

Chapter 2

Incidence and Prevalence of Pressure Ulcers

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Abstract Understanding pressure ulcer epidemiology is central to understanding disease burden and to efforts to improve pressure ulcer care. A variety of measures are commonly used, including incidence, prevalence, and facility acquired rates. Each of these measures has specific strengths and limitations when used in assessing pressure ulcer rates. Pressure ulcer rates are highly dependent on the data source and rates calculated from one source can never be compared to rates from a different source. Estimates of pressure ulcer rates from different settings vary considerably but indicate that pressure ulcers are among the most common conditions seen in hospitalized individuals.

Keywords Pressure ulcer • Epidemiology • Incidence • Prevalence • Outcome assessment

Epidemiology involves understanding the frequency and distribution of disease in a well-defined population. For many clinicians, their knowledge of pressure ulcer epidemiology is limited to being aware that pressure ulcers are among the most common conditions encountered in clinical practice and that regardless of specialty, they are likely to see many patients with pressure ulcers or at risk for developing an ulcer. This underscores the need for nearly all clinicians to understand the basics of prevention and treatment. However, for those clinicians with special expertise in wound care, additional knowledge on pressure ulcer epidemiology is often required. Pressure ulcers are more than a condition affecting the individual patient; they provide information on the burden of disease in a group of patients and on the quality of the care being provided to those patients. Pressure ulcer information can help

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address the question of how good is the care that we are providing and how do we compare to others. This information is typically provided through measurements of pressure ulcer rates, especially incidence and prevalence.

While incidence and prevalence are widely used, the interpretation of these rates is not always straightforward and there are a number of important considerations when analyzing these data. In addressing these considerations, this chapter will specifically describe the different measures that are available and their strengths and limitations. Next, we will examine the interpretation of these rates particularly when incidence and prevalence are used in describing performance of individual facilities or units. Finally, this chapter will conclude with a description of what is presently known about pressure ulcer prevalence and incidence in the key settings of hospitals and nursing homes.

Defining What You Measure

Any consideration of pressure ulcer epidemiology must include a clear definition of what is considered a pressure ulcer. While standardized definitions of pressure ulcers do exist, many epidemiological studies fail to provide the specific definition used or they use different definitions. This complicates comparisons of different studies. For example, in defining incidence and prevalence, some studies consider all pressure ulcers while others only include stage 2 and higher ulcers. Moreover, the definition of a pressure ulcer, and how it is interpreted, has changed in a number of ways over time. First, there is a much greater appreciation of moisture-associated dermatitis as a distinct entity from pressure ulcers. Many sacral and gluteal lesions that previously might have been considered a pressure ulcer are now more appropriately classified as moisture-associated dermatitis. Second, in 2007 the National Pressure Ulcer Advisory Panel (NPUAP) added deep tissue injury as a distinct stage of pressure ulcers [1]. This raises the possibility that lesions that previously were not counted are now recognized as a pressure ulcer. Finally, the important role of medical devices as a cause of pressure ulcers, particularly those in atypical locations, is now better recognized. These pressure ulcers are more likely to be counted in more recent studies. The net effect of all these changes on epidemiological studies is uncertain.

Measures of Pressure Ulcer Rates

Efforts to describe the frequency of pressure ulcers have typically relied on incidence or prevalence rates [2, 3]. Both of these are measures of disease frequency and provide a perspective of the scope of the pressure ulcer problem in a given setting and at a specific time. Yet both incidence and prevalence rates have limitations. To address some of these limitations, recent efforts to describe pressure ulcer rates have relied

on a “hybrid” approach known as the facility acquired or nosocomial rate. These approaches are described below.

Prevalence is a measure of the number of cases of pressure ulcers at a specific time, providing a description of the total burden of the disease. By providing insights into the magnitude of the pressure ulcer problem, it allows for the planning for health resource needs. The cases used in calculating prevalence may have recently developed or they may have been present for months or years. Prevalence may be described two ways. Point prevalence describes the situation at a specific point in time such as a specific date (first of the month) or an event (date of discharge). Period prevalence, in contrast, describes the cases over a prolonged time period such as the entire hospitalization. The main advantage of prevalence rates is their ease of calculation. However, since the cases may have developed elsewhere, prevalence rates provide fewer insights into the quality of care being delivered.

Incidence describes the number of new pressure ulcers in people without an ulcer at baseline. Since it only captures new cases, it provides the most direct measure of quality of care as well as allowing the identification of causative factors for pressure ulcer development. Calculation of incidence, though, is more complicated as it requires several assessments of pressure ulcer status, first to determine that there is no ulcer at baseline and subsequently to determine whether or not an ulcer has developed. Time plays a critical role when describing incidence as longer periods of follow-up will result in more pressure ulcers and a higher incidence rate. Consequently, it is often preferable to describe incidence over a defined time span such as 1 or 2 weeks rather than over an event such as an entire hospitalization that may sometimes last for a month or longer. An alternate approach is to describe incidence density which describes number of new pressure ulcers per 1,000 days of care rather than per patient. Central to this calculation is the assumption that pressure ulcer risk is stable over time so that the chance of developing a pressure ulcer on day 1 is the same as on day 30. This is most likely to be true in long-term care settings where people tend to be stable on admission rather than acute hospitals where people are generally sickest on admission and then improve.

Prevalence rates have the advantage of ease of calculation while incidence rates provide a better indication of quality of care. The facility acquired rate attempts to combine these advantages through a two-step process. First, prevalence is determined. Then, among those patients with a prevalent pressure ulcer, a further review is undertaken to determine whether the pressure ulcer was present on admission. Those present on admission are not counted in determining the rate.

Data Sources for Calculating Pressure Ulcer Rates

There are four main sources of data that could be used in calculating pressure ulcer rates; direct examination of patients, use of medical records, administrative databases, and patient survey. Each of these data sources has distinct advantages and limitations. Moreover, the pressure ulcer rate that is calculated will vary considerably

depending on the source so that rates calculated from one data source should never be compared to another.

Direct examination of the skin, performed as part of a comprehensive skin assessment, provides the most accurate information regarding pressure ulcer status. When performed by an appropriately trained assessor, results should be reliable and valid, and even stage 1 ulcers will be detected. By performing assessments at regular intervals, nearly all pressure ulcers will be detected and this approach may be considered the “gold standard.” However, direct examination of the skin is labor-intensive and expensive. The examinations are also intrusive so that informed consent will be required when performed as part of a research study. Consequently, pressure ulcer studies involving direct examination tend to be small and involve only a few sites.

Accurate data on pressure ulcer status may also be obtained from medical record reviews. Available data relies on detection of the pressure ulcer by a clinician, entry of this data into the medical record, and collection of the data during the medical record abstraction. The complexity of this process indicates the many ways in which information may be missed. In particular, stage 1 pressure ulcers will often not be detected. This suggests that pressure ulcer rates calculated from medical record abstraction may be lower than that obtained from direct examination of patients [4]. While chart abstractions are often labor-intensive, it involves less effort than examining patients.

Administrative databases, because of their widespread availability and ease of use, have frequently been utilized in epidemiological studies of pressure ulcers. Because they often have been developed for reimbursement purposes, they typically will provide information on thousands, or even millions of patients. There are two main types of databases. First are databases, such as hospital discharge abstracts, that provide a summary description of pressure ulcer status during an entire episode of care. Typically, this relies on an ICD-9 code for pressure ulcer listed among the discharge diagnoses. Until recently, though, databases based on discharge diagnoses did not contain information on pressure ulcer stage and whether the ulcer was present on admission. This would limit the ability to differentiate incident from prevalent ulcers. Second are databases such as the nursing home Minimum Data Set (MDS) or homecare Outcome and Assessment Information Set (OASIS) that capture pressure ulcer status on a specific date [5]. As assessments are repeated at periodic intervals, by examining serial entries for a patient, changes in pressure ulcer status over time can be determined allowing the identification of incident ulcers. However, rates cannot be determined for patients discharged prior to a second assessment. This may introduce bias in calculating rates as both healthier patients discharged home and sicker patients who die may be missed [6]. Databases often may miss information on pressure ulcer status due to incomplete entry. While this is particularly true for stage 1 ulcers, discharge diagnoses may miss even larger pressure ulcers [7]. As a result, rates calculated using administrative data tend to be lower than rates based on direct examination.

Finally, patients (or surrogates) may self-report their pressure ulcer status [8]. This approach has rarely been used in epidemiological studies due to its many limitations including difficulties in data collection, patients’ unawareness of pressure ulcer status, and failure to recollect past events. Rates collected by patient self-report would be expected to be very low.

Understanding Differences in Pressure Ulcer Rates

Pressure ulcer rates are often measured in order to compare the relative performance of different providers or to examine changes in performance over time. The assumption is that a lower rate is indicative of better quality of care. Whenever comparing rates, the first question must be whether the same method was used in calculating the different rates. Very simply, pressure ulcer rates calculated with different methods are not comparable. However, even when the same methods are used, two other factors must be considered before assuming that differences in pressure ulcer rates reflect differences in quality of care.

Individual patients differ in their risk of pressure ulcer development. A mobile, incontinent patient will be at lower risk than one who is comatose. Some providers are likely to have more of these high-risk patients than others, and these providers would then be expected to have a higher rate of pressure ulcers even when providing similar quality of care as a provider with many low-risk patients. These differences in case mix are important to account for when considering differences in pressure ulcer rates [9]. Case mix of providers may also change over time, such as in response to changes in reimbursement policies. Thus, even for a single provider, case mix may need to be considered when evaluating changes in pressure ulcer rates over time [10]. A variety of approaches to case mix adjustment are available including a simple stratification into high- and low-risk groups as done by the Centers for Medicare and Medicaid Services (CMS) or the development of detailed statistical models [5]. Without such adjustments, it will always be uncertain whether higher rates are due to worse quality of care or care of a “sicker” population.

Pressure ulcer rates may also differ among providers due to random variation [11]. When we measure pressure ulcer rates, we try to infer the “true” rate indicative of quality based upon observations in a finite sample of patients. However, when this sample is relatively small, we may be uncertain as to what is the true rate. In a 50 bed nursing home, one additional pressure ulcer will raise the rate by 2 % and we would not be surprised if a 10 % rate in one time period is followed by a 6 % or 14 % rate in a subsequent period. In contrast, with 1,000 patients, we would be surprised if there was much variation in the pressure ulcer rate over time due to chance. Estimates of provider performance based on relatively few observations should be viewed with caution.

Pressure Ulcer Rates in Specific Settings

Pressure ulcer rates have been examined in many studies and in a variety of clinical settings. The National Pressure Ulcer Advisory Panel (NPUAP) has recently reviewed this literature for the years 2000 through 2011 [12] and contrasted results with an earlier data synthesis [13]. While results of this literature are readily summarized, it must be recognized that due to the multitude of methods employed, it remains difficult to provide an accurate assessment of pressure ulcer incidence and prevalence. Results from three settings are described below.

Critical Care

Reflecting the high frequency of serious medical conditions that predispose to pressure ulcer development, reported rates in critical care units are often high. As one example, an old randomized clinical trial performed in an intensive care unit described an incidence rate of over 50 % in patients placed on a standard bed [14]. Most of these incident pressure ulcers were stage 1. More recently, the NPUAP review for the years 2000–2011 performed by Cuddigan identified 23 studies on pressure ulcer rates with 6 being from the USA [15]. Although rates generally were not as high as seen in some of the earlier studies, pressure ulcers remain a significant problem. A study performed in a neurological intensive care unit reported a 12.4 % incidence rate for stage 2 or greater pressure ulcers [16]. The most comprehensive data comes from the International Pressure Ulcer Prevalence surveys which has been collecting data using a standardized methodology for over 20 years and typically includes over 90,000 acute care patients in each of its surveys. In 2009, facility acquired rates for critical care units ranged from 8.8 % in cardiac care to 10.3 % in surgical intensive care units [17]. Around one in three of these ulcers were stage 3 or deeper. Prevalence rates in various types of intensive care units were in the range of 15–20 %. These results illustrate that significant opportunities exist for improving pressure ulcer preventive practices in critical care.

General Acute Care

As with critical care, pressure ulcer rates from general acute care settings tend to vary considerably depending on the data source and methods used. In the NPUAP review performed by Goldberg, 42 studies were identified of which 18 were from the USA [18]. Highest rates are generally seen in smaller studies of high-risk patients. For example, following hip fracture, pressure ulcers developed in 14.6 % of the patients during the initial hospital stay and increased to 36.1 % by day 32 following surgery [19]. The hospital rate translated into 48 incident ulcers per 1,000 days of care. Databases based on hospital discharge diagnoses can examine pressure ulcers among millions of patients and have reported, for example, that in 2006 there were 503,300 hospital stays with a pressure ulcer diagnosis [20]; the actual prevalence rate, though, was not calculated in this analysis. More accurate data is available from some of the large surveys that have been performed using standard data collection protocols. In the previously described International Pressure Ulcer Prevalence survey, prevalence rates in 2009 on various acute care medical and surgical units were in the 8–14 % range with the facility acquired rate in the range of 3–5 % [17]. Another large study that has collected data over several years at multiple sites reported a prevalence rate of 16.0 % among nearly 32,000 patients in 2004 [21]. The incidence rate in this study was described as 7 %. Results had shown little change compared to preceding years, again illustrating the tremendous opportunities for improvement.

Nursing Homes

Pressure ulcers are also very common among nursing home residents. An early study using a forerunner of the Minimum Data Set examined nearly 20,000 residents of 51 nursing homes and found that 11.3 % possessed a stage 2 or deeper pressure ulcer on admission and among those ulcer-free residents remaining in the nursing home for 1 year, 13.2 % developed a new pressure ulcer [22]. The NPUAP review by Pieper identified 34 distinct studies published between 2000 and 2011 of which 20 were from the USA [23]. Further complicating an analysis of this literature is the fact that prevalence studies have looked at pressure ulcers on admission to the nursing home, at some point during the stay, or when nursing home residents are admitted for an acute hospital stay. Each of these approaches conveys different information. Prevalence rates in most studies have been in the 8–12 % range, although both higher and lower rates have been noted depending on the methodology employed. Incidence rates have varied so much that it is difficult to make any firm conclusions. It will be interesting to determine whether the enhanced pressure ulcer data collected as part of the new Minimum Data Set Version 3.0 will allow for better assessments of pressure ulcer rates.

Conclusions

Clinicians will encounter data on pressure ulcer rates in a variety of settings. There rates may be calculated from different data sources and there are many options in subsequently presenting these pressure ulcer rates. It is very clear that there is no preferred approach to calculating pressure ulcer rates that should be used in every situation. Rather the selected approach will depend on many factors. The wound care specialist should understand the strengths and limitations of whichever approach is selected.

References

1. National Pressure Ulcer Advisory Panel. NPUAP pressure ulcer stages/categories [Internet]. 2007 [cited 2012 Sept 9]. Available from: <http://www.npuap.org/wp-content/uploads/2012/01/NPUAP-Pressure-Ulcer-Stages-Categories.pdf>
2. Baharestani MM, Black JM, Carville K, Clark M, Cuddigan JE, Dealey C, DeFloor T, Harding KG, Lahmann NA, Lubbers MJ, Lyder CH, Ohura T, Orsted HL, Reger SI, Romanelli M, Sanada H. Dilemmas in measuring and using pressure ulcer prevalence and incidence: an international perspective. *Int Wound J*. 2009;6:97–104.
3. DeFloor T, Clark M, Witherow A, Colin D, Lindholm C, Schoonhoven L, Moore Z. EPUAP statement on prevalence and incidence monitoring of pressure ulcer occurrence 2005. *EPUAP Rev*. 2005;6:74–80.
4. Gunningberg L, Ehrenberg A. Accuracy and quality in the nursing documentation of pressure ulcers: a comparison of record content and patient examination. *J Wound Ostomy Continence Nurs*. 2004;31:328–35.

5. Berlowitz D, Intrator O. Risk adjustment for long-term care. In: Iezzoni LI, editor. Risk adjustment for measuring health care outcomes. Chicago, IL: Health Administration; 2012.
6. Berlowitz DR, Brandeis GH, Brand HK, Halpern J, Ash AS, Moskowitz MA. Evaluating pressure ulcer occurrence in long-term care: pitfalls in interpreting administrative data. *J Clin Epidemiol*. 1996;49:289–92.
7. Goode PS, Allman RM, Bartolucci AA, Burst N. Accuracy of pressure ulcer diagnosis by discharge diagnosis coding [Abstract]. *Clin Res*. 1993;41(2):200A.
8. Guralnik JM, Harris TB, White LR, Cornoni-Huntley JC. Occurrence and predictors of pressure sores in the National Health and Nutrition Examination survey follow-up. *J Am Geriatr Soc*. 1988;36:807–12.
9. Berlowitz DR, Ash AS, Brandeis GH, Brand HK, Halpern J, Moskowitz MA. Rating long-term care facilities on pressure ulcer development: importance of case-mix adjustment. *Ann Intern Med*. 1996;124:557–63.
10. Berlowitz DR, Bezerra HQ, Brandeis GH, Kader B, Anderson JJ. Are we improving the quality of nursing home care: the case of pressure ulcers. *J Am Geriatr Soc*. 2000;48:59–62.
11. Berlowitz DR, Anderson J, Ash AS, Brandeis G, Brand HK, Moskowitz MA. Reducing random variation in reported rates of pressure ulcer development. *Med Care*. 1998;36:818–25.
12. Pieper B, National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence, and implications for the future. Washington, DC: NPUAP; 2012.
13. Cuddigan J, Ayello E, Sessman C, National Pressure Ulcer Advisory Panel, editors. Pressure ulcers in America: prevalence, incidence, and implications for the future. Reston VA: NPUAP; 2001.
14. Inman KJ, Sibbald WJ, Rutledge FS, Clark BJ. Clinical utility and cost-effectiveness of an air suspension bed in the prevention of pressure ulcers. *JAMA*. 1993;269:1139–43.
15. Cuddigan J. Critical care. In: Pieper B, National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence, and implications for the future. Washington, DC: NPUAP; 2012.
16. Fife C, Otto G, Capsuto EG, Brandt K, Lyssy K, Murphy K, Short C. Incidence of pressure ulcers in a neurologic intensive care unit. *Crit Care Med*. 2001;29:283–90.
17. VanGilder C, Amlung S, Harrison P, Meyer S. Results of the 2008–2009 International Pressure Ulcer Prevalence™ Survey and a 3-year, acute care, unit-specific analysis. *Ostomy Wound Manage*. 2009;55(11):39–45.
18. Goldberg M. General acute care. In: Pieper B, National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence, and implications for the future. Washington, DC: NPUAP; 2012.
19. Baumgarten M, Margolis DJ, Orwig DL, Shardell MD, Hawkes WG, Langenberg P, Palmer MH, Jones PS, McArdle PF, Sterling R, Kinoshian BP, Rich SE, Sowinski J, Magaziner J. Pressure ulcers in elderly patients with hip fractures across the continuum of care. *J Am Geriatr Soc*. 2009;57:863–70.
20. Russo CA, Steiner C, Spector W. Hospitalizations related to pressure ulcers among adults 18 years and older. Rockville, MD: Agency for Healthcare Research and Quality; 2006. 2008 Dec. HCUP Statistical Brief #64.
21. Whittington KT, Briones R. National Prevalence and Incidence Study: 6-year sequential acute care data. *Adv Skin Wound Care*. 2004;17:490–4.
22. Brandeis GH, Morris JN, Nash DJ, Lipsitz LA. The epidemiology and natural history of pressure ulcers in elderly nursing home residents. *JAMA*. 1990;264:2905–9.
23. Pieper B, Pieper B. Long term care/nursing homes: incidence and prevalence data. In: Pieper B, National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence, and implications for the future. Washington, DC: NPUAP; 2012.

Pressure Ulcers in the Aging Population
A Guide for Clinicians

Thomas, D.; Compton, MD, G. (Eds.)

2014, XI, 233 p. 32 illus., Hardcover

ISBN: 978-1-62703-699-3

A product of Humana Press