates did not decline.[20] It is possible that LTC facilities have more unavoidable PI due to increased age and relatively high pressure risk; additional research is needed to more precisely define LTC challenges in PI prevention efforts.

The 2013 National Healthcare Quality Report reported a decrease of 21% to 19% between the years 2006 and 2009 for short-stay residents and a decline from 13% to 11% across the same time period.[17] In the current study FAP was 5.6% in 2006 versus a 5.2% FAP in 2009; this difference represents a 7% decrease. Similarly, the decline in FAP for all pressure injuries except for Stage 1 revealed an 8% decline, but it fluctuated over the next several years. The reasons for this trend are not entirely clear; the current study does not differentiate between short- or long-term stay residents, and the sample size is limited.

Analysis of cumulative demographic data demonstrated a significant increase in body weight of patients (0.74 lb/year) and BMI (0.08 kg/m^2) over the 10-year period from 2006 to 2015. This trend is important when facilities consider both pressure injury prevention and safe patient-handing programs.

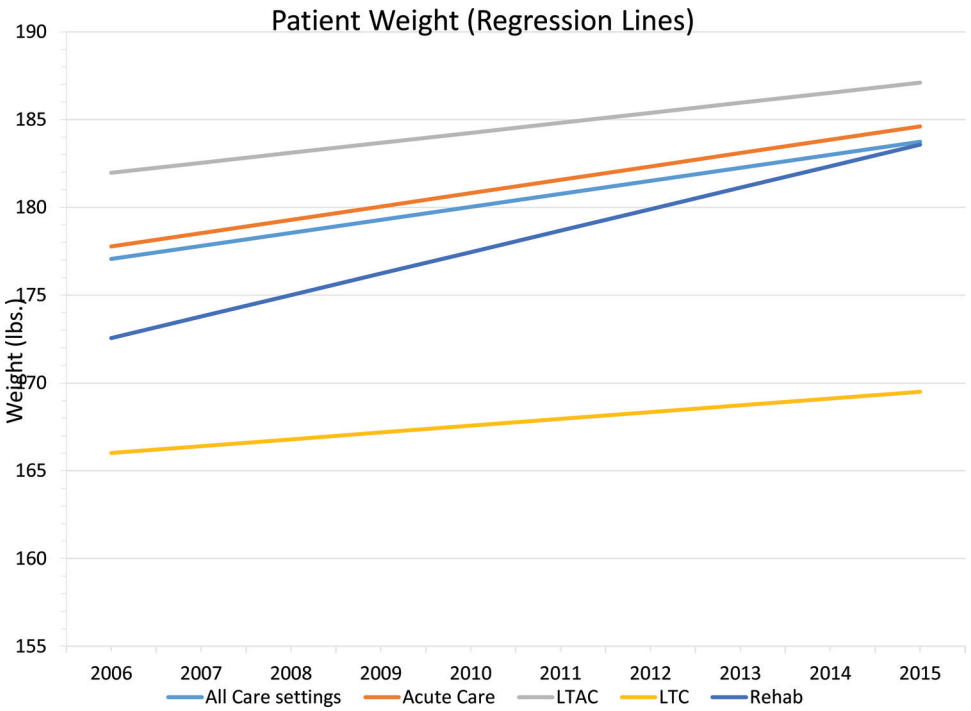

Figure 4. Average weight has risen in all care settings, but not significant in LTC. Change in weight ranges from 3.5 lb in LTC to 11 lb in Rehab. Acute care average weight rose 6.8 lb over this period (0.74 lb per year). Regression equations: All care settings: y = −0.0733x + 223.37; R^2 = 0.0406; AC: AC: y = 0.7606x − 1348; R^2 = 0.9803; LTAC: y = 0.5703x − 962.06; R^2 = 0.4336; LTC: y = 0.3879x − 612.11; R^2 = 0.0881; Rehab: y = 1.2243x − 2283.4; R^2 = 0.4436. Abbreviations: AC = Acute Care, LTAC = Long-term acute care, LTC = Long-term Care, Rehab = Rehabilitation facilities.

Contrary to expectations, the mean age for all care setting data declined by 0.13 per year. This finding differs from the 2012 National Projections, which reported that baby boomers were beginning to turn 65 years of age by 2011.[25] In order to confirm this finding, we performed an additional analysis of the proportion of patients in acute care 65 years or older, which was also declining.

Pressure injury risk measured via Braden Scale scores remained constant throughout the time period in AC, which was also surprising given that there have been reports of increases in acuity for AC facilities.[26] However, this higher level of acuity may not be adequately demonstrated by cumulative Braden Scale scores.

We found a trend for increasing body weight (0.74 lb per year in AC facilities) that is consistent with reports of an increasing incidence of obesity (13% in the 1960s vs 36% in 2009-2010).[27] Obesity is associated with multiple comorbid conditions, and it is more common in middle-aged adults. As a result, the likelihood of hospitalization in the obese younger population may outweigh the hospitalization risk associated with aging at this time, which may account for the declining age seen in this study.[27,28]

Limitations

This observational, cross-sectional cohort study has several limitations. The data are self-reported by facilities and results were not validated by the research team. Long-term care, Rehab, and LTAC data are modest in sample size relative to AC. Data are not distributed equally based on geography. The effectiveness of PI prevention programs may vary between facilities, and the facilities that participate in the survey may vary year to year. Therefore, our data sample is not longitudinal, but is representative. We did not evaluate whether there have been reductions of higher stage pressure injuries (Stages 3-4/unstageable); this question deserves additional study.

CONCLUSIONS

Overall and facility acquired pressure injury occurance have declined significantly over the 10-year period from 2006 to 2015 in the AC and Rehab care settings. In contrast, analysis revealed variability in OP and FAP in LTC and LTACs without consistent trends. Braden Scale scores remained stable during this time, indicating that these declines were not due to a lower pressure injury risk but likely the result of better pressure injury prevention practices. Weight and BMI show significant increases, and it will be important to manage even heavier patients if this trend continues. There was an unexpected decreasing age trend demonstrated in all care settings with the exception of LTC.

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