Science and Practice of Pressure Ulcer Management

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Foreword I

I consider it a great privilege to have been asked to write the foreword for this book. The European Pressure Ulcer Advisory Panel (EPUAP) is less than 10 years old having been founded in 1997. I had the honour of being the first president of this group and have been amazed and delighted at the progress and achievements the panel have made since that time. The progress is remarkable, not only because it is a truly European group consisting of a wide range of clinical and academic interests but also because it has retained its focus on the prevention and treatment of pressure ulcers.

The officers and board should be congratulated in developing a range of educational and research opportunities in this important but often neglected aspect of clinical practice. Not only have they organised a series of successful annual conferences that have been held in a number of a European countries but they have developed a number of other exciting initiatives. These have included setting up working groups, developing guidelines, undertaking prevalence studies and research projects. The latest addition to these activities is the publication of this book which I am confident will rapidly become the standard textbook for all interested in this subject—not only in Europe but on a global scale.

The editors of this book—who are all internationally known for their work in this area—are all key individuals in the success of the EPUAP. They have pulled together a comprehensive review of this subject written by a range of experts from different professional backgrounds representing many European countries. This is no mean feat and they should be congratulated on their vision and determination.

The 22 chapters address key issues in this condition and range from updates in research through to epidemiological aspects on to assessment of patients and equipment. The book also debates local wound care either by conservative or surgical methods, complications such as infection onto issues around developing and implementing guidelines and the increasingly important subject of litigation in this area. Many special interest groups claim to be working in a 'Cinderella' area but few conditions other than pressure ulceration can really justify that description. In an increasingly diverse world the challenges of providing pressure ulcer care in developing countries are different but no less challenging than those of providing care in so called developed or

advanced healthcare systems. It is perhaps surprising that in such advanced healthcare systems some cancer can be cured, heart disease can be prevented and organs can be transplanted but many patients in such systems can not guarantee that they will receive prompt and appropriate interventions to prevent or treat pressure ulceration. The challenge to all caring for such patients is considerable but this book provides a reference source for anyone who needs to understand the basis of many aspects of patient care in this area. In addition, the colour section provides excellent clinical illustrations that demonstrate a number of key points in pressure ulceration.

This subject is receiving increasing attention from a number of professional, governmental and legal directions. The importance, cost and ability to use aspects of this clinical problem as an indicator of the quality of health care delivery is to be encouraged but how robust is the research base, the development of standards of clinical care and consistency of healthcare practices in pressure ulceration on a local national and international basis?

This book will not replace all of the work needed to address these problems but it will provide a strong foundation from which we can build our understanding of this condition for improved standards of care to patients in what has been a long standing but neglected clinical challenge.

I congratulate the editors, authors and publishers for remaining focused on their task—to provide the best and most comprehensive and up to date review of this subject. I commend this book to you as an essential companion to help you improve standards of care for your patients.

Keith Harding, MD

Foreword II

One of the outcomes of advancing medical technology is that people are living longer. As life is extended, the complex issue of managing persons with chronic diseases becomes increasingly important. The increased number of persons with chronic wounds such as pressure ulcers is already being realized. The health-care burden of managing these chronic wounds can only be lessened if effective prevention programs are aggressively implemented and evidence-based management protocols are developed and followed.

The information contained in this book provides the critical elements for developing effective, evidence-based protocols for the prevention and management of pressure ulcers. What this book cannot provide is the commitment required to create an environment where the development of a pressure ulcer on a person is unacceptable. Protocol development is only one component of a comprehensive program for prevention and management of pressure ulcers. Everyone involved in patient care from administration to bedside provider has to make the commitment that pressure ulcers will not occur in their facility.

This book is a tremendous resource, but it needs to be used effectively. In the United States, the government sponsored the development of evidence-based guidelines on prevention and management of pressure ulcers. These guidelines became available in the early nineties. Since their publication, the prevalence of pressure ulcers in the United States has not changed at the national level. However, in those facilities that chose to use the guidelines to develop and implement new protocols for prevention and management of pressure ulcers, the incidence of pressure ulcers was reduced to zero or to a very low level.

The information in this book can be used to prevent new pressure ulcers from developing, and rapidly healing those that have unfortunately already developed. The only thing missing is the commitment to make change. I hope that everyone who reads this book makes the personal commitment to prevent pressure ulcers from occurring and to optimize the management of those that occurred at a different facility.

George T. Rodeheaver, PhD
Founding Member and Past President
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1 Pressure Ulcer, the Scale of the Problem

Theo Dassen, Antje Tannen, and Nils Lahmann

Introduction

The main goal of this chapter is to provide information about the frequency of pressure ulcers. However, in doing this it becomes evident that the chapter title—the scale of the problem—should really be amended to the problem of the scale. Due to the different rates used (prevalence, incidence), different grades/stages of pressure ulcers (1, 2, 3, 4), different body sites, different settings (hospital, nursing home, at home) and different ways of data collection it is almost impossible to find comparable data about the scale of this phenomenon in human beings. Therefore, this chapter should be regarded more as a guide on how to deal with data on pressure ulcers obtained from the literature. First, information is provided about the use of rates and their application to pressure ulcers. Then some suggestions are given about how to interpret the figures from the literature.

Rates

Measures of frequencies in a disease are usually expressed as rates.[1] Those rates are fractions or proportions that consist of three elements: a numerator, a denominator, and a time period. In this case the numerator is the number of people suffering from pressure ulcers. The denominator is the population that was selected as the number of possible occurrences (e.g. all patients in a hospital). The time period can be one moment in time or another well-defined period (for instance a year). In pressure ulcer research it is common practice to express the rate as a percentage, which means per hundred cases. The numerator is divided by the denominator and then multiplied by 100. For example, ten persons out of a thousand suffer from a pressure ulcer; this is: $10/1000 \times 100 = 1\%$.

The difference between prevalence rates and incidence rates is important. Pressure ulcer prevalence refers to the number of people with pressure ulcer as a proportion of the total population under investigation. Prevalence rates include all old and all new cases. If only the new cases are counted this is called the incidence.

So far, it does not appear complicated to provide comparable data about pressure ulcer, but the problem is that an exact definition is necessary for both parts, numerator and denominator, to make the calculated rates coherent.[2] Every author uses a definition for both, but there is standardization. This leads to publications with rates ranging from 5% to 50% or sometimes even less or more. It is not clear

whether there are indeed different rates or if these are the result of differences in the way the numerator and/or denominator have been defined.

Another aspect is the time period. If a prevalence rate is measured at one moment in a given period of time it is called a point prevalence. A period prevalence refers to the condition over a specified period of time. It is obvious that incidence rates are always calculated for a period. It is important in both cases that the chosen period of time is the same when comparing rates from different publications.

Numerator Confusion

When looking at a definition of pressure ulcer it becomes obvious that the numerator can vary depending on the project. In other chapters of this book this is discussed in more depth. According to the definition of the European Pressure Ulcer Advisory Panel (EPUAP)[3] a pressure ulcer can be located anywhere on the skin of the body and is a discoloration of the skin (with nonblanchable erythema), but it can also be an extensive destruction with tissue necrosis, damage to the muscle, bone or supporting structures with or without full-thickness skin loss. This means the numerator can include a red, damaged area of skin at the elbow and also a deep hole in the skin of the sacrum. Is it sensible to combine all these in a single classification? Yes and no! If we know that 10% of all patients in a hospital have a pressure ulcer we obtain information about this phenomenon. However, without a classification of the pressure ulcer according to grades and body sites this information cannot be used for any kind of policy. For this reason researchers divide the numerator into grades (or stages) and body sites. Table 1.1 shows an example of a division according to body sites, which is derived from a study conducted by EPUAP.[4]

This table shows that more than 25% of all pressure ulcers are located on the sacrum. This is supported by several other studies.[5,6] However, the sites of pressure ulcers in children are different. The occipital region of the scalp in infants and toddlers and the sacrum in children are prevalent sites of pressure ulcer formation.[7]

Approximately one third of the pressure ulcers are located on the heel, which is also supported by the literature.[8,9] So far it could be concluded that about half of the pressure ulcers are located on either the sacrum or the heel. What about the rest? Table 1.1 shows that the division of pressure ulcers at other body sites varies

Table 1.1. Pressure ulcer prevalence rates at different body sites (% of total prevalence)

Location	Belgium	Italy	Portugal	Sweden	UK	Total
Sacrum	25.6	40.9	26.9	25.3	37.5	532
Heel	34.9	31.9	33.9	30.0	26.2	484
Ischium	12.2	7.6	2.7	11.6	13.7	186
Ankle	3.6	9.1	10.2	24.5	6.4	149
Elbow	14.3	0.0	6.9	3.0	10.3	143
Hip	9.3	10.6	19.3	5.6	5.8	136
Total	301	132	186	233	778	1630

Source: Based on Clark et al.[4]

depending on the country. For instance, the pressure ulcer rate on the hip was about 5% in the UK and about 20% in Portugal. In the Swedish sample nearly 25% of pressure ulcers were located on the ankle compared to less than 5% in Belgium. These variations in pressure ulcer rates at particular body sites are found also in the literature.[10]

As well as different body sites the numerator can also include different grades or stages. Grade 1 (nonblanchable erythema) accounts for almost half of all pressure ulcers, as several studies show.[11] The measurement of grade 1 in people with dark skin is a special problem. The most severe form of pressure ulcer is grade 4 in the EPUAP classification. It was 2.5% in the study from which Table 1.1 was derived. In other studies it is reported at rates from 3% to 10%.[12]

As mentioned above, four grades and at least seven body sites result in more than 28 combinations that can be part of the numerator. Unfortunately, this is not the only problem regarding the numerator. The fact that some people have more than one pressure ulcer is another complication. In a prevalence study conducted in the Netherlands, 13.2% of the patients had one ulcer, 4.7% had two ulcers, and 3.5% had three or more.[13] This means that a person sustaining a new pressure ulcer, which is to be counted in an incidence study, could have already had one. A grade 1 pressure ulcer could also develop into a grade 2 ulcer, which is of course still regarded as a pressure ulcer, but should it be recorded as a new or as an old one? In other words: the difference between prevalence and incidence in pressure ulcers is increasingly complicated. Suggestions on how to deal with this problem are given by EPUAP[14] but not every researcher necessarily agrees with the solutions given.

This part of the chapter has shown that dealing with pressure ulcers is similar to dealing with fruit: there are various sorts with different characteristics, sometimes appearing individually and sometimes in a group of several. This has to be taken into account when calculating or comparing prevalence or incidence rates.

Denominator Complications

In order to calculate the prevalence or incidence rate of pressure ulcers the nominator must be divided by the denominator. In the case of prostate hypertrophy people with this condition form the numerator and all males in the sample are the denominator. Why are women not included in the denominator as well? Naturally, because they cannot have this disease and the denominator should consist only of persons "at risk." This confronts us with a serious problem when calculating prevalence rates of pressure ulcers. If, for example, we have all patients in a hospital as the denominator, this would mean we are dealing with a denominator that also includes people "not at risk." It is quite simple to find crude prevalence rates in the literature for entire institutions such as hospitals.[15,16] Even if they were all grade 4 pressure ulcers on the heel, the question with which denominator the calculation was made would still arise. Only those figures are comparable that use the same definition of the population "at risk." But how can it be defined? In some studies, e.g. the above-mentioned EPUAP survey, the Braden score (see Chapter 6) was used to divide the sample into "at-risk" and "not-at-risk" groups. In the literature there are several examples of investigations using this solution. There is only one problem, namely the cutoff point. For instance, in a comparison of pressure ulcers in the Netherlands and Germany the authors used a Braden score of 20 as the

cutoff.[17] In clinical practice a cutoff point of 16 or 18 is more common. Naturally, the differences in choosing a cutoff point are permitted but they complicate the comparison of results from the literature with clinical practice.

Due to the different cutoff points the number of at-risk individuals varies considerably. The rate increases if the denominator is smaller. This means that a high prevalence rate could be the result of a well-defined risk group. Or, conversely, a low prevalence rate could be the result of a widely defined risk group (e.g. all patients of the hospital). It should be remembered that the prevalence of prostate hypertrophy would be only half the size if all women were included in the denominator as well.

About one third of the hospital population and two thirds of the nursing home population were at risk when using a Braden score of 20 as the cutoff point. In a nationwide study in Germany[18] this proportion remained stable over some years. The above-mentioned comparison between Germany and the Netherlands revealed a different number of "at-risk" patients, with more than 50% in the Dutch hospitals. The EPUAP survey also showed (cutoff = 16) different proportions "at risk," from about 34% in Belgium to 23% in Italy. It is not the intention of this chapter to discuss the risk assessment but to show that calculating prevalence rates by using total populations of institutions will inevitably lead to figures that are not comparable. A highly sophisticated solution, called the case mix method, involves correction for all kinds of factors that can influence the occurrence of a pressure ulcer.[19] It is only practicable if all the information is available, which is, however, not always the case.

Apart from the difficulty of defining the risk group the denominator give rise to another serious problem—the influence of the nonresponse. Researchers have to respect ethical rules when using people's data for a scientific purpose. This means that permission has to be obtained from each patient in the hospital as a basic condition for using their data for the calculation of a prevalence or incidence rate. One of the side effects is that not every patient agrees to participate in the study.

Prevalence research can be classified as descriptive research. This is research that aims to generalize the results for a whole target group. In this case the target group could comprise all at-risk patients in a hospital or all at-risk residents in a nursing home. A high external validity is necessary for this kind of research.[20] It means that the sample under investigation should reflect the target group. This will not be the case in practice. Nonresponse rates can influence the prevalence significantly, as Table 1.2 illustrates. A measured prevalence of 19.7% could in fact be lower (15.2%) or higher (38.1%) depending on the nonresponse rate.[21] In this example the lowest rates were calculated on the assumption that all the at-risk people in the nonresponse portion *did not have* a pressure ulcer. The highest rates were calculated on the assumption that all the at-risk people in the nonresponse portion *had at least one* pressure ulcer.

Table 1.2. Example of measured and calculated (lowest and highest) pressure ulcer prevalence rates

Institution	Response %	Measured %	Lowest %	Highest %
Nursing home	79.6	12.5	10.0	30.3
Hospital	75.6	24.2	18.3	42.7
Total	76.6	19.7	15.2	38.1

Source: Based on Dassen et al.[18]

Solution of the Problem

It was established that the calculated rates can differ considerably depending on different definitions of the numerator and/or the denominator. This is a well-known problem that often occurs when using statistics. Tukey expressed it as follows: "Far better an approximate answer to the right question, which is often vague, than an exact answer to the wrong question, which can always be made precise."[22] This statement shows us that a question like "what is the pressure ulcer prevalence in this hospital" is wrong. A correct question would be "How many patients on intensive care wards have a pressure ulcer grade 2, 3, 4 on the sacrum?" An example of the answer then is "58% of all people who had a pressure ulcer."[23] This answer is not precise but it tells us that a pressure ulcer on this part of the body is not an exception. It can become more informative if the prevalence and the definition of the risk group are known. In this case, the answer was 21% of people who scored 20 or lower on the Braden scale. This means that about 12% of the people "at risk" had a pressure ulcer grade 2, 3, or 4 on the sacrum.

Another example is the number of pressure ulcers in dead bodies that were inspected prior to cremation. A difference in grade 4 was found in a comparison between Berlin (2.3%) and Hamburg (0.9%).[24] Here the population was defined as "all dead bodies that were brought to the crematorium." Again a specific group was selected and a clear distinction between grades and body sites was used to present the data.

Finally

The problem of prevalence and incidence of pressure ulcers was discussed without obtaining a precise answer to the question of the scale of the problem as mentioned in the title of this chapter. Naturally, it is not intended to evade this question. The reason quite obviously is that there are almost no comparable data. A prevalence rate of 10% in one publication can be quite different from 10% in another publication. Depending on the definition of the numerator and the denominator a prevalence or incidence rate can include different information. A clear distinction between prevalence and incidence is nearly impossible owing to factors such as multiple pressure sores in the same patient and progression to higher grades in an existing pressure ulcer.

Therefore, information regarding findings from different publications is more interesting and safer. Most studies revealed more grade 1 than grade 4 pressure ulcers. Several studies mention the sacrum and the heels as those body sites with the most frequently occurring pressure ulcers. In children other parts of the body (occipital region of the scalp) are more predominant.

Special groups such as intensive care patients or patients on geriatric wards are affected by pressure ulcers to a larger extent than are hospital patients on other wards.

Finally, it can be stated that pressure ulcers are found more often in geriatric patients than in younger patients, more often in intensive care wards than in lower care wards, and more often on the heel or the sacrum than on other body sites. Furthermore, it is known that a grade 1 pressure ulcer occurs in about 50% of patients with pressure ulcers and the higher the grade the lower the proportion of

all pressure ulcers. Comparable figures concerning the prevalence or incidence of pressure ulcers in human beings are not known.

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2 Pressure Ulcer Patients' Quality of Life from a Nurse's Perspective

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Part of a nurse's work is to assist patients with their physical, spiritual, and social needs if patients are unable to satisfy these needs on their own. Hygiene and skin condition, including nutritional balance, are significant factors in preventing pressure ulcers. The occurrence of pressure ulcers has an important influence on the patient's quality of life in many ways. According to the literature,[1–5] factors influencing the pressure ulcer patient's quality of life, and which can be influenced by nursing, include skin condition, cost-effective wound care, comfortableness of the mattress, quality of sleep, high-quality auxiliary devices, and treatment of pain including appropriate care practices.[6,7] In addition, the nursing staff's motivation, competence, and skills in effective methods[8–10] influence the success of preventive measures.

The patient's wellbeing, feeling of comfort in bed, and quality of sleep can be promoted by selecting an appropriate mattress for the patient, taking the known risk factors of ulceration into account. Experience has shown that even though the patient is informed about the beneficial effects of an alternating pressure mattress, the patient may not be willing to test such a mattress. Reasons for this decision may be the patient's previous negative experiences or beliefs. For some patients, even the most silent machinery is experienced as annoying and affecting the quality of sleep. On the other hand, the spasticity of a patient with a spinal cord injury may be activated, a very skinny and small patient may feel as though they are "drowning" in the mattress, and an extremely obese or tall and large patient might experience the dimensions of the mattress as uncomfortable. Consequently, the patient's own wishes and experiences of special mattresses must always be taken into account. Sometimes, the best solution is to allow patients to bring their own special mattress for the hospital stay.

In some cases, the patient's quality of life and motivation improve if the patient becomes aware of the costs arising from pressure ulcers and the effects of these ulcers.[11–13] Regrettably, young patients especially often only understand the actual risk of having a pressure ulcer when the first ulcer occurs. In the research data of the Helsinki University Hospital[14] over half of the patients with pressure ulcers were patients with spinal cord injury. Thus, in particular young patients with a spinal cord injury should have peer support and practical examples in their own language. The care staff should create ways, together with the patients, by which the best possible preventive methods for pressure ulcers can be offered.[15,16] This requires personnel who have appropriate education, competence, and motivation

for high-quality nursing.[17] In her doctoral dissertation "Pressure Ulcer Risk Assessment in Long-term Care. Developing an Instrument," Lepistö[18] concludes that staff are aware of the need to prevent pressure ulcers in high-risk patients, for example bedridden patients, but that prevention of other patients' pressure ulcers is more difficult.

However, not all pressure ulcers can be prevented. Treatment of pressure ulcers, preventing infections, and preventing an infection from spreading are a very important part of nursing. Pressure ulcers are usually located in difficult places, which is unpleasant for the patients, and it is impossible for them to treat these ulcers themselves. The patients might easily feel like "prisoners" of the ulcers and isolate themselves, being anxious about the bandages becoming soaking wet or odors coming through.[9] Nurses are required to have expertise in selecting the most economical bandages that will also have a positive effect on patients' quality of life, allowing patients to lead as normal a life as possible. In western countries, there are hundreds of products from which to choose. However, the problem is that the products are usually very expensive and knowledge of their effects is based mainly on recommendations generated through experience and information given by the manufacturers. Whenever possible, the most economical treatment should be selected if its effect is as good as the more expensive alternative. In treatment of chronic wounds, no differences have been observed in healing of the wounds when the use of sterile and factory clean techniques, including sterile wound cleaning, and the use of drinking water have been compared.[19] However, using drinking water is significantly cheaper. A pressure ulcer in itself causes significant additional costs for the patient in addition to human suffering.

A Practical Example of the Methods Used for Prevention of a Plastic Surgery Patient's Pressure Ulcers

The patient's risk of having a pressure ulcer is individually evaluated. There is no risk evaluation indicator in regular use but the risk evaluation is based on experience, research, and the most recent available knowledge including following up of the incidence of pressure ulcers and common agreements. For example, the European Pressure Ulcer Advisory Panel (EPUAP) prevention and treatment guidelines have been utilized in teaching.

All patients coming for corrective surgery of pressure ulcers or patients who already have a pressure ulcer when they are hospitalized, including all immobile patients, will have an alternating pressure mattress preoperatively at the hospital. If the number of mattresses is not sufficient on the ward, it is possible to rent them and they are available within a few hours. The patient's nutritional imbalance is primarily treated with dietary supplements. Those patients who are not allowed to change their position freely in bed postoperatively will have a mattress of this kind at latest in the recovery room. The nurse receiving the patient evaluates his or her need of special mattresses and other auxiliary devices when the patient enters the hospital. In addition to written instructions, regular training is organized in prevention of pressure ulcers, for example use of auxiliary devices and correct lifting techniques. It has also been commonly agreed that a physiotherapist and several nurses participate for the first few times in moving those patients who need a lot of help. The physiotherapist guides the patient but also shows the nursing staff how to use the best methods. Following up the incidence of pressure ulcers is an issue

of utmost importance. If a pressure ulcer occurs during the patient's stay on the ward, the reasons why it may have occurred are examined together with the patient at the earliest possible opportunity. An open discussion on the ward which includes the nursing staff, the physicians, and the surgery personnel has decreased the incidence of pressure ulcers. On the other hand, when the issue has become public so to say, it seems to have improved the nursing personnel's motivation to implement high-quality nursing.

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