Pressure Sores: an investigation into the clinical nursing management of the prevention and management of pressure sores within an acute hospital trust.

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Abstract

Pressure sores are a common problem throughout all health care settings. A number of risk assessment scales have been developed in an endeavour to help carers recognise the individuals most at risk of developing pressure sores, and to identify the factors which contribute to that risk in order to guide appropriate and individualised plans of care. Waterlow (1991) suggests that a care plan relating specifically to the prevention and management of pressure sores may be beneficial. However, no study has investigated if the results of risk assessment are used to plan patient care or if a pressure sore care plan is advantageous.

This two-phase correlational study was conducted to identify whether there was an association between risk assessment, as defined by the Waterlow Risk Assessment Scale, severity of sore, as defined by the Stirling Pressure Sore Severity scale, and management of care. In addition, two care plan systems were compared to determine if a care plan specifically for the prevention and treatment of pressure sores facilitated the systematic management of patient care. The study was conducted in an acute hospital trust. Thirty Registered Nurses were interviewed using a structured interview schedule and 327 patient records were reviewed. A comparison was made between two different care plan systems in use. Data were analysed using chi-squared, Spearman's correlation co-efficient, and McNemar's test. Level of significance was set at $p<0.05$

The relationship between Waterlow score and mobilisation ($\chi^2=3.2, df=4, p=0.530$) was not significant. Significant relationships were detected between Waterlow score and pressure relief ($\chi^2=32.92, df=2, p<0.001$), Waterlow score and education ($\chi^2=6.04$, $df=2, p<0.05$), Waterlow score and severity of sore ($rs=0.46$, $p<0.001$). Also between care plan type and pressure relief ($\chi2=38.3, df=2, p<0.01$), care plan type and mobilisation ($\chi2=12.1, df=2, p<0.016$) and between care plan type and education (χ^2 40.8, $df=2, p<0.01$). The clinical significance of the results suggest that Waterlow Risk Assessment Scale is invalid when used in routine practice and that regardless of care plan type, individual risk factors are not being taken into account when planning patient care.

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Finally I would like to thank my husband and family for the understanding and perseverance they have demonstrated during the conduct of this study.

Author's Declaration

I, Elizabeth Tolmie, confirm that the research study detailed in this thesis was conducted solely by me and results were analysed by me.

Author's Signature__ _____ Date 04.06.00

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Researcher's Note

The study described in this thesis is presented in five chapters. Chapter One provides an introduction to the study and describes why the study was conducted. Chapter Two reviews the literature relevant to the study and helps formulate the hypotheses. The literature pertaining to the methods are also presented and rationale for the study methods are provided. In Chapter Three, the materials and methods used in the study are described followed by a description of the pilot study and the findings from the pilot study. Following this, the conduct of the main study is described. Chapter Four presents the results of the study in two phases. Phase I describes the results obtained from the structured interview schedule and Phase II presents the results obtained from the retrospective case record analysis. A discussion of the results is presented in Chapter Five. The Conclusion is presented in Chapter Six followed by recommendations for practice based on the study results.

The purpose of the study described in this thesis was not to validate products. Nor was it to recommend particular agents. Therefore the literature has not been reviewed on product efficacy. However, inevitably given the necessity to collect data on products, reference is made to them.

Abbreviations

AHCPR	Agency for Health Care Policy and Research
CRAG	Clinical Resource and Audit Group
CSAG	Clinical Standards Advisory Group
DoH	Department of Health
EPUAP	European Pressure Ulcer Advisory Panel
IAET	International Association for Enterostomal Therapy
ID	Identification
MI	Myocardial Infarction
MRD	Medical Records Department
MSD	Medical Statistics Department
NPUAP	National Pressure Ulcer Advisory Panel
# NOF	Fractured neck of femur
PSCP	Pressure sore care plan
PSPS	Pressure Sore Prediction Score
RN	Registered nurse
SPSSS	Stirling Pressure Sore Severity Scale
UK	United Kingdom
UKCC	United Kingdom Central Council
USA	United States of America
WRAS	Waterlow Risk Assessment scale

Definition of Terms

For the purposes of this study the following definitions have been adopted:

Pressure sore:

a lesion caused by unrelieved pressure that results in damage to underlying tissues (CRAG 1995).

Waterlow Risk Assessment Scale:

a risk assessment tool used to identify specific risk factors thought to contribute to an individuals risk of developing a pressure sore (Appendix I).

Risk score:

a numerical value, assigned to an individual which indicates the degree of risk he/she has of developing a pressure sore(s). The value is obtained by summing the item scores which equate with the characteristics of the individual.

At risk:

For the purposes of this study, a score > 9 as indicated by the Waterlow risk assessment tool (Waterlow 1985)

Stirling Pressure Sore Severity Scale:

A four point classification scale used to indicate the degree of tissue damage caused by a pressure sore (Appendix II).

Pressure Sore Care Plan:

A nursing record sheet, designed specifically for the prevention and management of pressure sores, which incorporates the Waterlow risk assessment tool, and the Stirling Pressure Sore Severity Scale.

Chapter One - Introduction

1.0 Introduction to the study

In 1995 following the publication of the CRAG guideline on pressure area care (CRAG 1995), I was asked to implement a continuous pressure sore prevalence survey throughout the Trust in which I was employed. This led me to review the pressure sore literature available at that time. The review highlighted that early research focussed on pressure sore aetiology (Braden and Bergstrom 1987; Maklebust 1987; Berlowitz and Wilking 1989) and development of pressure sore risk assessment scales (Norton 1962; Goldstone and Roberts 1980; Waterlow 1985; Braden and Bergstrom 1987.)

Since then, a number of studies have investigated the reliability and validity of the various risk assessment scales in use (Goldstone and Roberts 1980; Pritchard 1986; Bergstrom, Braden, Laguzza and Holman 1987; Bergstrom, Demuth and Braden 1987; Bergstrom, Kemp, Champagne and Ruby 1987; Lowthian 1989; Williams and Davies 1991; Aronovitch, Millenbach, Kelman and Engin 1992; Hergenroeder, Mosher and Sevo 1992; Salvadena, Snyder and Brogdon 1992). However, most (Gosnell 1973; Lowthian 1989; Bergstrom et al 1987[a]; Bergstrom et al 1987[b]; Salvadena et al 1992; Harrison, Wells, Fisher and Price 1996) measure the validity of a particular risk scale in terms of the scale's sensitivity and specificity.

Some studies have compared the use of one risk scale over another (Pritchard 1986; Wardman 1991; Williams and Davies 1991). A few have compared the use of a formal risk assessment tool to that of nursing intuition (Jones 1986; Hergenroeder et al 1992; Preevost 1992) and found that nurses intuitively predicted which patients would develop a pressure sore. The uncertainty that remains regarding the effectiveness of risk assessment tools is reflected in the contradictory findings reported in the literature. Nevertheless, many institutions determine pressure sore prevalence (O'Dea 1993; Potter 1994; Callaghan 1994; Clark and Watts 1994; Dealey

1994; Kearsley, Little, and Wiseman 1994) using risk assessment scores and pressure sore classification scores.

The purpose of risk assessment is to identify the appropriate interventions required for an individual in order to prevent them developing a pressure sore(s). Therefore, if risk assessment scales are to have a positive effect on patient outcome, they need to influence management of care appropriately. Few studies have investigated whether the use of a risk assessment scale improves patient care.

Jones (1986) investigated the relationship between risk assessment and nursing intervention and detected problems associated with inadequate documentation. Since that time, many researchers have encountered similar problems (Pieper, Mikols, Mance and Adams 1990; Preevost 1992; O'Dea 1993). Despite the increased use of risk assessment scales, documentation pertaining to the prevention and management of pressure sores remains inadequate. Thus it is argued that risk scales are being applied in a ritualistic manner without necessarily improving patient care.

In an attempt to encourage the provision of more informative and detailed information which would facilitate the systematic management of patient care and thus direct appropriate changes in care, a care plan relating specifically to the prevention and treatment of pressure sores (PSCP) (Appendix III) was implemented throughout one directorate of the Trust.

The focus of this study was to investigate the relationship between risk assessment, severity of sore and management of patient care in relation to the Waterlow scale and to determine if the PSCP facilitated the systematic management of patient care.

1.1 Purposes of the study

The main purposes of the study were:

to identify the pressure sore prevention and management strategies currently in use within the Trust;

to determine if there was an association between risk score, grade of sore and management of patient care;

to determine if a care plan specifically designed for the prevention and management of pressure sores facilitated the management of patient care.

1.2 Search Parameters

Computerised databases Medline and Cinahl were used to search the research literature from 1987–1998. The RCN Library's Journals database (1985–1995) was searched via issue 1 of RCN Nurse ROM. The Journal of Advanced Nursing and Nursing Research from 1987–1999 and Nursing Abstracts from 1990–1993 were hand searched. Reference lists from retrieved papers were searched on an ongoing basis. Copies of all relevant governmental policy documents were obtained via an Internet search and from key individuals. Only documents in English were reviewed.

1.2.1 Key Words

The terms used were: pressure sores; decubitus ulcers; bedsores; pressure ulcers; risk assessment; risk score; Waterlow; pressure sore management; and nursing documentation.

Chapter Two: Literature Review

2.0 The cost of pressure sores

A pressure sore is a lesion caused by unrelieved pressure which leads to damage of underlying tissue (CRAG 1995). The financial cost associated with pressure sores is difficult to quantify and estimations vary widely (McSweeney 1994). A report commissioned by the DoH estimated the cost of preventing pressure sores to be in the region of £645,000–£2,700,000 and the cost of treatment to be between £645,000 and almost £1,200,000 per annum (Touche Ross 1993). The cost estimated by Touche Ross (1993) was based on a hypothetical hospital with 600 occupied beds and an overall prevalence rate of 19% (estimated from data available in England). Estimated cost took account of: equipment and material; staff time; and where treatment was necessary, length of stay. No allowance was made for any changes to either the patient's quality of life or distress suffered; nor were potential legal costs accounted for. Consequently, the associated cost of pressure sores is probably considerably higher than that estimated by Touche Ross (1993).

Responsibility for the prevention of pressure sores is not clearly defined and is dependent on individual circumstances (Tingle 1992). A patient taking legal action against a hospital employee(s) following the development of a pressure sore would need to show that the risk of pressure sores had been foreseeable and that negligence had occurred. Legally, on the basis of vicarious liability, if a patient sues for damages while in the care of a Trust or health authority, and an employee is found negligent, the employer is liable for any cost incurred (Dimond 1994). Therefore, achieving a 5-10% annual reduction in pressure sore incidence (DoH 1992) should theoretically minimise the associated financial and opportunity costs. However, reducing the incidence and cost associated with pressure sores requires that prevention strategies are targeted effectively so that appropriate preventative measures can be initiated. This necessitates that the population at risk of developing pressure sores be accurately identified; a requirement which, so far, has proven difficult to accomplish (Deeks 1996) despite the number of risk assessment tools now available. Nevertheless, a

number of government publications (DoH 1991; DoH 1993; AHCPR 1992; CRAG 1995) had suggested that baseline data in the form of incidence rates and prevalence surveys was necessary if progress towards the then national target was to be demonstrated.

2.1 National guidelines

The number of working parties which have been formed to address the pressure sore issue reflect the international concern surrounding the problem. The King's Fund Pressure Sore Group was established in 1987 and published the first edition of the strategy for the prevention of pressure sores in England in 1989 (Simpson and Livesley 1993). Two years later in 1991, the DoH published The Health of the Nation Targets recommending a 5-10% reduction in pressure sore incidence (DoH 1991). This target was re-iterated in a second publication (DoH 1993) which was issued to all NHS purchasers and providers. The Scottish version of the pressure sore guideline was published in 1995 (CRAG 1995). In 1989 and simultaneously with the work being done by The King's Fund Pressure Sore Group, the Agency for Health Care Policy and Research (AHCPR) in the USA undertook the task of formulating a national guideline for the prediction and prevention of pressure sores (Bergstrom, Allman and Carlson et al 1992). In 1996, the European Pressure Sore Advisory Panel (EPUAP) held their inaugural meeting with experts from many European countries and have recently published guidelines on prevention and treatment of pressure sores which draw heavily on those produced by the AHCPR (EPUAP 1999).

In addition to the work conducted in the UK and USA, researchers in a number of other countries have tackled the pressure sore problem in a variety of ways (Ek and Boman 1982; Rundgren 1986; Halfens and Eggink 1995). For example in 1990, 114 (44%) hospitals in 15 separate European countries chose to study the prevention of pressure sores within their own institutions as part of an international quality assurance programme (Klazinga and Giebing 1994).

The widespread interest in the pressure sore problem has allowed the subject to be approached from a variety of perspectives. However, this same strength may also be a weakness in that much of what has been published in relation to pressure sores has been based on opinion or experience rather than research, a fact which may account for the lack of progress in clinical practice (Swain 1989; Clark 1993; Cullum and Sheldon 1996). Furthermore, while the call for an annual reduction of pressure sore incidence (DoH 1991) is clearly a worthwhile goal, to date, the methods used to obtain prevalence and incidence figures are so variable that the information is incompatible. Rarely can results be aggregated to provide a national, or even a local picture.

2.2 Pressure sore surveillance

The pressure sore studies reported in the literature reflect the focus of the investigations previously conducted. Some (Ek and Boman 1982; Halfens and Eggink 1995; Harrison, Wells, Fisher and Prince 1996) take a broad perspective on the pressure sore problem. Most (Barbenel, Jordan and Nicol 1980; Callaghan 1994; O'Dea 1993; Clark and Watts 1994) report prevalence or incidence. Therefore, it could be argued that the publication of national targets unwittingly steered pressure sore surveillance away from clinical practice research towards pressure sore audit leaving many questions unanswered.

The fact that many gaps in knowledge still exist is clearly illustrated in the pressure sore guidelines published by the AHCPR (1992). Of the 800 publications used to aid development of these guidelines only 27% were research based (Bergstrom, Allman, Carlson et al 1992). CRAG (1995) and others draw heavily upon the AHCPR guidelines (Taylor and Clark 1994; EPUAP 1999). Again emphasising earlier points, current guidelines rely more on expert committee reports, consensus statements and clinical experience than they do on research based evidence.

2.3 Prevalence and incidence of pressure sores

The terms 'prevalence' and 'incidence' are used inconsistently throughout the literature (Clark and Watts 1994) despite the fact that they each provide a different measure of pressure sore occurrence. In relation to pressure sores, 'prevalence' is the total number of pressure sores which exist over a specified period of time (O'Dea 1993; Cullum, Dickson and Eastwood 1996), or in the case of 'point prevalence' at a given point in time (Hitch 1994; Lockyer-Stevens 1994) whereas 'incidence' is the number of newly acquired pressure sores over a specified period of time (O'Dea 1993; Clark and Watts 1994). It has been argued that incidence is more reflective of the quality of care because it identifies sores which occur after admission (Clark and Watts 1994), and allows comparisons within a unit to be made over time (Hillan, Smith, Swaffield, Fraser and Durie 1997). Nevertheless, and despite recommendations for a reduction in incidence (DoH 1991), the most popular method of monitoring pressure sore occurrence is by prevalence (Bridel 1993).

Prevalence rates are affected by healing rates, incidence and admission and discharge policies (Hillan et al 1997). Both prevalence and incidence rates are influenced by the methods used to gather data (Hamilton 1992; Hillan et al 1997). Consequently, reported prevalence and incidence of pressure sores (Barbenel, Jordan and Nicol 1980; O'Dea 1993; Callaghan 1994; Clark and Watts 1994) vary widely. As a result, contradictory findings both within and between institutions prevent firm conclusions from being drawn regarding the extent of the problem. Furthermore, when used in isolation, neither prevalence nor incidence can identify which changes are required in order to improve care. Thus it is argued that routine monitoring of prevalence and incidence data is not cost effective and is unlikely to make adequate impact on patient outcome. It may be more advantageous to identify which patients develop a pressure sore(s) in order to investigate why the pressure sore occurred, monitor what treatments were used; and evaluate the effectiveness of those treatments.

2.4 Expansion of pressure sore risk assessment and classification scales

The need to provide prevalence and incidence data and the recommendation that a recognised risk assessment and classification scale be used (DoH 1991; AHCPR 1992; DoH 1993; CRAG 1995) may have encouraged increased use of risk assessment and classification scales. The presumed advantage of using such scales is that they permit pressure sore data to be recorded in a way which can be easily quantified. However, with the exception of 'mobility' and 'activity' few studies agree on which criteria should be included within a risk assessment scale and which should be excluded (Appendix IV). Nevertheless, and despite the lack of evidence to support their effectiveness (NHS 1995; Cullum, Dickson and Eastwood 1996), the use of pressure sore risk assessment scales has become routine practice (Klazinga and Giebing 1994).

2.5 Pressure sore risk assessment

Competent pressure sore risk assessment requires access to, or knowledge of, the factors known to contribute to pressure sore development, and an understanding of, or access to information relating to the physical and mental condition of the individual being assessed. Pressure sore risk assessment scales consist of a list of criteria believed to contribute to pressure sore development such as: level of patient activity; mobility; continence; nutrition, and other factors. Use of such instruments require the assessor to match patient characteristics against each of the criterion listed. Therefore, theoretically they should help improve patient care by assisting the assessor identify specific problems which can then be managed appropriately to prevent skin care complications. However, in general, risk assessment scales incorporate a scoring system whereby items on the scale are matched to patient characteristics and assigned scores which are then tallied to provide a total score. A pre-determined threshold score which indicates onset of risk, is used as a baseline to determine the degree of risk for each patient. It is of some concern that patient risk scores may be used inappropriately to determine allocation of resources.

2.6 Sensitivity and specificity of risk assessment tools

The criteria for pressure sore risk assessment tools are that they should be highly sensitive, be highly specific and have good predictive value (National Pressure Ulcer Advisory Panel 1989; Bergstrom, Allman and Carlson 1992). The sensitivity and specificity of a measurement tool is a measure of the tool's validity (Larson 1986). Thus in relation to pressure sores, sensitivity is the risk scale's capacity to correctly identify the patients who develop a sore while specificity is the scale's capacity to correctly identify the patients who do not develop a sore (Bridel 1993). Positive predictive value estimates the probability of the characteristic under investigation [a pressure sore] being truly present. Negative predictive value estimates the probability of the characteristic being truly absent (Altman 1991).

In theory, an ideal risk assessment scale should be 100% specific and 100% sensitive. However, in practice this is impossible to achieve because sensitivity and specificity are influenced by the point at which the threshold score is set, the prevalence of the characteristic under investigation (Larson 1986), the inter and intra-reliability of the instrument when in use (Bridel 1993), and the way in which the test is conducted (Harrison et al 1996). A pressure sore screening test which is highly sensitive at the expense of including many false positive results will have poor utility in the clinical area. If such a test is used to determine the allocation of resources, preventative measures might be provided for patients who do not require them. This would increase cost unnecessarily and, if resources are restricted, might result in patients who require preventative care having to do without. Conversely, a test which is highly specific at the expense of including many false negatives might deny appropriate treatment to patients who are 'at risk' of pressure sores but not identified as such. Logically, the choice of screening test should be based on which one provides the best balance between sensitivity and specificity (Larson 1986). However, in practice, the reported sensitivity, specificity and predictive values both within and between different risk assessment scales varies widely (NHS 1995).

The application of sensitivity and specificity tests as a measure for evaluating the accuracy of a pressure sore risk assessment scale has been questioned on the basis that preventative action influences outcome (Norton 1989; Waterlow 1996) by ensuring that pressure sores do not occur. To assess the accuracy of any risk assessment scale in terms of its sensitivity and specificity, all preventative measures would need to be withheld (Norton 1989; Waterlow 1996) once the score had been calculated. Sensitivity and specificity could then be determined by the number of patients who went on to develop pressure sores when no prevention was provided. Ethically, this could never be put to the test (Healey 1996). Consequently it has been argued that the most effective scales are those which appear to over-predict (Norton 1989; Deeks 1996). Waterlow (1998 personal communication) disputes the use of statistical analysis to determine the predictive ability of the Waterlow or Norton scale on the basis that neither were designed be to be used in such a way.

2.7 The Norton scale

The first risk assessment scale was developed by Norton, Exton Smith and McLaren in 1962 (Norton et al 1962) and is still in use today. The scale consists of five main assessment criteria: physical condition; mental condition; activity; mobility, and incontinence. Each criterion contains several sub-scales which differentiate between levels of patient dependency.

The Norton scale was developed originally as a data collection tool for a research study investigating pressure sores in two care of the elderly hospitals. The study investigated: the incidence of pressure sores (Series I); a trial of four local applications (Series II); and the effect of turning on pressure sore prevention (Series III). Data collected for the study included: patient weight; build; appetite; medication; preventative measures; treatment measures; pressure area status and skin changes (Norton 1989).

In order to determine the relationship between initial risk score and subsequent development of pressure sores (Series I), a convenience sample (n=250) of patients from one hospital, who were pressure sore free on admission, were included. Descriptive analysis detected a linear relationship between risk score and incidence of sores; that is, the lower the patient score, the greater the patient was at risk of developing pressure sores. Patients with a score ≤ 12 had a 50% higher ratio of pressure sores than those with a score >12 (Norton et al 1962). The mean score for patients who developed a pressure sore was 12.9 while the mean score for patients who did not develop a pressure sore was 15.7. Consequently the threshold score, indicating onset of risk was set at 14 (Norton 1989). No recognised pressure sore classification scale was available at the time of Norton's study. Therefore severity of sore was not classified according to a recognised grade. However Norton did distinguish between superficial and deep sores and found that patients with a 'deep' sore tended to have a lower score.

In Series III, and using a convenience sample (n=100) of female patients who were pressure sore free on admission to hospital, Norton found activity and mobility to be the most significant factors relating to pressure sore development. Irrespective of the patient's physical condition, the incidence of pressure sores was lower when patients were assisted to change position frequently (Norton 1962).

No statistical analysis was performed on Norton's data. However, results were clinically significant. Replication of Norton's study has not been possible because in order to repeat the study, all pressure relief would need to be withheld from patients who were unable to change position independently (Norton 1989). Nevertheless, conflicting reports of the Norton score as an indicator of pressure sore development have since been reported (Goldstone and Goldstone 1982; Lincoln, Roberts, Maddox, Levine and Paterson 1986).

2.7.1 Validity and reliability of the Norton scale

The Norton score was shown to be a reliable guide to pressure sore incidence by Goldstone and Goldstone (1982) who set out to test the predictive value of the Norton score in an orthopaedic trauma unit within a district general hospital. The study compared the original Norton scale with four variants of the Norton scale. A convenience sample (n=40) of alternative admissions aged ≥ 60 was included in the study. The Norton scale was not in use on the ward at the time of the study and no extra preventative measures were initiated on the basis of the score. An experienced nurse who was not a member of the ward team recorded patient risk score. Ward staff remained blind to patient score. Therefore no additional preventative measures were initiated on the basis of the score. The sample was divided into two groups who were matched according to: sex; principal diagnosis; level of consciousness; pulse; blood pressure; temperature; and time in casualty, pre-op ward and theatre. Admission score was used in analysis of results. The severity of the sore was classified by width. Of the 40 patients included in the study, 18 developed pressure sores.

The difference of 1.75 points in Norton scores between those who developed sores and those who remained pressure sore free was statistically significant ($p<0.01$). The only other difference detected between the two groups was that patients with pressure sores were on average slightly older than those without pressure sores ($p=0.13$). (Goldstone and Goldstone 1982).

When the predictive ability of the Norton score was compared to the predictive ability of Goldstone and Goldstone's (1982) variants of the Norton, the Norton was shown to perform as well as one variant and better than the others. However, with the threshold score at 14, the Norton score over-predicted the number of patients assigned "at risk" status. As threshold score was lowered, sensitivity decreased and specificity increased. Therefore no evidence was found to justify altering the threshold score from 14 (Goldstone and Goldstone 1982).

To test the external validity of the results, a follow-up study was conducted in the same ward over a period of six months. A sample (n=15) of patients comparable with the patients in the previous study was included. Goldstone and Goldstone (1982) reported that results from the follow up study confirmed the findings of the original study, that the Norton score was a reliable guide to potential pressure sore development.

A pilot study conducted to determine the predictive validity, interrater reliability, and face validity of the Norton score (Lincoln et al 1986) contradicted Goldstone's (1982) findings. Lincoln et al (1986) used a convenience sample (n=36) of medical and surgical patients to determine the predictive validity of the Norton score. All patients were ≥ 65 years and pressure sore free on admission to hospital. Trained research assistants assessed participants within 24 hours of admission and every three days until discharge or death. Ward staff remained blind to patient risk scores. Skin status was recorded using a 5-point classification scale. Admission score was used to compare risk status and subsequent development of pressure sores.

Lincoln et al (1986) found no difference in the characteristics of patients who developed a sore and those who did not. Of the 36 participants included in the study, 6% (n=2) were considered to be 'at risk'. Neither developed a sore. Of the 34 patients deemed 'not at risk', 14% (n=5) presented with a superficial sore. When changes in patient score over time were compared to changes in skin condition over time, no relationship was detected. Unlike Goldstone et al (1982), Lincoln et al (1986) concluded that the Norton score required some modification before being used in practice.

Lincoln et al (1986) claimed that the results of the study were statistically significant but due to short lengths of stay, only seven patients, that is four surgical patients and three medical patients, were available to assess the predictive validity of the Norton (1962) scale. The use of a small convenience sample does not permit firm conclusions

to be reached regarding the Norton scale's predictive power.

Goldstone and Roberts (1980) compared patients with pressure sores and patients without pressure sores. A purposive sub-sample (n=64) of patients older than 60 years of age, who were pressure sore free on admission to hospital, was used. Results from 60 patients were suitable for analysis. Of these 65% (n=39) remained free from pressure sores; 15% (n=9) developed a sore; and 20% (n=12) developed 'noticeable erythema'. For the purpose of analysis, all patients with noticeable erythema were classified as having contracted a pressure sore thereby increasing the pressure sore group to 35% (n=21).

The only significant difference between patients who developed sores and those who did not was detected in the individual scores for activity and mobility. No significant difference was found in relation to patients' physical, mental or continence status. Goldstone and Roberts (1980) concluded that the original five Norton categories were not required and that patients needed only to be rated on activity and mobility. However, a later study (Goldstone and Goldstone 1982) which derived from Goldstone and Roberts' (1980) results did not confirm this conclusion (see section 2.7.1).

Goldstone and Roberts' (1980) findings cannot be generalised because the study was confined to a small, non-random sample of orthopaedic patients. Restricting the study population solely to orthopaedic patients who may have been admitted to hospital primarily for deficits associated with activity and mobility, introduced bias. Furthermore, the term 'noticeable erythema' was not defined. Therefore it is not clear whether the transfer of patients with 'noticeable erythema' into the pressure sore group was appropriate.

2.8 The Gosnell scale

An alternative to the Norton scale was developed by Gosnell (1973) for use in her research study which set out to identify specific variables contributing to pressure sores and to detect the degree of influence each variable had on pressure sore development.

Gosnell (1973) modified the Norton scale only slightly for use [in her study] by substituting Norton's 'incontinence' and 'physical condition' with the terms 'continence' and 'nutrition'. The remaining Norton criteria - mental status, mobility and activity - were retained.

A convenience sample (n=30) of patients admitted to four similar extended care facilities were included in the study. All patients were aged 65 and over and pressure sore free on admission. Patients were observed twice weekly for four weeks or until discharge or death. The data collection tool used in the study incorporated a rating scale for scoring patient risk status and a sheet for recording data relating to patients' vital signs, skin status and medication. A descriptive rather than numerical classification system was used to determine severity of sore. For the purpose of analysis, subjects 'at risk' were classified by risk score and divided into three distinct at risk groups (6-10, 11-15, and 16-20) according to admission score.

Gosnell (1973) found mobility, activity and mental status (three of the original Norton criteria) to be indicative of pressure sores. Continence was not found to be related to pressure sores. The additional data gathered by Gosnell (1973) suggested that poor nutrition, increased body temperature and low blood pressure were also associated with pressure sore development. Consequently Gosnell (1973) concluded that the scale used in her study should be revised to include categories for vital signs, fluid balance, protein metabolism and medication.

Results of the study were based on a small sample of patients of whom only four developed pressure sores. Segregation of this small sample of pressure sore positive

patients into three separate risk groups (6-10, 11-15, and 16-20) appears arbitrary and disadvantageous particularly when the lowest admission score was 10. Gosnell (1973) points out that the data collection tool used in the study was limited in that it did not measure the extent of nursing care provided, or the level of self-care patients were capable of. No studies have been undertaken since to test the validity or reliability of the Gosnell scale.

While Gosnell (1973) recommended supplementing the Norton scale, a later study (Goldstone and Roberts 1980) found that pressure sore risk could be determined by reducing Norton's risk scale to just two items.

2.9 The Douglas scale

While Goldstone and Roberts (1980) suggested that the five categories within the Norton scale exceeded the requirements of a pressure sore risk scale, Pritchard (1986) considered the Norton criteria to be inadequate. Pritchard's (1986) view, based on experience and intuition, stemmed from the belief that the Norton scale failed to identify the patients in Pritchard's ward who were at risk of pressure sores. Consequently Pritchard amended the Norton scale to take account of: nutritional state; low haemoglobin; pain; and skin status, factors which she and her colleagues considered relevant to patients in a male medical ward. The revised risk assessment scale became known as the 'Douglas Ward Risk Calculator'.

Pritchard (1986) conducted a comparative trial of the Norton scale and the Douglas Ward Risk Calculator to determine which was the most accurate. A purposive sample (n=28) of male medical patients, identified solely by professional judgement to be at risk of pressure sores, provided the subjects for the study. Each patient was assessed twice; once using the Norton scale and once using the Douglas Ward Risk Calculator. Of the 28 patients originally identified as 'at risk', the Douglas Ward Risk Calculator identified 17 while the Norton scale identified 15.

Some of the patients identified 'at risk' on the basis of professional judgement were not detected by either the Douglas Ward Risk Calculator or the Norton scale (Pritchard 1986). Consequently a further three categories (periodic pain, sedation and unco-operative behaviour) were added. When data were re-analysed, variances between the revised Douglas Ward Risk Calculator and the Norton scale became more apparent. Of the 28 patients, included in the study, 27 were identified by the revised Douglas Ward Risk Calculator while only 18 were identified by the Norton scale (Pritchard 1986). Pritchard (1986) concluded that pressure sore risk factors should be determined by speciality.

No explanation is given as to whether the accuracy of the risk scales was measured against patient skin status or nursing judgement. In addition, it is not clear if the results acquired at the second analysis were obtained from a second comparative trial of the Norton scale and the Douglas Ward Risk Calculator or if initial results were re-calculated to take account of the additional factors. Lack of detail regarding methodology and small sample size make it difficult to draw any firm conclusions in relation to Pritchard's work. However, any scale which has been developed from factors identified by professional judgement to be relevant, will find a good level of agreement when measured against professional judgement. No studies have since been conducted which assess the validity and reliability of the Douglas Ward Risk Calculator.

2.10 The Waterlow scale

The Waterlow Risk Assessment Scale (WRAS) was formulated in 1985 by a clinical nurse teacher who believed that the Norton scale did not encompass the factors shown to contribute to pressure sores since Norton's research (Waterlow 1998). Consequently, the Waterlow scale was developed following a literature review of all pressure sore research available by 1985 (Waterlow 1991).

The WRAS (Appendix I) incorporates 10 assessment criteria (build/weight for height, continence, visual skin type, mobility, sex/age, appetite, tissue malnutrition, neurological deficit, major surgery/trauma and medication). Each criterion has a number of sub-scales, rated on a scale of 0-8 according to degree of risk. A zero rating is allocated to any sub-scale which indicates no risk, for example skin 'healthy'. The scale was evaluated in medical, surgical, orthopaedic and elderly care wards using a sample (n=650) of in-patients who were pressure sore free on admission to hospital. Only patients admitted to hospital ≥ 3 days were included in the study (Waterlow 1991). The Torrance (1983) scale, a five-stage classification system (see section 2.23) was used to determine severity of sore.

As in Norton et al's (1962) study, descriptive analysis detected a linear relationship between risk score and development of sores. However with the Waterlow scale, the higher the patient score, the greater the patient is at risk of developing pressure sores. Onset of risk was set at 10 because no patient with a score <10 developed a sore (Waterlow 1985). Degree of risk was quantified by applying three separate risk categories i.e. "at risk" (10-14); "high risk" (15-19); and "very high risk" (20+).

The Waterlow scale has been criticised for overlap between its categories (Johnson 1994) and for being too broad thereby adopting a 'blanket approach' at the expense of over-predicting the number of patients at risk (Wardman 1991; Chan, Chow, French, Lai and Tse 1997; Pang and Wong 1998). However, this may be due, in part, to the fact that the cut off point appears to have been based on the lowest score of a patient who developed a pressure sore. Nonetheless, the WRAS has also been criticised for excluding categories such as arthritis and pain, two factors which are thought from community nursing experience to influence pressure sore development (Williams and Davies 1991).

The WRAS, was later re-named 'The Waterlow Pressure Sore Prevention/Treatment Policy' to encourage its use as an aid to prevention and treatment (Waterlow 1991). Its purpose was threefold: to provide a method of risk assessment; to raise awareness of pressure sore aetiology and classification; and to indicate when preventative action or

treatment was required (Waterlow 1985). A manual to help users define the categories more clearly has since been published (Waterlow 1992). The manual recommends specific action according to identified risk score. This assumes that the scale is valid and reliable. However, the validity of the Waterlow scale has never been adequately tested (Bridel 1993). Some small evaluation studies have been conducted but these are generally of poor quality with small sample sizes. Nevertheless, despite its lack of validation, the Waterlow scale has been reported as the most widely used risk assessment tool in the UK (Waterlow 1991; Wardman 1991; Cook, Hale and Watson 1999) and is one of the most widely quoted in the nursing press.

2.10.1 Validity and reliability of the Waterlow scale

A recent study in a Hong Kong hospital compared the Waterlow and Norton scales to determine which was more effective in predicting the occurrence of pressure sores (Chan et al 1997). The rationale for the study was that although the Norton scale was widely used in Hong Kong, accounts regarding its effectiveness were largely based on personal opinion and anecdotal evidence. The Waterlow scale was chosen as comparison because of its prominence in the literature (Chan et al 1997).

A sample (n=185) of patients admitted to an elderly care ward and pressure sore free on admission were included in the study. Data were collected over four consecutive weeks by nurses caring for the patients and four researchers. Patients were assessed on admission and at weekly intervals using both scales. For the purpose of analysis, data relating to the patient's last day as defined by the last day of the study, discharge or death were used.

Chan et al (1997) found the Waterlow scale to have more sensitivity but less specificity than Norton scale. Of the 185 patients included in the study, the Waterlow scale identified 72% (n=134) to be 'at risk' of pressure sores while the Norton scale identified only 35% (n=65) to be at risk. Eight patients developed a pressure sore. The Waterlow scale identified seven of these while the Norton scale identified six. One patient who developed a pressure sore was not identified by either scale. Chan et al

(1997) concluded that the Norton scale was more economically effective on the basis that it might minimise the number of patients who receive unnecessary intervention.

A major limitation of the study was that nurses conducting risk assessments were accustomed to using the Norton scale but unfamiliar with the Waterlow scale. Therefore bias was introduced. Statistical significance is not reported therefore it is not clear if any statistical tests were performed.

2.11 The Braden scale

The Braden scale was developed from the results of a literature review which led to the formulation of a conceptual schema for the study of pressure sore aetiology (Braden and Bergstrom 1987). The conceptual schema identified two principal factors critical to the development of pressure sores; that is the degree and duration of pressure, and the tolerance of the tissue to withstand pressure. Within these two principal factors, five sub-scales exist. Three of these: sensory perception; activity; and mobility, are linked to the degree and duration of pressure. The remaining two, extrinsic which encompasses moisture, friction, shear, and intrinsic which encompasses nutrition, age, arteriolar pressure, interstitial fluid flow, emotional stress, smoking, and skin temperature, are linked to the tolerance of the tissue to withstand pressure. As in previously developed scales, each factor is rated according to degree of risk.

Braden reverts to Norton's (1962) scoring system whereby a lower score indicates a higher risk. The content of the Braden (1987) risk assessment scale differs from those previously described in that descriptors are focused more specifically on patient self-care deficits. These are clearly defined and mutually exclusive, and therefore have the potential to reduce some of the problems associated with inter and intra-rater reliability. Results of three studies report the interrater reliability of the Braden scale to range from r = .83 to r = .99 (Bergstrom et al 1987[a]). However, two of these studies compared the obtained scores of only two raters and the third conducted pairwise correlation of four raters. Bergstrom et al (1987[b]) report that content and construct

validity of the Braden scale have been established via expert opinion and empirical testing.

2.11.1 Validity and reliability of the Braden scale

Bergstrom et al (1987[a]) conducted two prospective studies to assess the sensitivity and specificity of the Braden scale on patients within medical-surgical units. A total sample of 200 patients (100 from each unit) who were pressure sore free on admission to hospital were included in the study. Patients were admitted to the study within 72 hours of admission. The sample in each unit differed in that the participants in one unit were more acutely ill and therefore expected to be in hospital longer than the patients in the other participating unit. The methods used in both studies were reported by Bergstrom et al (1987[a]) to be similar. Nursing staff were asked to provide standard care for patients and were instructed in the purpose of the study and the use of the Braden scale. Ward based nurses assessed the patient's skin and rated the patient's risk status weekly and until discharge or death using the Braden scale. The investigator obtained patient data from both the patient's nurse and the patient's chart.

Data from only one patient was not suitable for analysis and thus 99.5% (n=199) of the original sample was available for analysis. Because the Braden risk assessment tool was new, the point at which the patient could be deemed at risk of developing a pressure sore could not be determined (Bergstrom et al 1987[a]). Consequently the cut-off point was determined once the study was complete. A cut-off point of 16 was shown to provide the best balance between sensitivity and specificity. The Braden scale was shown to be 100% sensitive in both studies. However specificity differed between studies. In the first study the scale was 90% specific while in the second study, where patients were more acutely ill, the scale was found to be only 64% specific.

It is not clear if the risk score recorded on admission, or a subsequent risk score was used in the analysis of results. Bergstrom et al (1987[a]) attempted to minimise bias by informing staff of the purpose of the study and instructing them to give 'standard'

care. These same nursing staff were also required to conduct a skin assessment and record the risk score for each patient. This might have resulted in a Hawthorne effect and influenced patient care if nursing staff were conducting a more conscientious and thorough assessment than was usual practice because they were aware of the study.

Another study (Bergstrom et al 1987[b]) found the Braden scale to have similar specificity but slightly lower sensitivity than that obtained in Bergstrom et al's (1987[a]) second study described above. Bergstrom et al (1987[b]) evaluated the Braden scale for use in an Adult Intensive Care Unit (AICU). A sample (n=60) of consecutive patients, aged between 21 and 84 years and with no pre-existing pressure sores participated in the study. As in the studies described above, staff were instructed in the use of the scale. The primary nurse rated the patient using the Braden scale within 72 hours of the patient's admission to hospital. Skin assessment was conducted by the primary nurse at the beginning of the study and every 48 hours thereafter for two weeks or until discharge from the hospital. Pressure sores were classified on a 5-point scale which included zero for 'no sore'. To minimise bias, the investigator remained blind to the patient's risk score until completion of the study.

Results indicated that with a cut-off point of 16 the Braden scale was 83% sensitive and 64% specific. Bergstrom et al (1987[b]) point out that results should be treated with caution since results were based on admission score. Using admission score may not be appropriate in areas where the patient's condition alters frequently (Bergstrom et al 1987[b]).

More recent studies (Salvadalena et al 1992; Harrison et al 1996) show the Braden scale to perform less well in clinical practice than those previously reported. Salvadalena et al's (1992) study, which is discussed more fully later in this thesis, found the Braden scale to be 40% - 57% sensitive and 70% - 74% specific. Results varied according to the grades of sore included in analysis. A later study (Harrison et al 1996) reported the Braden scale to be 38% sensitive and 87% specific.

Harrison et al (1996) assessed the accuracy of the Braden scale in a study which set

out to determine the pressure sore prevalence and to evaluate the AHCPR guidelines in an acute care setting. A sample (n=23) of registered nurses formed the survey team for the prevalence survey. Training films developed by Bergstrom were included in a workshop which trained the survey team in all aspects of the study. Following the prevalence study, a random sample (n=300) of patients, who were pressure sore free on prevalence day, participated in the second part of the study which aimed to evaluate the Braden scale.

The survey team assessed patients' skin status using a 4-point classification scale which included a category for the presence of eschar but none for 'no sore' while remaining blind to the patients' initial Braden score (Harrison et al 1996). Reliability of the Braden scale (r = .87) was established. Only patients free from pressure sores on admission were included. Data from 54% (n=161) of the original sample of patients were used in analysis. Results indicated that with the cut-off point set at 16, the Braden scale was 38% sensitive and 87% specific (Harrison et al 1996).

Harrison et al (1996) acknowledge that the poorer performance of the Braden scale in their study as opposed to the results reported in previous studies might have been due to variances in study population. However they cautioned against using the total Braden score for predicting risk, or for implementing prevention strategies because of its poor performance in the study.

A more recent study which compared the predictive power of the Norton, Waterlow and Braden scales (Pang and Wong 1998) found the Braden scale to be more specific than both the Waterlow and the Norton scale but less sensitive than the Waterlow scale. Pang and Wong (1998) conducted a comparative study in a large Hong Kong rehabilitation hospital A sample (n=138) of Chinese patients from medical and orthopaedic units who were pressure sore free on admission to hospital participated in the study.

A four week pilot study was conducted prior to the main study. Three instruments were used to collect data for the study: a demographic data collection form; a skin

assessment chart; and a nursing intervention checklist. A 4-point classification scale was used to determine severity of sore. Interrater reliability ($r>0.99$) of the nursing intervention checklist and the skin assessment chart was established by two assessors simultaneously rating the same patient using the same scale.

The main study took place over a period of five months. Each patient was assessed within 48 hours of admission using each of the three risk assessment scales and the skin assessment tool. To minimise bias, each scale was used by a different assessor trained in its use. Skin status was observed daily until a pressure sore developed or until the fourteenth day. Preventative interventions received by the patient and/or documented as provided were recorded on the nursing intervention checklist.

Data from 32 patients, whose admission to hospital was <14 days, were excluded. Therefore data from 106 patients were used in analysis of results. Twenty one patients (19.8%) developed a pressure sore.

All scales showed a statistically significant association between predicted risk and development of pressure sores. The Braden scale was found to provide the best balance between sensitivity and specificity correctly classifying 68% of patients as opposed to Norton (63%) or Waterlow (54%). However, the cut-off points used to determine risk were higher than that used in previous studies with Waterlow being set at 16 and Norton and Braden at 18.

Twenty (95%) of the 21 (86%) patients with pressure sores belonged to Braden's 'friction and shear' criterion, while 18 belonged to Waterlow's non-healthy 'skin type'. This led Pang and Wong (1998) to question the benefit of using a risk assessment scale suggesting that frequent measurement of skin condition may provide more valid data. While this may be a logical conclusion, it is clear that the development of a pressure sore automatically places individuals into Waterlow's non-healthy skin type. This attribute however may provide an artificially high estimate of the Waterlow scale's performance.

2.12 The Pressure Sore Prediction Score

The Pressure Sore Prediction Score (PSPS) was developed in an Orthopaedic Hospital in 1988 (Lowthian 1993). The scale consists of six questions:

- sitting up?
- unconscious?
- poor general condition?
- lifts up?
- gets up and walks?
- incontinence?

for which a simple yes/no response is required. Four of the questions also allow for an indeterminate response; that is, yes but/no but. Responses are allocated a score from zero to three. The higher the score, the greater the risk. The cut-off point which indicates risk, is set at six. The scale incorporates characteristics of the Norton, Braden and Waterlow scales. Categories are similar to those used by Norton, a pocket score card and guide for users, similar to that produced by Waterlow is available and like the Braden scale, descriptors focus on self-care deficits. The PSPS is reported to be 89% sensitive and 76% specific and is used to assign patients to particular support systems (Lowthian 1993). No studies are available to confirm or refute these results.

As in the Waterlow scale, recommendation of support systems according to risk score assume that the PSPS is valid and reliable. The PSPS has not been tested for validity since its conception.

The practice of using a total risk score to initiate prevention strategies and assign resources has been reported as inappropriate (Harrison, Logan, Joseph and Graham 1998).

Following a prevalence study and an evaluation of the Braden Scale, Harrison et al (1998) reported that use of the total Braden score to plan care and assign resources to

be unacceptable. Consequently, they chose to use the Braden sub-scales to improve the care of patients at risk of pressure sores. Interventions to address patient deficits within each of the Braden sub-scales were developed by the multi-disciplinary group which was convened. Over a period of four years pressure sore prevalence within the institution was reduced from 32.3% to 19.6% (Harrison et al 1998). Harrison et al (1998) claim that the success of the initiative was due to the diverse activities undertaken to address the barriers to evidence based practice.

Details of the method Harrison et al (1998) used to evaluate the sensitivity and specificity of the Braden Scale are not provided. Therefore it is not possible to determine if it was appropriate. However the decision to involve the multi-disciplinary team to develop guidelines based on specific patient deficits, rather than an identified score appears to have been instrumental in reducing pressure sore prevalence.

2.13 Summary

With the exception of 'mobility' and 'activity' few studies agree on which criteria should be included within a risk assessment scale and which should be excluded (Appendix IV). Mobility and activity are generally considered to be two of the most important factors contributing to pressure sore development (Norton 1962; Goldstone and Roberts 1980). Both feature consistently in the scales available. More recently, it has been suggested that mobility and activity are of secondary importance and that the primary consideration in risk assessment should be neurological status (Gerbhart 1995).

As illustrated in the previous discussion, research relating to the development of pressure sore risk scales appear to have developed in an ad-hoc rather than a systematic manner. Scales developed since that produced by Norton seem to have evolved from the assumption that specific factors within the Norton scale are defective (Clark 1993). Some claim to improve on the original but are merely adaptations (Bergstrom et al 1992; Bridel 1993; Cullum et al 1996). All have developed before preceding tools have been properly evaluated and most have little

in the way of research to support their use. While planning patient care on the basis of risk factors rather than a total score is likely to be more effective, there is no clear evidence to indicate which risk assessment scale performs best. Nor is there sufficient evidence to demonstrate if use of a risk assessment scale is more effective than clinical judgement alone.

2.14 Risk assessment and nursing intuition

While it is recommended that pressure sore risk should be assessed using a recognised pressure sore risk assessment scale (AHCPR 1992; CRAG 1995), it has been argued that nurses can identify patients at risk of developing a pressure sore through intuitive means alone (Jones 1986; Hergenroeder, Mosher and Sevo 1992; Salvadalena, Snyder and Brogden 1992; Preevost 1992). A study by Hergenroeder et al (1992) which set out to compare nursing intuition and the Braden scale found that nurses could accurately predict pressure sores without using the Braden scale.

Hergenroeder et al (1992) conducted a descriptive comparative study to compare the accuracy of the Braden Scale with nurses' single item pressure sore risk assessment. A convenience sample (n=72) of patients aged 60 years and over admitted to a male medical unit were included in the study. The research investigator assessed patients within 40 hours of their admission using the Braden scale and asked nurses to indicate by verbally responding 'Yes' or 'No' whether they considered the patients they were admitting to be at risk of pressure sores. Results indicated that lower Braden scores correlated with nurses' assessment of increased pressure sore risk ($r = -.76$, $p<0.05$). Hergenroeder et al (1992) concluded that nurses accurately predicted pressure sore risk with a simple Yes/No answer and that nurses' own assessment method, that is, good clinical judgement, was as reliable as the Braden scale.

Hergenroeder et al's (1992) original study method required nurses to record either 'Yes' or 'No' on the nursing assessment sheet. However, due to nurses omitting to document their response as requested, the researchers had to seek a verbal response regarding the patient's pressure sore risk status. Asking nurses directly to make a

pressure sore risk assessment may have encouraged them to make a more thorough assessment than that which they would perform routinely. If this was so, bias will have been introduced. Sample details are not provided therefore results cannot be generalised.

Results from other studies (Preevost 1992; Salvadalena et al 1992) have also found clinical judgement alone to be a reliable method of identifying those at risk of pressure sores. Preevost's (1992) study found that patients identified with the Braden scale as 'at risk' were also identified by nurses using only clinical judgement. Salvadena et al (1992) report similar results.

Salvadalena et al (1992) conducted a clinical trial to compare the accuracy of the Braden scale in predicting pressure sores with that of nurses' clinical judgement. A convenience sample (n=100) of acute medical patients, who were pressure sore free on admission to hospital, participated in the study. Salvadalena et al (1992) claim that "most" patients were ≥ 65 years of age. Two teams of masters-prepared nurses were trained specifically for the study. The training was conducted in accordance with the recommendations of Bergstrom and Braden (Salvadalena et al 1992). Interrater reliability was tested on three occasions and found to be consistent ($r>0.9$).

One team (n=4) of nurse researchers recruited patients to the study and conducted skin assessments at time of admission and three times weekly. A second team (n=5) recorded the patient's Braden score. Allocation of a score was based on information obtained from the patient's nurse and the patient's record. Each team remained blind to the recordings of the other. In addition, nurses caring for the patients were asked to respond "Yes" or "No" to the question "Do you think this patient will have a pressure ulcer during this hospital stay?". To minimise bias, staff nurses were asked to respond to the question before any data were collected. Data from 99 patients were used in analysis of results. There was no statistical difference in Braden score between patients who developed sores and those who did not.

Salvadalena et al (1992) reported that neither method was highly predictive regarding which patients would develop pressure sores. However, nurses' clinical judgement was found to be 49% sensitive and 73% specific as opposed to the 40% sensitivity and 70% specificity obtained by the Braden scale (Salvadalena et al 1992). A correlation co-efficient (0.20 $p<0.001$) of nurse prediction and patient outcome was reported although no equivalent data is provided for Braden score and patient outcome.

Before data were collected, nurses were asked if they thought the patient would develop a sore. While the purpose of this was to minimise bias, the nurses' responses may have influenced the investigators and inadvertently introduced bias. Furthermore, the Braden score allocated to patients by the investigators is likely to have been influenced by clinical judgement since it was based on information obtained from the patient's nurse and the patient's record.

2.15 Summary

As discussed in section 2.14, some researchers (Preevost 1992; Hergenroeder et al 1992; Young 1996) support the view that pressure sore risk can be accurately identified using nursing judgement without the need for a risk assessment scale. Others (Norton et al 1962; Waterlow 1995[a]) believe that professional judgement is subjective and that the use of a formal risk assessment tool provides an objective measure of risk status. Norton et al (1962) stated that experienced nurses could recognise risk only when the risk was obvious but were less able to recognise risk in circumstances where patient deterioration was insidious. To date, there is insufficient evidence to indicate if risk assessment tools are more effective in identifying patients at risk of pressure sores than clinical judgement alone. Current guidelines (AHCPR 1992; EPUAP 1998) recommend that risk assessment tools be used in conjunction with clinical judgement.

2.16 Identification of risk and nursing intervention

A study by Salvadalena et al (1992), discussed earlier in this report (see section 2.14), found that even when nurses intuitively predicted patients to be at risk of pressure sores, effective preventative strategies were rarely implemented. This led Salvadalena et al (1992) to caution that implementation of a risk assessment tool may not address the problem. However, to date, only one study (Jones 1986) has investigated how nurses make use of the pressure sore risk assessment data available to them.

Jones (1986) demonstrated that nurses, using a wide and logically structured database such as a pressure sore risk assessment scale, gave more specific, detailed and individualised prescriptions for pressure sore prevention than nurses who used an intuitive approach; and that nurses who had recent exposure to a wide and logically structured database, prescribed more nursing actions than those who had no such exposure. Her hypotheses stemmed from earlier research (Hammond 1966[b]) which suggested that nurses identified problems at three distinct levels: intuition; induction; and logical inference (Jones 1986).

Jones' (1986) interpretation of Hammond's research (Hammond 1966[b]) was that intuitive solutions relied on past experience. Since neither individual circumstances nor new knowledge were taken into account, solutions were sometimes inappropriate. Problems solved via inductive means, although also reliant on past experience, searched for confirmation that the correct solution had been achieved. However, once confirmed, additional data were not always used. Conversely, logical inference was judged to be the most effective problem solving method because it considered and tested many possible causes of a problem. Until the correct solution was found no possible causes of the problem were disregarded (Jones 1986).

Jones (1986) conducted an experimental study to compare three methods of pressure sore risk assessment by applying Hammond's theory to test her hypotheses. Nursing intuition, the Norton scale and the Knoll scale were chosen to represent the three levels of problem solving since these were thought by Jones (1986) to equate with

intuition, induction, and logical inference respectively. A quota convenience sample (n=22) of nurses from four medical wards, who used the nursing process but no risk assessment tool, were randomly allocated into one of three groups. One group acted as the experimental group while the remaining two groups acted as controls for the experimental group and each other. A questionnaire, consisting of scenarios derived from exemplars of patients on the ward, was distributed to participants. Each group was asked to use all three assessment methods in varying order as instructed by Jones (1986). Each group was asked to identify two patients they considered to be at 'high risk' of developing a pressure sore and two they considered to be at 'medium risk'. Participants were then asked to justify their decision. On four occasions, scales were incorrectly completed therefore 18 were available for analysis.

Results of the study indicated that once biased towards a particular cause of a patient's problem, nurses did not use the other clues available to them to solve patient problems in a systematic and efficient way (Jones 1986). Furthermore, Jones (1986) found that patient assessment was inadequate and inconsistent and that calculation of risk score was often inaccurate. This led Jones (1986) to conclude that nursing care was highly routinised and habitual with no evidence of cognitive problem solving and that the intuitive approach used to assess pressure sore risk resulted in patients receiving a 'blanket approach' to care.

Jones (1986) acknowledged that bias might have been introduced due to small sample size (n=18) and the fact that nurses were not accustomed to using quantitative measures to assess risk. Nevertheless, the study highlights a number of issues which merit further investigation.

2.17 Summary

It has been suggested that rather than continue to develop new pressure sore risk assessment scales we should be questioning why existing ones do not work (MacDonald 1995). Certainly it seems judicious to investigate how risk assessment scales are being used in practice before proceeding with further sensitivity and

specificity tests. With the exception of Jones (1986), there is nothing in the literature to indicate whether the use of a risk assessment scale influences the care provided. If risk assessment scales are to be used to inform care decisions, particularly in situations where staff have little opportunity to become familiar with individual patients and their particular problems, they need to be valid and reliable irrespective of which nurse is conducting the assessment. Furthermore, regardless of whether risk is assessed using a risk assessment scale, nursing judgement or a combination of both, strategies for management of care should be guided by a full and competent assessment which considers all possible causes of the problem.

2.18 Utilisation of effective prevention and treatment strategies

The effective prevention and treatment of pressure sores requires a competent risk assessment, a wide body of relevant knowledge (see section 2.5), and the ability to implement research findings into practice. The literature suggests that the latter is often unsuccessful, although proposals as to why this is so are diverse; some being based on personal beliefs, or past experience (Hunt 1981; Gould 1986); others on the results of research studies which set out specifically to identify why such a problem exists (Hunt 1987; Funk, Champagne, Wiese and Tournquist 1991; Nelson 1995; Pearcey 1995; Rodgers 1997). Nevertheless, and despite the many reasons proposed, most researchers (Hunt 1987; Funk, Champagne, Wiese and Tournquist 1991; Nelson 1995; Pearcey 1995; Rodgers 1997) agree that lack of managerial support is a major obstacle.

MacGuire (1990) suggests that managers may withhold support because of conflicting reports and a lack of research synthesis and, therefore, no clear evidence to justify action. This can be argued on the grounds that a number of initiatives, such as nursing skill mix management systems, integrated care pathways, pressure sore risk assessment scales and routine monitoring of pressure sore prevalence, have been implemented amidst absent or conflicting research reports and lack of research synthesis. Thus, it could be argued that it has been the pursuit of quantitative data rather than the pursuit of knowledge which has determined the initiatives to be

implemented. This view may be supported by the findings of a recent study (CSAG 1998) which demonstrated that routine information available within the health service was related to activity rather than effectiveness. In relation to pressure sores, the earlier emphasis on activity is clearly evident (see section 2.2) and despite the availability of pressure sore guidelines in some areas, utilisation of recommended prevention strategies has been limited (Halfens and Eggink 1995).

Halfens and Eggink (1995) conducted an exploratory study to investigate the extent of nurses' knowledge, beliefs and use of pressure sore prevention methods. The study was conducted in the Netherlands where pressure sore guidelines distinguished between methods considered by the Dutch Consensus Committee to be: always useful to all patients; unproven but recommended as useful in individual cases; not useful at all.

A random sample (n=730) of nurses working in Dutch hospitals participated in the study. A questionnaire listing 27 preventative methods derived from the Dutch guidelines was mailed to nurses in receipt of a free weekly nursing journal. This constituted >80% of nurses working in the Netherlands. A return rate of 76% (n=556) was achieved, of which 51% (n=373) were suitable for analysis. Each question related to 'high risk' patients and nurses were asked to respond in three ways:

1. was the method always used or only sometimes used in individual cases?
2. would they recommend the method as always useful, only sometimes useful for individual cases, or never useful?
3. did they consider the method to be always useful, only sometimes useful in individual cases or not at all useful?

Results indicated that of the nine methods recommended by the guidelines as always useful, nurses knew about 6.9%, believed 7.1% to be useful but utilised only 5.4% of them. Of the 11 methods considered to be sometimes useful in individual cases, nurses knew about 5.9% of them, believed 5.6% but used only 5.1%. Of the seven

methods judged to be of no use, nurses knew about 1.9% of them, and considered 2.1% of them to be of no use. However, only 2.8% of them were never used in practice.

Halfens and Eggink (1995) concluded that the relationship between the methods nurses knew to be useful, as determined by the guidelines, and their beliefs about them, was stronger than the relationship between the methods nurses knew to useful and those they utilised in practice. This led Halfens and Eggink (1995) to conclude that the Dutch pressure sore prevention guidelines were insufficiently incorporated into practice. Halfens and Eggink (1995) recommended that if nurses were to incorporate the methods endorsed by the Dutch Consensus Committee into practice, they required support in the form of guidelines, equipment, and empowerment.

Halfens and Eggink (1995) stated that for the purpose of the study there was no reason to assume that reported practice differed from actual practice. However, the study did not pursue why methods known to be useful were not being used or why methods known not to be useful were still in use. Consequently, the basis on which Halfens and Eggink (1995) make their recommendations is not clear. A recent study (CSAG 1998) however, has indicated that poor research utilisation may be due to inadequate or inappropriate dissemination of information.

CSAG (1998) conducted a descriptive study to identify to what extent research-based information was used to plan, provide and monitor clinical services. Using stroke services as an example, a sample (n=321) of health care professionals, patients, carers and advocacy groups from a stratified random sample (n=13) of districts and boards throughout the UK participated in the study. Questionnaires, semi-structured interviews and document analysis were used to gather information on how clinical effectiveness had been applied in the local situation and how it was perceived by both professionals and non-professionals.

Results were grouped according to the:

- nature and accessibility of relevant evidence;
- planning and implementation of managerial programmes and activities and attitudes of health professionals;
- availability of information to assess the effectiveness of services and monitor changes resulting from clinical effectiveness activities.

Findings from the study indicated that relevant information was not reaching the appropriate health care professionals. While practitioners perceived a need for existing knowledge to be reviewed by experts prior to implementation, even when this was available, systems for disseminating information were ineffective. For example, many health care professionals were not aware of the Effective Health Care Bulletin series on pressure sore prevention (CSAG 1998). This refutes MacGuire's stance (see page 32) and is worrying on the grounds that despite the cost of pressure sores and the emphasis on prevention, readily available and relevant evidence is not being disseminated.

2.19 Clinical Governance

The purpose of the clinical governance framework is to ensure that all NHS organisations continuously monitor and improve the quality of the services they provide (DoH 1997). Chief Executives of NHS Trusts and Health Authorities have had clinical responsibility aligned to their current financial responsibility. Consequently, they must ensure that evidence based practice which has been evaluated, is disseminated and used (DoH 1997). In addition, all health care organisations are required to implement high quality systems for the collection of relevant information and clinical record keeping (IHSM 1997).

These changes require managers within the health service to reconsider the type of data needed if improvements in patient care are to be effected. They may also need to ensure that the methods currently used to record patient care are either significantly

improved or radically altered.

2.20 Record keeping

The need to maintain accurate nursing records is an essential component of nursing which carries potentially serious legal and professional ramifications if neglected (UKCC 1993; Dimond 1994). Nevertheless, there is an abundance of literature which discusses the inadequacies of nursing documentation.

In recognition of the problems associated with poor documentation, and following publication of the UKCC Standards for Records and Record Keeping (UKCC 1993) and the issue of teaching packs by the NHS Management Executive (NHS 1993; NHS 1994), Hale et al (1997) conducted a study to determine whether data contained in nursing records accurately reflected the care given. The study was conducted in five medical and eight surgical wards within four hospitals in the North of England and the problems chosen to represent the issue under investigation were myocardial infarction (MI) and fractured neck of femur (# NOF). The methods chosen to obtain relevant data were: retrospective case record analysis (n=16); interviews with nurses caring for patients whose records were being reviewed; interviews with senior nurses of the relevant wards. Patients gave consent for their nursing records to be examined and for ward staff to provide information regarding their care.

Following discussion with expert nurses a checklist of nursing interventions was devised for each condition. The areas chosen for investigation were: anxiety and patient education (MI); nutrition, pressure areas, and information and teaching (#NOF). Pain and mobility were investigated for both groups. Data collection tools were constructed to extract information to determine if:

- the nursing assessment included the topics identified by the 'expert' nurses;
- individual patient problems or needs were identified in each topic;
- a care plan was made for each topic in which a problem was identified;
- the care plan was evaluated and changed when necessary.

Hale et al (1997) found that all records failed to satisfy the UKCC (1993) criteria and that care planning was standardised and superficial and failed to deal with individual patient problems. Although pain management in patients with MI (n=7), prevention of pressure sores in patients with # NOF (n=9) and mobility in both groups were "relatively" well documented, all other areas were poorly documented. Furthermore, while nurses reported that they observed the skin of patients with # NOF every 3-4 hours there was no evidence of this in the nursing record. Nor was there any record of the frequency of passive exercises or whether the patient acted on advice about pressure relief. Although there were no "glaring" discrepancies in what care was documented to that which nurses said they provided (Hale et al 1997), Hale et al (1997) concluded that nursing records were not a valid source of data and that any attempt to relate patient outcome to nursing interventions was limited.

The main limitation of the study was that, due to the time required for location and abstraction of data, a smaller than anticipated sample of patient records was used (Hale et al 1997). The number of interviewees participating in the study is not stated. However, results were based on the assumption that the care given was as stated by interviewees rather than that documented in the nursing record. Since, Hale et al (1997) reported some difficulty in identifying nurses familiar with the patient's care (Hale et al 1997) this assumption may not be appropriate.

Although limitations of the study prohibit generalisation, the study highlights the importance of comprehensive nursing records, particularly in areas where there is a rapid turnover of patients who may be cared for by nurses unfamiliar with their needs. It also supports findings of previous studies (Pieper et al 1990; Preevost 1992; O'Dea 1993) which found relevant documentation to be present only 25%-63% of the time.

As part of a larger retrospective study Pieper et al (1990) investigated what nurses documented about pressure sores. One hundred and sixty seven nursing records from two hospitals, were reviewed and assessed against the International Association for Enterostomal Therapy (IAET) guidelines for the assessment of pressure ulcers. The entire patient record was reviewed and all documentation relating to pressure sores

was recorded.

Although 157 (94%) patient records contained reports of pressure ulcers, the most frequently documented descriptor (76%) was ulcer site. All other descriptive categories were present in < 40% of records. Only 15 (9.6%) patient records contained a description of the pressure sore on day of discharge. Furthermore, there was some evidence to suggest that nurses were classifying the same pressure sore differently. Consequently, and as a result of the inconsistencies which existed, the accuracy of the nursing records was questioned (Pieper et al 1990).

A later study (Preevost 1992) (see section 2.14) demonstrated that only 63% (n=359) of 568 preventative actions provided by nurses were documented. Failing to document preventative measures is not only legally precarious, it may be detrimental to patient care. In today's health care culture where patients are often provided for by non-registered personnel, a written plan of care is essential to ensure the care provided is appropriate. Furthermore, with regard to treatment measures it may help ensure that the same application is applied consistently and that it is effective. Nonetheless, one study (McClemmont 1994) found that 75% (n=20) of pressure sore ≥ grade 3, were not evaluated while O'Dea (1993) reported that 48% of patients with an established pressure sore had no care plan at all.

Inadequacies in nursing documentation may account for the fact that few research studies report on the methods nurses currently use to prevent and treat pressure sores. Most of the studies available have been conducted for alternative reasons (Clough 1994; Dealey 1994; Halfens and Eggink 1995) and provide only a brief overview of the methods used. Some are no longer valid due to passage of time (Norton 1962; David, Chapman, Chapman and Lockett 1982; Ek and Boman 1982). Others are limited by small sample size (Ballard-Krishnan 1993), or weak methodology (Larson 1993). The literature review conducted for this study failed to identify any recent research study, adequate in sample size and design, which investigated the type of pressure sore prevention and treatment methods currently being utilised. This dearth of information makes it impossible to determine to what extent current research has

been incorporated into practice or evaluate what treatments are effective.

Effective documentation is believed to allow measurement of patient progress (Pieper et al 1990), facilitate the management of patient care, and influence outcomes of care (Smith and Lait 1996). Waterlow (1995a) has suggested that pressure sore risk scores should be documented along with any action taken and that a pressure sore care plan, where all relevant information is held together would be beneficial (Waterlow 1991). To date, no research studies have been identified which compare the use of a pressure sore care plan, where all relevant information is held together to that of a standard care planning method.

2.21 Summary

As discussed in the previous section, there are numerous reasons as to why research findings are not incorporated into practice (Hunt 1987; Funk et al 1991; Nelson 1995; Pearcey 1995; Rodgers 1997). However, in relation to pressure sores, there is insufficient evidence to confirm or refute the notion that pressure sore prevention and treatment strategies are not research based. Conversely, there is an abundance of literature to illustrate that nursing documentation is superficial, inadequate, inconsistent and fails to monitor the progress of patients at risk of, and with, pressure sores (Pieper et al 1990; Preevost 1992; O'Dea 1993 Hale et al 1997). There is therefore a clear need to identify what practices are currently being used to prevent and treat pressure sores and to continually monitor if the care given is effective. Yet until there are systems in place to ensure that patient care is adequately recorded this may not be achievable.

In an attempt to improve documentation of pressure sores, the surgical and medical directorates participating in the study described in this thesis used different care plan systems. This study compared both methods (see section 2.27.2). Nevertheless, despite the differences between the care planning methods used, both utilised the WRAS (Appendix I) and SPSSS (Appendix II) to document pressure sore risk and monitor skin condition. Consequently both the WRAS and the SPSSS formed the

basis of the data collection instruments developed for this study (Appendix V; Appendix VI). For this reason, and to aid the understanding of the reader, a brief description of classification scales, and a more in-depth discussion of the SPSSS is provided in the following section. The WRAS is described in section 2.10.

2.22 Pressure sore classification scales

At least 14 different pressure sore classifications scales are said to exist (Healey 1995). The number of categories within each vary and the definitions applied to each grade, although similar, differ to some extent. Ratings assigned to each category of sore are related to the extent of tissue damage and the structures involved (Culley 1998). Some scales include a zero rating (Lowthian 1993; Reid and Morrison 1994; CRAG 1995). Others (David et al 1982; AHCPR 1997) do not. Some are concise, others are very detailed. These variations make comparison of results difficult and are likely to cause confusion among health care staff.

It has been suggested that use of a single standardised classification tool may provide a common language for health care professionals (Reid and Morrison 1994) and that it would permit comparison of results between incidence and prevalence surveys (Healey 1996). Nevertheless, and despite the associated problems, different pressure sore classifications are used both within and between different institutions.

2.23 The Torrance classification system

The Torrance classification system categorises ulcer progression in five stages ranging from intact skin which blanches with pressure (stage 1) to infective necrosis penetrating to deep fascia (stage 5). Stage 2 of the Torrance system indicates non-blanching hyperaemia where superficial damage to the epidermis may be present. Ulceration progressing through the dermis is classified as stage 3 and extension into subcutaneous fat as stage 4.

Although more recent classification systems vary slightly from the Torrance system, differences are mainly due to the omission (AHCPR 1992) or re-categorisation (CRAG 1995) of Torrance's 'blanching erythema'. Consequently, stage 1 (non-blanching erythema) of alternative classification systems generally equate with Torrance's stage 2. Other variances are limited to the detail with which each stage is described, the inclusion of a category which indicates that no pressure sore exists as in the SPSSS, or the exclusion of any such category as in the AHCPR system.

2.24 The Stirling classification system (SPSSS)

The SPSSS (Appendix II) is the most detailed classification scale currently in use. It was created in October 1992 at Stirling Royal Infirmary, Scotland. The tool was developed following a review of existing classification systems and the identification of problems inherent in those systems (Reid and Morrison 1994). Representatives from the Departments of bioengineering, dermatology, geriatric medicine, nursing, pharmacology, and spinal cord injury were involved in its development.

The SPSSS is based on the AHCPR (1992) guidelines and categorises pressure sores in four main stages. However, unlike the AHCPR system, each stage of the SPSSS is categorised using several digits and a fifth stage (stage 0), applicable when no pressure sore exists but skin status is to be recorded, is included. The scale depends solely on visual assessment unless infection is suspected and bacteriological investigations are required for confirmation (Reid and Morrison 1994). However it could be argued that relying on visual observation alone is not always appropriate. For example erythema is not always visible on patients with darkly pigmented skin; and sores can be present even when the skin remains intact (Healey 1995). Reid and Morrison (1994) recommend that at least the first two digits of the classification system be recorded along with the location of the sore, its surface dimensions, severity of pain, degree of exudate and factors influencing wound healing. Interrater reliability of the SPSSS has been reported as poor in comparison to two alternative classification scales (Healey 1995).

Healey (1995) compared the interrater reliability of the Surrey, Torrance and Stirling (SPSSS) scales in seven Trusts in England. An opportunity sample (n=109) of registered nurses participated in the study. All data were collected by Tissue Viability nurses who asked participants to examine 10 photographs of pressure sores and determine the stage of each pressure sore illustrated using either the Surrey scale, the Torrance scale or the SPSSS. All four categories of the Surrey scale and all five categories of the Torrance scale were used. For the SPSSS, the first two digits of each stage were used. Seventy nine nurses graded all ten photographs. Cohen's kappa co-efficient was used to test the interrater reliability. The Surrey scale was found to have the highest inter-rater reliability ($\kappa = 0.37$) as opposed to $\kappa = 0.29$ (Torrance) and $\kappa = 0.15$ (SPSSS), $p<0.001$. While a second analysis of the SPSSS using only the first digit increased inter-rater reliability ($\kappa = 0.22$), it remained lower than both the Surrey and the Torrance.

Healey (1996) stated results of the study were limited because the photographs did not provide a three dimensional image of pressure sores and that different nurses rated each of the scales. A clerical error on the data collection form resulted in 28% of the nurses grading only 6 of the photographs (Healey 1996). Furthermore, it is not clear if results were based on the original sample (n=109) or those (n=79) who graded all 10 photographs. Finally, it is not specified whether any nurses were familiar with the classification scale they were asked to use or had any training in its use.

2.25 Conclusion

Poor pressure sore management has been attributed to a number of factors. Much of the literature which discusses why this is so, appears to be based on assumption rather than evidence. Whether there is any foundation for these beliefs is not known since no large scale investigations into pressure sore prevention and treatment practices have been reported since that conducted by David et al (1982) more than 16 years ago.

The current emphasis on prevalence and incidence data to help plan future pressure sore management strategies is unlikely to prove effective since prevalence and

incidence data are of limited use if employed in isolation. This is compounded by the fact that patients at risk of pressure sores are generally identified using different risk assessment scales, none of which have sufficient scientific evidence to support their use and many of which are outdated (Ratcliffe 1998). Many studies which have investigated the use of risk assessment scales have focussed on the scale's sensitivity, specificity and predictive power (Gosnell 1973; Lowthian 1989; Harrison et al 1996) and inter or intra-reliability (Bergstrom et al 1992; Salvadena et al 1992). In relation to pressure sores, sensitivity and specificity measures are limited because of the extraneous variables which affect their reliability and validity. In addition many of the tests have been conducted by the individual who developed the scale or a team of researchers trained specifically for the purpose of the study. Consequently interrater reliability studies attain a level of correlation which is unlikely to be maintained in everyday practice where the scales are open to more subjective interpretation.

Although it is now widely accepted that pressure sores are a multi-disciplinary responsibility (Smith 1993; Hillan et al 1997), this does not absolve nurses from the responsibility of ensuring that the most effective pressure sore prevention and management strategies are utilised. Rather, it emphasises their obligation to co-ordinate appropriate and effective strategies. Achieving this aim, however, requires the adoption of a logical and systematic approach to care which offers a structured programme of assessment, planning, implementation and evaluation. Unfortunately, the quality of nursing records indicates that a systematic and logical approach is not being adopted (Jones 1986; O'Dea 1993).

It has been suggested that appropriate charting systems may influence the management and outcomes of care (Smith and Lait 1996) and that a care plan designed specifically for the management of pressure sores (Waterlow 1991) would be beneficial. However, no research has been conducted to identify whether such a care plan improves care, or encourages a more logical and systematic approach to care. In today's health care culture, where the use of temporary staff, the movement of patients between units and flexible staffing rotas appear to be on the increase, it is unreasonable to assume that patient care will be evaluated by the same nurses, or even

the same group of nurses throughout a patient's stay in hospital. It is therefore imperative that a record system which encourages continuity of care and facilitates the monitoring and evaluation process regardless of who is providing or recording care, be found.

2.26 Literature supporting selected research methods

2.26.1 Introduction

Hypothesis testing, which looks for associations between variables, requires a range of data to be collected (Hicks 1990). To test a hypothesis in an experimental study and determine a causal relationship, manipulation of the variables under investigation is necessary (Cormack 1996). However, when the hypothesis is exploring an association between variables, the situation is studied as it occurs naturally and variables are not manipulated. Data are collected on two variables which are then related to test the hypothesis (Diers 1979). To test the hypotheses in this study, the situation was studied as it had occurred naturally and variables were not manipulated.

2.27 Data sources

All data collection methods have limitations. Therefore it is necessary to choose a method whereby the advantages of using that method outweigh its limitations. For the purpose of this study, data were obtained from patient case notes and via self-report methods from qualified nurses.

2.27.1 Self-report methods

Self-report methods include questionnaires, structured interviews, semi-structured interviews and unstructured interviews. While questionnaires have the advantage of making respondents feel more anonymous (Brink and Wood 1983), the researcher's personal experience has shown that when completing postal questionnaires, nursing staff sometimes enlist the help of colleagues in an attempt to provide the 'right' answer. Bias may arise when respondents provide an answer rather than admit they do not know (Ogier 1989). Interviews have the advantage of enabling the researcher to re-assure participants that 'not knowing' is acceptable and of increasing response rate (LoBiondo-Wood and Haber 1986; Newall 1994).

The personal contact afforded in the interview situation enables the interviewer to describe the purpose of the study in greater depth, to answer queries and to address any misunderstandings which arise. Semi-structured and unstructured interviews are suitable for qualitative studies (Polit and Hungler 1995) while the use of structured interviews is appropriate for association testing studies (Diers 1979).

The time needed to conduct interviews can be disadvantageous particularly if the study has to be completed within a limited time-scale. Although this limitation can be overcome by using group interviews and taping responses, it is not always appropriate to use such methods. If non-assertive or junior respondents feel unable to contradict more assertive or senior respondents they may feel inhibited or guarded when answering.

Structured interviews are used where the researcher knows in advance what (s)he wants to know (Polit and Hungler 1995). Where a structured interview schedule is used, each question is pre-prepared, presented in a particular sequence and asked in the same way and in the same order. The researcher reads out the questions to the respondent and records his/her response on the interview schedule. This has the advantage of allowing responses to be coded, analysed and interpreted more easily, particularly if anticipated responses are pre-coded (Newall 1994). However, fixed alternative responses used in structured interview schedules (Polit and Hungler 1995) may result in important data being overlooked (Newall 1994). This can be overcome by including a section for additional comments, 'other' responses and by utilising probes. Probes which have been established in advance (Schalk Thomas 1990) permit the interviewer to investigate why respondents are responding as they are, and gain additional information (LoBiondo-Wood and Haber 1986).

For the purpose of this study, a structured interview schedule with fixed alternative questions was used (see Appendix V). Probes which had been established in advance, were placed where respondents were forced to choose 'yes/no' responses. The purpose of the probes was to elicit more detailed data than that volunteered in initial responses (Polit and Hungler 1995) relating to the perceived usefulness of the Waterlow Risk

Assessment and Stirling Pressure Sore Severity Scales. The SPSSS and the Waterlow risk scores were used as visual aids (Nay-Brock 1984) (see section 3.8.2) to ensure all respondents were using the same frame of reference during the interview.

The structured interview schedule clearly distinguished between the methods used to prevent pressure sores and those used to treat pressure spores; a problem which had been identified in a previous study (see Section 3.7).

2.27.2 Existing records

It has been suggested (Lo-Biondo Wood and Haber 1986) that existing records can be rich sources of data. However, their use for research purposes has been questioned on the basis that poor nursing documentation may not provide valid data (Hale et al 1997). Inadequate nursing documentation has created problems for a number of nurse researchers (Diers 1979; Rundgren 1986; Ibbitson 1988; Pieper et al 1990; Hergenroeder et al 1992; Preevost 1992; Reed 1993; Smith and Lait 1996) (see section 2.20). Nevertheless, existing records are economical to use (Polit and Hungler 1995; Brink and Wood 1983; Lo-Biondo Wood and Haber 1986) and can avoid the ethical dilemmas associated with observational techniques and the bias arising from the Hawthorne effect. Reed (1993) suggests that nursing care plans are themselves an appropriate area for research. This supports the view of a number of researchers (Pieper et al 1990; Waterlow 1991; Smith and Lait 1996) who have suggested that effective documentation may benefit patient care.

The study described in this thesis compared two different care plan methods to determine if there was difference between one method and the other. Therefore a review of patient records was essential. For the purpose of this study, a data collection tool to collect data from patient records was developed (see Appendix VI)

2.28 Reliability

Reliability is the degree of consistency with which the instruments used in a study measure the attribute concerned (Polit and Hungler 1997). Three measures of reliability are consistency, equivalence, and stability (Cormack 1996). Consistency assesses whether all items on an instrument measure the same phenomena. Equivalence measures the degree to which an instrument obtains the same result when used by different raters. Stability is the capacity of a test to yield the same results on repeated applications. Knapp (1985) distinguishes between the stability of a test which assumes that the test is reliable and the stability of a construct which assumes that the construct does not change. If knowledge and practice progress after an instrument has been developed to measure them as they were, as in Preevost's (1992) study, (see section 2.29.2) the original instrument will no longer be reliable and the development of a new instrument may be deemed necessary.

Reliability of a new instrument can be increased if adequate operational definitions (Diers 1979; Cormack 1996) and a data collection protocol (David et al 1982), which clearly defines the meaning of the questions are used. Reliability can be further improved if the instrument is pre-tested (Diers 1979; Lackey and Wingate 1989) and a pilot study is conducted. A pilot study helps identify existing problems and may permit them to be resolved before the main study commences (Diers 1979; Eby 1993).

To increase reliability in this study, instruments were pre-tested and a pilot study was conducted before the main study took place. The samples used in the pilot study were excluded from the main study (Lackey and Wingate 1989). Operational definitions were constructed and incorporated within the data collection protocol/code-book. An exemplar of the data collection protocol/code-book is given in Appendix VII. Since all data were collected by the researcher, problems arising from poor interrater reliability were eliminated.

2.29 Validity

The validity of a study is a measure of how accurately the study measures what it is purports to (Polit and Hungler 1985). Schalk Thomas (1990) describes three types of validity: internal validity; external validity; and instrumental validity. While internal validity relates to the scientific rigour of the entire study external and instrumental validity are associated with specific aspects of a study (Schalk Thomas 1990).

2.29.1 External validity

External validity is the ability to generalise study findings to situations outside the study and is linked to the sampling methods used (Schalk Thomas 1990). To ensure samples are representative and results generalisable, random sampling methods are required (Diers 1979). Stratified random sampling helps ensure that the number of respondents in each category are proportionately represented (Polit and Hungler 1995). Stratified random sampling is more representative than simple random sampling when sample size is small (Burns and Grove 1995). Diers (1979) suggests that purposive sampling should not be used in association testing studies. However, purposive sampling can ensure specific elements are included (Burns and Grove 1995).

A number of nurse researchers have encountered problems when conducting research in areas where different pressure sore risk assessment and classification scales have been used (Barbenel 1980; Callaghan 1994; Clark and Watts 1994) (see section 2.3). Others (Pieper et al 1990; Preevost 1992; Hale et al 1997) have experienced difficulty when patient records are inadequately documented (see section 2.20). Since two of the research questions in this study related to patients identified as at risk of developing a pressure sore(s) as defined by the Waterlow risk score, it was necessary to ensure each patient record included in the sample contained this information. In addition, the study was investigating whether there was an association between care plan type and management of care. As there were different care plan systems being used by each of the directorates which took part in this study, it was necessary to ensure that the

patient record sample contained a representative sample of the patient care plans used in both directorates. Therefore, for the purposes of this study purposive sampling was an appropriate method to use.

The study described in this thesis compared the care plan method used within the surgical directorate to that used within the medical directorate. Therefore, on statistical advice, 50% of the sample was from the medical unit and 50% from the surgical unit. In Phase I of the study, a stratified random sample of nurses was interviewed to ensure that each directorate was proportionately represented in terms of the different areas and grades of staff within each. In Phase II, a purposive sample of patient records was procured. Purposive sampling guaranteed that all records met the criteria for the study (see section 3.3.2) and that problems arising from the use of different risk assessment and classification scales would be avoided.

2.29.2 Instrumental validity

Instrumental validity encompasses face, content, criterion-related, and construct validity (Polit and Hungler 1997). Face validity is achieved when the data collection instrument incorporates all items representing the study concept (Schalk Thomas 1990). This can be confirmed by asking individuals to comment on how well the instrument appears to measure the concept. However, when new instruments are used, the very minimum that must be done, is to establish content validity (Diers 1979). Content validity can be accomplished by developing the instruments from current literature (Diers 1979; Eby 1993) and submitting them to the critique of experts in the field (Diers 1979; Sapsford and Abbott 1992). Criterion-related validity is a more complex issue which involves comparing results of a new instrument to those of a previously validated one, or subjecting divergent groups to the same test to determine if the instrument differentiates between them. Construct validity can only be established after many replications (Polit and Hungler 1997).

It is argued that the development of new data collection tools should be avoided if previously validated tools appropriate to the research are available (Gibbon 1995).

However, the validity of an instrument can only be evaluated in terms of its purpose (Castles 1987). In relation to pressure sores, the main purpose of the instruments currently available is to highlight patients at risk of pressure sores (Norton 1969; Waterlow 1985; Braden 1987); or to determine pressure sore prevalence; or to measure the reliability and validity of a specific risk assessment tool (Goldstone and Roberts 1980; Bergstrom et al 1987) in terms of its sensitivity and specificity and/or predictive validity.

The literature review conducted for this study identified an instrument which had been constructed to test the relationship between pressure ulcer risk, nursing interventions and pressure ulcer presence (Preevost 1992). Since the instrument incorporated the IAET recommendations for pressure sore prevention, it was considered by Preevost (1992) to be valid. However, before Preevost's study was completed, the IAET recommendations were superseded by the AHCPR guidelines. This prompted Preevost to suggest that her instrument required further development to take account of the more up to date AHCPR guidelines (Preevost 1992). Although Preevost's data collection instrument may have been valid when she commenced her study, it could not take account of any new and relevant evidence subsequently established. In addition, the relationship which Preevost established between pressure ulcer risk, nursing interventions and pressure ulcer presence, related to the number rather than type of preventative measures used.

Since the literature review conducted for this study failed to identify an appropriate and valid data collection instrument, the construction of new instruments was essential. Consequently, neither criterion-related nor construct validity could be assessed. However, the advice of a statistician was sought regarding the design of the instruments prior to their development. Face validity was established by incorporating all items representing the concept of the study within the tools and asking experts in the field to comment on the content. Content validity was achieved by developing the instruments from all pressure sore literature currently available and by submitting them to the critique of a tissue viability nurse considered to be an expert in the

prevention and management of pressure sores.

2.29.3 Validity through triangulation

Some researchers (Morse and Field 1985; Redfern 1994; Sapsford and Abbott 1994) advocate the use of triangulation to increase the overall validity of a study. This approach employs two or more theories, investigators, data sources, methods or analysis within one study to investigate a single concept. Where different techniques are combined, the term multiple triangulation is applied (Burns and Grove 1997).

2.29.4 Methodological triangulation

Methodological triangulation uses two or more methods within the same study. A distinction is made between within-method triangulation which employs different types of the same method to investigate the area of interest and between-method triangulation which uses different methods to investigate the area of interest (Redfern 1994). However, Redfern and Norman (1994) state that the term 'triangulation' is only applicable if a link is established before the study commences and the researcher specifically sets out to use the data collection methods for confirmation. Where there is no evidence that this has occurred, the researcher may have merely used a 'mixed bag' of methods. Nevertheless, while employing a 'mixed bag' of methods cannot be considered triangulation, it is likely to provide a more detailed and informative picture than relying on a single technique. It may also serve to identify different perspectives from which further studies should be approached.

Breitmayer, Ayres, and Knafl (1993) distinguish between the use of triangulation for completeness and the use of triangulation for confirmation. Triangulation for confirmation compares the results from each method and focuses on the area of overlap (Norman, Redfern, Tomalin and Oliver 1992) to help establish convergent validity. Triangulation for completeness uses the data from each method to add further dimensions to the picture (Breitmayer et al 1993; Redfern 1994) and to depict the

context within which the study took place (Breitmayer et al 1993).

The study described in this thesis used both interviews and record review to gather data. However, the purpose of using both techniques was to gain access to different data relating to the same phenomena and obtain a variety of information (Holloway and Wheeler 1996) rather than to validate results. A secondary purpose was to minimise the limitations which occur from using a single method (Parahoo 1993). Similarly, to offset the limitations of using a structured interview schedule where fixed alternative questions predominate, probes were added. However, the wealth of information stemming from the probed responses inspired some reflection on the part of the researcher regarding data analysis. It was this rather than any pre-conceived attempt to combine different world views which led to the decision to use a narrative form of analysis rather than rely solely on quantitative methods as planned.

Data collection in hypothesis association testing studies must be objective, unbiased and consistent. Therefore knowing the hypothesis may bias results (Diers 1979). Where all data are collected by the researcher, as described in this thesis, this could be seen as a major limitation. However, when the researcher is aware of the limitations and bias arising from incomplete data, steps can be taken to minimise bias and increase validity (Polit and Hungler 1997).

2.30 Summary

For the purpose of this study, stratified random sampling methods ensured that a representative and proportionate sample of nurses was obtained for Phase I. In Phase II, purposive sampling methods guaranteed that an adequate and appropriate sample of patient records was secured. Since no instruments suitable for the study were identified, the development of new data collection instruments was essential. Face validity of these instruments was established during the pilot study by asking respondents to comment on the instruments. Content validity was established by developing the tools from a comprehensive literature review and submitting them to a

tissue viability nurse considered to be an expert in the field.

All data were collected by the researcher. Therefore problems associated with interrater reliability were avoided. Furthermore, while triangulation did not occur, by utilising two different methods of data collection, the researcher gained a deeper insight into the questions being studied.

Chapter Three: Materials and Methods

3.0. Purposes of the study

The purposes of this study were to:

1. identify the strategies utilised by registered nurses employed within an acute hospital Trust, to prevent and treat pressure sores;
2. determine if there was an association between pressure sore risk assessment, grade of sore and management of patient care;
3. determine if a care plan, specifically designed for the prevention and management of pressure sores, facilitated the management of patient care.

3.1 Null hypotheses

1. That there is no association between pressure sore risk assessment, severity of sore and management of care.
2. That nursing teams, who utilise a care plan relating specifically to the prevention and management of pressure sores, do not manage pressure care prevention and treatment more systematically than nursing teams who do use a care plan relating specifically to the prevention and management of pressure sores.

3.2 Study design

The overall design of the study was a two phase non-experimental investigation into the nursing management of the prevention and care of pressure sores. Data were gathered via a structured interview (Phase I) and a retrospective review of patient records (Phase II). The sample consisted of 327 patient records from one acute hospital Trust and 30 RNs employed within the same hospital. A pilot study was conducted over four weeks between March 1997 and April 1997. The main study commenced in July 1997. Data for the main study were collected over a period of

six months between July 1997 and December 1997 using two data collection tools designed specifically for the study. Data were analysed using non-parametric tests and frequency tabulations.

3.3 Population and sample

The population in this study was hospital-based RNs and patient care plans. As there were two different care plan systems in use, that is, one used within the medical directorate and another used within the surgical directorate, the patient record sample was split between records pertaining to medical admissions and records pertaining to surgical admissions (see section 2.29.1). In an attempt to ensure results would be generalisable to the hospital trust, advice was sought from a statistician regarding sample size. It was decided on the basis of the time available to conduct the study, and on statistical advice, that a minimum of 300 case records would be required to allow statistical comparison between records. The sample was determined as 30 RNs for Phase I of the study and 300 patient records for Phase II.

3.3.1 Sampling frame

The sampling frame used for Phase I was a current list of all RNs working within the adult in-patient medical and surgical directorates of the Trust. To ensure that the number of nurses in each grade was proportionately represented (Polit and Hungler 1995), names were subdivided by directorate and grade and a purposive stratified random sample of C, D, E, and F grade nurses who met the criteria for the study, was drawn. The number (n=30) of nurses, that is 15 medical and 15 surgical nurses, was decided on the basis of the time available for the study; the number of nurses who met the study criteria, and on statistical advice. The sample was overdrawn to provide the pilot sample and to permit the researcher to replace any nurses who were unavailable, refused to participate or withdrew from the study.

For Phase II of the study, a list of all patients admitted to the hospital over a period of six months was obtained from the Medical Statistics Department. In addition, the surgical pressure sore prevalence record was obtained from the Surgical Directorate. A purposive sample (n=327) of patient care plans was procured from these lists.

3.3.2 Criteria for study inclusion

The criteria for study inclusion were:

Phase I - Structured Scheduled Interview

- ward-based RNs grade C, D, E or F, working day or rotational shifts including 'days';

- RNs must be working in an area where the Waterlow risk assessment scale and Stirling Pressure Sore Severity Scale were in use.

Rationale for inclusion criteria

RNs of grade G and above were excluded on the basis that, by definition, as ward managers and specialist nurses, their role within the Trust differed from that of nurses on other grades. Whereas staff of grade C, D, E and F routinely assessed, planned, implemented and evaluated individual patient care, higher grades of staff worked in a managerial or advisory capacity. Furthermore, nursing staff employed within a ward situation during daytime hours, were responsible for the referral of patients to other therapists and specialists and for the ordering and initiating of specialised equipment and wound care products. This responsibility did not extend to staff working night duty, other than in emergency situations. In addition, the researcher's personal experience as a nurse working within the Trust led her to believe that staff employed on nights only, plan, document and evaluate care to a much lesser extent than nurses who work during the day. Finally, the decision to exclude nursing staff unfamiliar with the Waterlow Risk Assessment Scale and/or Stirling Pressure Sore Severity

Scale was made on the basis that it was unlikely that they would be able to provide the relevant data to answer the research questions.

Phase II - Retrospective Document Analysis

The criteria for study inclusion were that case notes indicated:

- patients had been admitted to hospital for > 24 hours;
- the Waterlow Risk Assessment scale had been used;
- a risk score greater > 9 had been recorded;
- the classification system in place was the PSSS.

Rationale for inclusion criteria

Trust policy dictated that patients admitted to the Trust for < 24 hours are considered day patients and therefore generally do not have a pressure sore risk assessment conducted. To increase the validity of the study, patient records which did not contain a Waterlow Risk Assessment record were excluded. Those notes which did not have a risk score > 9 recorded on the Waterlow risk assessment tool were excluded on the basis that the patient had been assessed as 'not at risk' of developing a pressure sore(s).

3.4 Study site

The study was conducted within one acute hospital Trust in Scotland. The CRAG(1995) clinical guideline on pressure area care was in use within the trust at the time of the study.

All adult in-patient wards within the medical (n=10) and surgical (n=9) directorates were included. The areas involved were: general medical, care of the elderly, renal,

dermatology, cardiology, infectious diseases, haematology, general surgical, urology, vascular, orthopaedic and maxillo-facial.

3.5 Access

In October 1996, a verbal request was made to the Director of Nursing requesting access to nursing staff for the purpose of inviting them to participate in the study. Verbal consent was granted. In December 1996, a letter was submitted to the Clinical Director of the medical unit and the Clinical Director of the surgical unit requesting access to patient records (Appendix VIII). Another was sent to the Director of Nursing requesting written consent to review nursing notes (Appendix IX). That same month, written consent to access patient records was received from the Clinical Director of the medical unit. A letter from the Director of Nursing granting permission to review nursing notes was also received at this time.

In January 1997, written consent to access patient records was obtained from the Clinical Director of the surgical unit with the proviso that all Consultants within the unit be notified of the study. To meet this criterion, and as a matter of courtesy, a letter was sent to the 21 Consultants within both the surgical and the medical unit informing them of the study (Appendix X). All agreed and in February 1997, a final letter (Appendix XI) was submitted to the Trust Research & Development Committee. In February 1997 and on behalf of the Trust Research & Development committee, the Medical Director granted consent for the study.

3.5.1 Access to the Medical Statistics and Medical Records Department

Details of all patients admitted to and discharged from the hospital were recorded on a database within the hospital Medical Statistics Department (MSD). The personal details recorded on this database included: patient ID, admitting unit and admission and discharge date. By entering the patient's name and ID from this database into a second database held within the Medical Records Department (MRD), the location of

the appropriate medical record could be identified. Therefore, following approval for the study, a verbal request was made to staff within the MSD requesting a print-out of all hospital admissions between November 1996 and May 1997 (see section 3.5.1). The request was subsequently granted.

Following receipt of the print-out from the Statistics Department and four weeks prior to the commencement of the pilot study, the researcher met with both the manager and the supervisor of the MRD to inform them of the purposes of the study. Confirmation that written consent for access had been obtained from the Consultants and the Medical Director was given. The researcher's requirements regarding the acquisition of patient records was explained and advice was sought regarding the most efficient way in which to trace the necessary records. In addition, re-assurance was given by the researcher that any disruption to the department would be kept to a minimum.

In order to permit the needs of the MRD to be met, it was agreed that the researcher could have access to the department from Tuesday-Friday between 10.00 and 16.30. Access to the computerised patient database during these times was also agreed in principle. However, this could not be guaranteed and would ultimately be determined by departmental workload.

In addition to the patient information held within the statistics and medical record departments, the researcher had access to the surgical pressure sore prevalence record (see section 3.5.1) which distinguished between patients 'at risk' of pressure sores and those not at risk. Access to the medical records pertaining to patients identified on this database was as for all patient records and location of the relevant records was via the Medical Records Department as described above.

3.6 Ethics approval

The Trust Research and Development Committee in its role as the Trust Ethics Committee gave consent for the study to take place (see section 3.5). External ethical approval was not required since patients were not directly involved. Nevertheless

there were a number of ethical issues to be considered. In Phase I of the study these related to the consent of nursing staff to be interviewed. In Phase II, the confidentiality of patient records was paramount. Both are discussed in the following section.

3.6.1 Ethical considerations

Consent of participants

The ethical considerations regarding participants was in protecting their anonymity and treating their information confidentially. Protecting anonymity could have proven difficult in this study because the research was being carried out solely within one hospital by an investigator employed by the participating hospital. However, at the time of the study, the researcher's role within the Trust was a facilitative one which often involved personal communication with nursing staff. Therefore any contact between the respondents and the researcher was not viewed by others as an unusual event and would not have been necessarily linked to the research study. Nevertheless, the researcher was conscious of the fact that some nurses working within the Trust perceived the researcher's usual role as managerial rather than facilitative. Thus the researcher was conscious that some respondents may have felt obliged to participate, while others may have been reluctant to take part for fear of appearing unknowledgeable about the topic under study. Furthermore, the researcher was aware that at an anecdotal level some staff within the Trust were concerned about the motives of studies conducted within the Trust.

To minimise any bias which might arise from the issues described above, the invitation letter was typed on university notepaper and placed in a sealed envelope. To maintain anonymity, the letter was marked 'Private and Confidential'. It was felt that these steps were particularly important since the letter was to be sent to individuals via the ward in which they worked. The content of the letter (Appendix XII) outlined the purpose of the study, assured recipients that confidentiality would be maintained and that refusal to participate would not adversely affect them in any way.

A telephone number and page number were provided to enable potential participants to contact the researcher should they wish to do so.

To allow individuals time to consider their decision to take part, the letter was sent two weeks prior to any personal contact being made by the investigator. As stated in the initial letter, subsequent contact was made via telephone directly to the ward in which potential respondents worked. When potential respondents were unavailable, the recipient of the call was asked to convey a message to the appropriate individual asking them to contact the researcher when available. The purpose of the telephone call was not disclosed to anyone other than the potential respondent. Once personal contact with potential respondents was secured, they were asked if they wished to participate. Verbal re-assurance was given at this time that all information would be treated confidentially. Decisions not to participate were accepted at face value.

Once individuals agreed to participate, an interview date was agreed. All participants were informed that they could contact the researcher by telephone or page at short notice should they be unable to attend the arranged interview for any reason. Immediately prior to the interview, full details of the study were discussed with respondents and a consent form (Appendix XIII) was signed. No record of the responses were kept within the Trust and no identifying information was retained once the study had been completed.

Response Rate of Participants

At the time of the study, four other research studies were being carried out within the hospital placing an exceptional burden on staff. Thus, where possible, nurses were interviewed within their working hours or directly following their shift.

Three nurses declined to participate in the main study; one stated she did not have time to participate; one offered no explanation as to why she would not participate; and one withdrew from the study as she was participating in another three studies at that time. Four other nurses were not available; three due to long term sickness and one due to maternity leave. To ensure the sample size remained adequate, a further

sample of seven RNs was drawn from the sampling frame. All participated in the study. An overall 100% response rate was achieved.

Access to patient information

Patients were not directly involved in Phase II. Nevertheless their case notes were under scrutiny. All efforts were made to maintain confidentiality of personal records and all data were treated in accordance with The Data Protection Act (1984) as it then was prior to the 1998 Act. Only relevant information was extracted from patient records, all of which was extracted by the researcher. All data were coded to minimise the risk of patient information being linked to any individual. The information obtained was used solely for the purposes of the study. Data were stored away from the study site as it was collected. Patient data were destroyed once the study was completed.

3.7 Development of data collection instruments

For the reasons discussed in section 2.29.2, two new data collection instruments were developed for use in the study. One was for use during Phase I of the study and the other for Phase II. As discussed in section 2.29.2, both were developed from the results of a literature review. Prior to pre-testing of the instruments, advice was sought from the researcher's academic supervisor regarding the layout and content of both instruments. Following discussions, amendments were made and an appropriate coding system inserted. A statistician confirmed the appropriateness of the coding system and advised on the most appropriate statistical tests to use. The design of both instruments was based on:

- the pressure sore risk assessment tool in use within the Trust at the time of the study;
- pressure sore prevention and treatment methods known to be in use within the Trust at the time of the study;
- 'best practice' for management of pressure sores, as advised by current research (NPUAP 1992; Hermans and Bolton 1993; Thomas 1994; CRAG 1995; VFM 1996) (see Appendix XVI).

Phase I - Structured Interview Schedule

The structured interview schedule (Appendix V) was developed to record participant responses. Questions relating to personal data were placed at the beginning of the data collection tool even though Oppenheim (1992) suggests that this can be off-putting. However, by placing the simple questions first, the investigator hoped to relax the respondents and ease them gently towards the more difficult questions. The structured interview schedule clearly distinguished between methods used to prevent pressure sores and the methods used to treat pressure sores, a problem which had been highlighted in an earlier study (Ek and Bowman 1982).

The design of the structured interview schedule elicited information on the:

- personal characteristics of the respondents (Appendix V, Part 1, page 132);
- respondents' use and perception of the usefulness of the WRAS and SPSSS (Appendix V, Part 2, page 133);
- strategies used to prevent pressure sores in relation to patient risk score as classified by the WRAS (Appendix V, Part 3, page 134-135);
- strategies used to treat pressure sores in relation to severity of sore as classified by the SPSSS (Appendix V, Part 4, page 135-136);
- factors inhibiting documentation of pressure sore management (Appendix V, Part 5, page 137);
- factors influencing prevention and treatment of pressure sores (Appendix V, Part 6, page 138).

Since the structured interview schedule consisted of fixed alternative questions which did not permit interviewees to expand on their responses, four probes were inserted. Two were placed directly after the questions relating to the perceived usefulness of the WRAS and SPSSS. A further two were placed following questions relating to documentation of management strategies. As discussed in section 2.27.1, the purpose of the first two probes was to elicit answers as to why the WRAS and SPSSS were

perceived as they were. The remaining probes were to determine what factors inhibited documentation if respondents affirmed that this was so.

The interview schedule was pre-tested by interviewing one nurse employed within the Trust as Tissue Viability Nurse and considered as an 'expert' in pressure sore management. Since the Tissue Viability Nurse acted as an information resource for staff and was involved in contracting for specialised equipment and assessing equipment and wound products, it was felt that he would be the most appropriate individual to review the structured interview schedule prior to piloting.

Three additional management strategies were suggested by the Tissue Viability Nurse, that is, debridement using scissors and scalpel, cavity foam dressing, and Prafo pads. The former two were subsequently added to both data collection instruments. Prafo pads were excluded on the basis that the product was not available for use within the Trust at the time of the study.

Phase II - Retrospective document analysis

The data collection tool developed for Phase II of the study (Appendix VI) was designed to extract information on:

- patient characteristics (Appendix VI, Part 1, page 140);
- Waterlow risk score (Appendix VI, Part 1, page 140);
- patient skin status as determined by the SPSSS (Appendix VI, Part 1, page 140);
- methods used to prevent/treat pressure sores as documented in the patient record (Appendix VI, Part 2, page 141);
- pressure sore risk factors as defined by the WRAS and management of care as documented in the patient record (Appendix VI, Part 3, page 142-143);
- evaluation of skin status as documented in the patient record (Appendix VII, Part 4, page five.

To increase the reliability and validity of the data collection instrument used for Phase II of the study, it was pre-tested (Lackey and Wingate 1989) using a purposive sample of patient records obtained from the medical and surgical directorates. The data collection instrument for Phase II was amended on three separate occasions during the pre-testing phase. Following the pilot study, further amendments were made and a data collection protocol/code book was developed (see section 2.28). To accommodate changes in a patient's condition (Barbanel 1987[b]) the data collection instrument permitted the collection of three risk scores and three classification scores, that is the first, middle and last recorded scores pertaining to the relevant hospital stay.

3.8 The pilot study

A pilot study was conducted to test the methodology of the main study (Polit and Hungler 1995). The pilot study was conducted over a four week period during May and June 1997.

3.8.1 The pilot sample

The pilot sample was 10% of the total sample size (Polit and Hungler 1995). Recruits for the pilot study were drawn from the same sampling frame as that used in the main study and were excluded from the main study.

The purposes of the pilot study were to:

- identify any problems within the chosen methods or study design;
- test data collection methods;
- obtain feedback regarding any difficulties in understanding the questions;
- obtain a realistic gauge of the time requirements of the main study;
- pre-test the coding system.

3.8.2 Conduct of the pilot

Data for Phase I were obtained via a structured interview schedule and data for Phase II from a retrospective examination of nursing records.

Phase I - Structured Interview Schedule

Three nurses participated in the pilot study. Four weeks prior to commencement of the pilot study, a letter typed on university paper (Appendix XII) was sent to the three nurses who had been randomly selected from the sampling frame (see section 3.3.1). The letter gave a brief outline of the purpose of the study, invited recipients to participate and stated that they would be contacted within two weeks to discuss the study further. A follow up telephone call was made within two weeks of the letter being sent. The rationale for leaving time between the initial letter being sent and the follow-up telephone call, was to allow potential participants time decide if they wished to take part in the study and to consider any questions they might have. During the follow up call, verbal consent was obtained from those agreeing to participate. Arrangements were also made regarding where and when the interview would take place. One nurse failed to attend the interview and therefore another nurse was recruited using the sampling technique described previously.

Immediately prior to each interview, the purpose of the pilot was explained and confidentiality was assured. To increase the validity of the study, questions regarding the study were invited and responded to. Participants were asked to comment on any questions which they found ambiguous or difficult to understand (Lackey and Wingate 1989). An informed consent form (Appendix XIII) was signed by the participant and the researcher. A poster depicting the SPSSS (Reid and Morrison 1994) and a sheet displaying the range of scores indicative of pressure sore risk (Waterlow 1985) were displayed for reference during the interview. The purpose of this was to reduce bias by ensuring that all interviewees were using the same frame of reference when responding to the questions asked.

The prepared interview schedule was read out to the respondent by the researcher and responses recorded on the data collection instrument by the researcher as appropriate for interview schedules (Diers 1979). Each question was asked sequentially. As each preventative measure listed on the structured interview schedule was read out, the respondent was asked to indicate if s(he) used the stated method by answering 'Yes' or 'No'. When a 'Yes' response was given, each Waterlow risk category was read out. As each was read out, the respondent was ask to indicate, using a yes/no response, if the stated risk score would prompt them to use the specified pressure sore prevention method. The same procedure was applied to questions regarding treatment. As each treatment was read out, the respondent was asked to indicate using a yes/no response if s(he) used the stated treatment. When a 'Yes' response was given respondents were asked to indicate using a yes/no response, if they would use the specified treatment for the severity of sore stated. Where probes (see section 2.27.1) were used, responses were recorded and read back to the respondent to ensure they had not been misinterpreted.

At the conclusion of the interview, respondents were offered an opportunity to discuss any issues related to the context of the study and were asked to comment on the interview schedule. It had been anticipated that respondents might find it difficult to link responses regarding prevention and treatment methods to specific risk scores or severity of sore. All participants stated that they had no difficulty in understanding the questions, or relating pressure sore management to risk score or severity of sore. Each interview was completed within the estimated time-scale of 30-60 minutes.

Phase II - Retrospective Document Analysis

A total of 30 (15 medical and 15 surgical) patient records were obtained for the pilot study. For the reasons discussed in section 3.9 a decision was taken to rely solely on the Medical Statistics Department print-out (see section 3.5.1) to locate patient records. All entries on this print-out were examined to identify those which met the initial study criteria (see section 3.10.2). Patients' names and unit numbers were then entered into the MRD database (see section 3.5.1) and their location identified. The records were then 'pulled' by the researcher and two colleagues who assisted on a goodwill basis. The obtained records were searched by the researcher to identify those which met all study criteria (see section 3.3.2). A random sample of patient records (n=6) were pulled directly from the MRD shelves without reference to the print-out. The purpose of this was to check the reliability of the sampling procedure by estimating how many patient records which met study criteria were not being identified using the chosen sampling method. None were found. On completion of data collection, data were coded and transferred to Minitab V11. A statistician confirmed that the data collection method and data collection tools were appropriate.

3.9 Pilot study findings

The disadvantage of relying solely on the method described in section 3.8.2 to identify appropriate patient records was that it was not possible to distinguish between records which identified patients 'at risk' of pressure sores from those identified as 'not at risk'. Consequently, the records of all adult in-patients identified on the initial print-out had to be located and hand-searched until an adequate sample was obtained which met the study criteria. This proved to be extremely time-consuming. Use of the surgical pressure sore prevalence record would have reduced data collection time considerably because it contained a register of patients identified at risk or with pressure sores. However, it listed only surgical patients and there was no equivalent system within the medical directorate. Therefore, when it became evident that the location of appropriate patient records was more difficult than anticipated, a decision

was taken to retain the surgical pressure sore database for use in the main study. Consequently, data collection over-ran the estimated time-scale by two weeks.

In addition to the problems associated with the need to hand search patient records, the pilot study highlighted the following issues:

- the patient record data collection tool required minor amendments due to one typing error, three questions which were inadequately defined and the omission of two prevention/treatment methods;
- the time-scale estimated for record review had been underestimated.

In response to the results of the pilot study a written data protocol/codebook which clearly defined the questions on the patient record data tool, was prepared. The typing error was corrected and the required additions to methods/treatment were made. In addition, an application was submitted to the Trust Research & Development Committee requesting funding to enable the researcher to purchase staff hours to pull patient records given the time requirement. The main study therefore commenced in July 1997.

3.10 Main Study

3.10.1 Data collection period

The main study commenced in July 1997. Data collection via structured interviews and record review were conducted simultaneously over a period of six months between July 1997 and December 1997.

3.10.2 Data collection process

To ensure that any limitations and bias due to incomplete data or unanticipated problems were identified (Polit and Hungler 1997) and to avoid problems associated with interrater reliability, all data were collected by the research investigator. To minimise bias and to aid analysis of results, the data collection protocol/code book (Appendix VII) was referred to during data collection. Field notes were kept to permit any problems encountered during the conduct of the study to be recorded and later reflected upon. This also permitted problems which had not been highlighted during the pilot study to be discussed with the statistician prior to data analysis.

Phase I - Structured interview process

A stratified random sample (n=30) of RNs, that is 15 from the medical directorate and 15 from the surgical directorate, was drawn from the sampling frame (see section 3.5). The procedure used to contact, arrange meetings, and interview potential participants was a replica of that used in the pilot study (see section 3.6.1). A letter (Appendix XIV) was sent to each RN whose name had been drawn from the sampling frame inviting them to participate in the study. A follow-up telephone call (see section 3.6.1) was made and for those who agreed to participate, an interview date was arranged. Respondents were offered the choice of attending the interview at the researcher's office, an area within the ward or the staff coffee room.

Three nurses declined to participate in the main study and four were unavailable.

Therefore a further seven were drawn from the sampling frame (see section 3.6.1). On some occasions (n=4) pre-arranged interviews were cancelled. All were re-arranged and conducted at a later date. Respondents who cancelled more than once were requested to call the researcher whenever they were available. Where necessary and when possible, interviews were conducted at short notice. All respondents who had agreed to participate in the study attended for interview.

Prior to the interview, respondents were informed of the purpose of the study and offered an opportunity to ask questions. The format of the interview schedule was then explained. Respondents were informed of the expected timescale and instructed to stop the interview at any point if they wished a break (Newall 1994) or wanted any questions clarified. Re-assurance was again given that all individual responses would be treated confidentially. As discussed in section 3.8.2, the SPSSS (Reid and Morrison 1994) (Appendix II) and the Waterlow risk levels (Waterlow 1985) were displayed for reference during the interview.

All respondents were asked each question sequentially. No disapproval or non-agreement was shown towards any of the responses. Responses which had not been anticipated and therefore were not pre-set on the interview schedule, were recorded under 'other' and coded prior to data analysis. Where interviewees were given an opportunity to expand on their responses via the use of probes, only one declined. Most respondents provided data which was both illuminating and informative and most seemed interested in the purpose of the study. Consensual validation was achieved by the investigator reading back to the respondents what had been written down.

All interviews remained within the estimated timescale, each taking approximately 30 minutes to complete. At the conclusion of the interview, respondents were once again invited to ask questions about any aspect of the study. None did. A letter (Appendix XV) was sent to each respondent thanking them for their participation and confirming that they would be informed of the results.

Phase II - Retrospective document analysis

A printed list of all patients admitted to the hospital between November 1996 and March 1997 and the surgical pressure sore database (see section 3.5.1) covering the same period were used to identify patient records. This period was chosen because a comparison was to be made between the Pressure Sore Care Plan (PSCP) (Appendix III) and an alternative care plan method. Patient records relating to surgical admissions prior to that time did not contain a PSCP as the system had been implemented in the surgical directorate in June 1996. To prevent overlap in the data collection methods resulting in data from the same patient record being identified and entered on more than one occasion, all ID numbers were checked at data entry.

When using the statistics department print-out to obtain the names and ID numbers of patients admitted to the hospital it was necessary to systematically search for and highlight only those entries which correlated with admissions to an adult in-patient unit where the WRAS and SPSSS were in place (see section 3.3.2). When this had been accomplished, the highlighted names and ID numbers were entered onto the MRD database to identify the whereabouts of the appropriate records. Once located, the records were 'pulled' by the researcher and a colleague who assisted on a goodwill basis. Each record was then reviewed by the researcher to identify those which met the study criteria. The same method was used to locate the records of patients identified on the surgical pressure sore prevalence record. This method was more efficient in that most of the records identified in this manner did meet the study criteria. Nevertheless, for a number of reasons and regardless of which method was used, locating records via the MRD database proved to be time-consuming and relatively unproductive.

The MRD was extremely busy between 08.30 and 17.00. Therefore, despite the willingness of staff to permit the investigator access to the patient database, this was not always possible. Consequently researcher access to the necessary database was gained on an opportunistic basis. Short spells of access disrupted and hindered progress. In addition, the department was in the process of being 'culled' during data

collection. Thus patient records were difficult to obtain because some were being re-located to a storing facility outwith the hospital, while others were being stored in boxes waiting to be re-filed. To overcome this problem, which had not occurred during the pilot study, the researcher requested that she be permitted access to the MRD between the quieter hours of 17.00 and 20.30. This was subsequently granted.

Despite increased access to the Medical Records Department, attempts to locate patient records often proved unfruitful because the computer failed to recognise the patient's name and ID number. In addition, when the whereabouts of the patient record was identified, procurement of the appropriate record was not always possible when the database located the patient's record to be outwith the hospital. Consequently and due to time constraints, records not available within the MRD were excluded from the study. In addition, a decision was taken to use the statistics print-out to identify adult in-patient admissions and then search for the associated patient records directly from the archive shelves within the MRD rather than via the computer system. This proved to be more efficient because the print-out was 'sorted' in numerical order in accordance with the shelving system. Thus time was not wasted on searching the database for patient records which were in use, in storage elsewhere, or missing. Missing records were immediately obvious and identification of records which met the criteria for the study became more systematic. A random sample (n=50) of patient records were pulled without reference to the print-out (see section 3.8.2). None of these met the study criteria.

Since all patient records were reviewed by the researcher and all data were recorded by the researcher, twelve patient records proved to be the maximum number which the investigator could examine before fatigue was evident. To minimise the chance of error, the researcher restricted record review to between six and twelve patient records which met the criteria for the study, at any one point in time.

In the final week of data collection the Research and Development Committee granted funding for the purpose of purchase of staff hours to assist in the location and 'pulling' of patient records. To ensure the records pulled would meet study criteria,

the names and ID of patients identified on the surgical pressure sore prevalence record as 'at risk', or with, pressure sores were extrapolated and submitted to staff within the Medical Records Department who procured the corresponding records for the researcher. This proved to be extremely efficient although time restrictions did not permit all of the records procured in this way to be reviewed. However, an additional 27 patient records which met the criteria for the study were obtained.

During data collection it became apparent that the WRAS held within the patient record was used differently between and within individual departments. Some nursing staff identified specific risk criteria by circling the relevant score relating to individual criterion then added these to arrive at an overall score. Others recorded only sub-totals and an overall total without identifying specific criteria, while others used a mix of both methods. Consequently it was not always possible to identify which criteria accounted for the overall risk score. This had not been identified as a problem during the pilot study and therefore had not been allowed for in the main study. To ensure this did not prohibit data analysis, all data obtained from the WRAS were recorded on the data collection tool exactly as documented in the patient record. When a situation arose which required the researcher to make a decision regarding how an entry in the patient record should be defined, the definition was added to the data collection protocol and code-book. Similarly, when a treatment, not listed in the code-book was documented as having been applied, this too was added to the code-book. This ensured that all subsequent recordings were defined or coded in exactly the same way and data were not lost. Field notes were written to assist with analysis in the event that the data would need to be re-coded and to serve as a reminder of why particular decisions had been made.

A total of 1949 entries which met the initial criteria for the study were identified from the print-out. These were systematically searched for within the Medical Records Department. A total of 731 were not accessible within the department. The remaining 1218 were located and reviewed until 300 (25%) which met all study criteria (see section 3.6.1) were identified. An additional 27 surgical patient records which met the necessary criteria were located via the surgical pressure sore database. These were

included in analysis. Therefore 327 patient records that is, 148 from the medical directorate and 179 from the surgical directorate were included in analysis.

3.11 Data analysis

On statistical advice, level of significance was set at 0.05. Data from all (n=327) patient records and all (n=30) structured interview schedules were prepared for analysis. To increase the validity of the study, the data collection protocol/code-book was referred to during data coding, data entry, and data analysis.

Phase I - Structured interview schedules

Following the interview, all data were initially hand coded onto the coding section incorporated within the interview schedule. Data from fixed alternative questions were coded first. Data recorded in 'other' categories were coded last to ensure that no responses were omitted or entered twice. Probes were initially treated as a closed question by allocating a single code solely to indicate that a probe had been used. Random checks were conducted by the researcher to ensure all data were coded correctly (Burns and Grove 1995). Data were then transferred onto Excel 5 by an experienced data clerk who conducted random checks to observe for error by comparing the codes recorded on the data collection forms to the appropriate entry on the spreadsheet. Probed responses were typed directly into Word 7 exactly as they had been recorded.

Phase II - Retrospective document analysis

With the exception of data from part 3 of the Phase II data collection tool, data were handled in the same manner as that for the fixed alternative questions in the interview schedule. However, due to the manner in which the WRAS was used, all data from part three of the patient record data collection tool (see appendix VI) had to be re-coded onto a second data sheet prior to data entry. The consequences of this deviation from the planned data collection method and the proposed method of re-coding, was discussed with the statistician. The statistician confirmed that re-coding of the data prior to analysis was appropriate and would not bias results. Nevertheless, some detail from the re-coded data was inevitably lost because data were classified according to the 10 Waterlow criteria rather than the more specific criteria encompassed within these. However, unexpected detail regarding the way in which the WRAS was being used in practice, was acquired.

Following re-coding, data from the secondary data sheet were entered onto Excel 5 by an experienced data entry clerk. For the purpose of statistical analysis, data were then transferred to Minitab V11 by the researcher. Random checks were conducted by the researcher at this time. No errors were detected.

3.11.1 Data analysis process

In Phase I (Structured Interview Schedule), demographic data were summarised using frequency tabulations. Frequency tabulations were also used for data relating to the pressure sore prevention and treatment methods used.

Responses from four of the probes within the structured interview schedule were grouped by question number and classified under one of the four components of the nursing process (see section 4.6) prior to tabulation. Text is used to illustrate the results as using frequency counts alone would have resulted in loss of meaningful data.

Where a comparison was made between the factors influencing the pressure sore

prevention and treatment methods used (see section 4.2.1), each factor was cross-tabulated against the other to determine if there was a difference between the paired proportions. The p.value for each cross tabulation was calculated to determine if the difference was statistically significant. As the same subjects were rating each factor, data were paired. Therefore a McNemar's test was to analyse results.

In Phase II (Document analysis), frequency tabulations were used to describe patient details (see section 4.8). In section 4.9.1, the number of products used to treat pressure sores were numerous in relation to the number of pressure sores treated. In addition, categories were not mutually exclusive. Therefore statistical tests were not appropriate. A table is used to illustrate results.

To determine the association between risk score and severity of sore (see section 4.10) a Spearman's rank correlation co-efficient was used. This is appropriate where data are ordered categorical. A Spearman's rank correlation co-efficient assesses a general rather than linear association and provides more information than a p.value alone (Altman 1991). It is a valid test to use where data are ordinal but normality cannot be assumed (Campbell and Machin 1993).

A chi-squared test was used to test for associations between risk assessment and management of care and between care plan type and management of care. This was appropriate for nominal data. Where aggregated data did not permit statistical analysis due to the number of responses in some categories, and further aggregation of the data would have rendered the data meaningless (see section 4.11.2), frequency tabulations were used.

3.12 Presentation of results: Researcher's Note

Results are presented in two main sections. Phase I is presented first and describes the results obtained from the structured interview schedule with probes. The nurse sample (n=30) was apportioned equally between the medical and surgical directorates and analysed together. All data were included in the analysis of results. As the number

of nurses interviewed was small, numerals are used rather than % to provide greater clarity. Originally it had been intended to subject all data to statistical analysis. However, as previously noted, on some occasions even when data were aggregated, the variation and spread of responses precluded statistical analysis. Statistical advice confirmed this position. Where statistical analysis was not performed results are presented in frequency tabulations and tables.

As discussed in section 4.0, probed responses resulted in data which were richer than anticipated. Therefore in order to convey the findings provided by probes, a narrative is used. Since the nursing process provided a structure for the study, probed responses relating to respondents' perceptions of the WRAS and SPSSS are categorised under: assessment, planning, implementation and evaluation.

In Phase II, a review of 327 patient records, the numbers used in analysis of results were dependent on the completeness of available data. Since this varied according to the question being investigated the numbers used in analysis are provided in each relevant section. Where a % is given, figures have been rounded to the first decimal point in line with statistical advice.

Chapter Four: Results

4.0 Phase I: Demographics: Nurse Sample

As can be seen in Table 4:1, the majority of respondents were registered nurses of grade E (n=15) or grade D (n=12). Table 4.2 shows that almost half of the respondents had been qualified for at least 5 years (n=14).

Table 4.1
Number of nurses by grade

Nurses (n=30)	Grade of nurse
1	F
15	E
12	D
2	C
Total = 30	

Table 4.2
Number of nurses by years qualified

Nurses (n=30)	Years qualified
1	<1
5	1-2
10	>2 <5
14	5 +
Total = 30	

Table 4.3 illustrates the range of units in which respondents worked. Included within 'general medical' are respondents working in the infectious diseases unit and the medical receiving unit. Included within 'general surgical' are respondents working in the urology, vascular surgery and maxillo-facial units.

Table 4.3
Number of nurses by area of practice

Directorate	No of nurses (n=30)	Area of practice
Medical	8	General medicine
	3	Renal
	1	Cardiology
	2	Care of the elderly
	1	Dermatology
Surgical	7	General surgery
	8	Orthopaedics
Total	30	

4.1 Attendance at pressure sore educational sessions

Only one third (n=10) of respondents reported that they had attended a study day or course pertinent to the prevention and management of pressure sores since qualifying. As shown in Table 4.4, the content of the educational sessions attended varied. While nine nurses received education related to wound dressings and to wound assessment, only seven had been informed about pressure sore risk assessment scales and wound classification scales.

Table 4.4:
Content of education sessions by number of nurses present at session

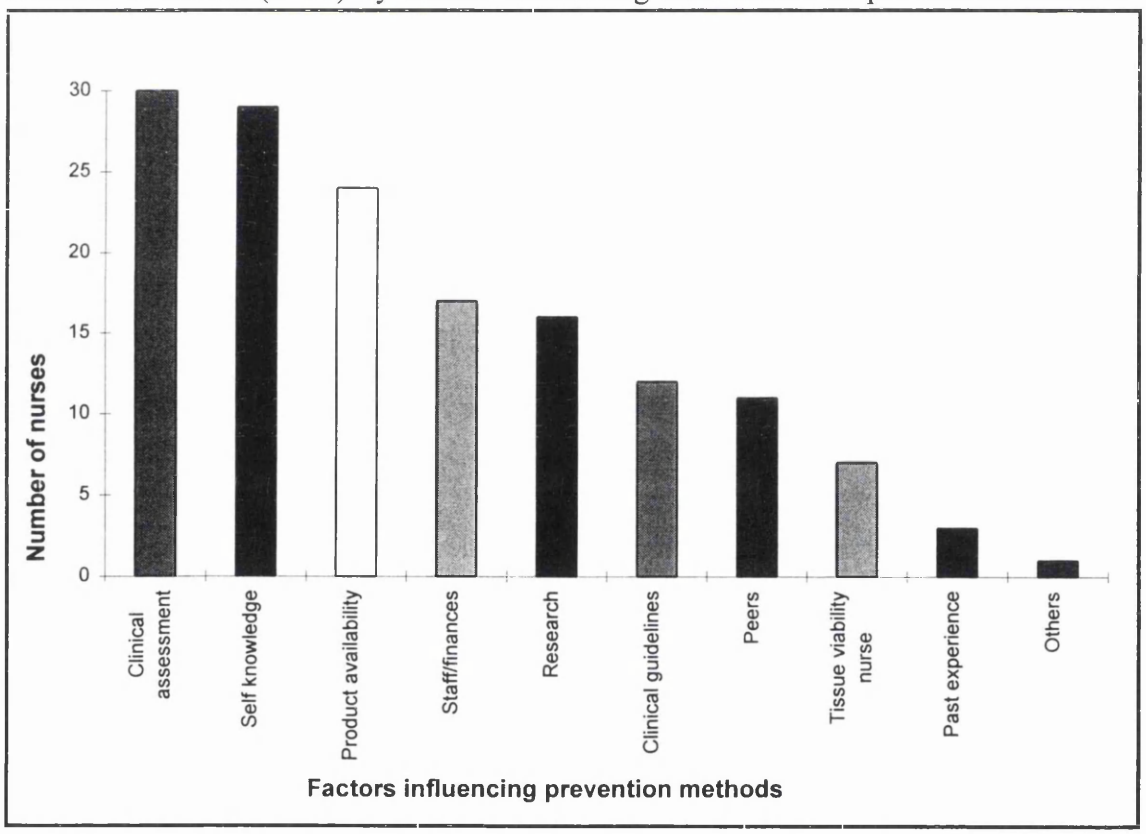
Content of educational sessions	**No. of nurses per session (n=10)**
Wound assessment	9
Wound dressings	9
Pressure sore risk assessment	7
Pressure sore classification scales	7
Pressure sore preventative aids	3
Pressure sore prevalence	1

4.2 Pressure sore prevention

4.2.1 Factors influencing choice of prevention methods

Respondents were asked to indicate which factors influenced the pressure sore prevention methods they chose to use. As shown in Figure 1, all respondents (n=30) reported that clinical assessment influenced the methods they used to prevent pressure sores and almost all (n=29) stated that their own knowledge did so also. On statistical advice an overall p value was not calculated as it was not though to be particularly useful. An overall p value would have identified whether differences were significant but would not have identified where the differences were.

Figure 1
Number of nurses (n=30) by factors influencing their choice of prevention methods



Because data were paired, that is the same subjects were rating each factor, McNemar's test (χ^2) was used. Results indicated that clinical assessment and respondents' own knowledge was significantly more likely to influence choice of pressure sore prevention methods than product availability ($\chi^2 = 5$, $p<0.05$), published research ($\chi^2=13$, $p<0.001$) or any other factor ($p<0.001$).

4.2.2 Methods used to prevent pressure sores

All respondents were asked which methods they would use to prevent pressure sores and for which of the Waterlow risk categories they would use each method. Table 4:5 shows the methods used by respondents to prevent pressure sores, with the number of respondents reporting use of each method as specified by the data collection tool and based on the literature. Responses are grouped into the four categories illustrated in Table 4:5 for ease of reading and according to the literature relating to pressure sore prevention.

Of the 17 different prevention methods in use, most were aimed at reducing pressure by utilising equipment, increasing patient activity or educating patients on pressure sore prevention.

Table 4:5
Methods used to prevent pressure sores and number of nurses (n=30) reporting use of that method.

Equipment		**Activity**		**Nutrition**		**Skin care**	
specialised bed	30	mobilisation	30	nutritional support	28	barrier cream	20
seating system	25	position change	30	referral to dietician	25	film dressing	2
foam wedge/trough	6	patient education	29			skin observation	6
heelmuff	6	referral to physio	23			rubbing heels	1
water filled gloves	5	monkey pole	3				
sheepskin (natural)	4						

On comparing the level of risk (Waterlow criteria) for which respondents used each method, it was clear that respondents used most pressure sore prevention methods for all patients identified at risk of pressure sores, regardless of the Waterlow risk score obtained. However, most respondents (n=27) reserved the use of specialised beds/mattress replacements for patients with a Waterlow score ≥ 15 (high risk). Only a few respondents (n=3) said they used specialised beds/mattress replacements for patients with a lower Waterlow score. Also, of the respondents who used specialised seating systems (n=25) to prevent pressure sores, more than half said they used them only for patients with a Waterlow score ≥ 15.

Most respondents (n=28) said they provided nutritional support, that is assisted patients to eat and/or provided food supplements to reduce pressure sore risk and many (n=25) said they utilised the services of the dietician. However, two said they did not take account of the patients' nutritional requirements at all when planning a pressure sore prevention strategy.

It is to be noted that some of the methods used as preventative measures were likely to have been ineffective and possibly harmful. For example one respondent "rubbed heels" to improve circulation and some (n=5) said they relieved pressure on the patient's heel by placing water filled gloves below the heel. Interestingly, comments such as *"yes but I thought we weren't supposed to use that method"* from those who used water filled gloves suggest the users were aware it was not good practice. Unfortunately, the structured interview schedule did not permit exploration of why respondents used water filled gloves when they appeared to know the practice was not recommended.

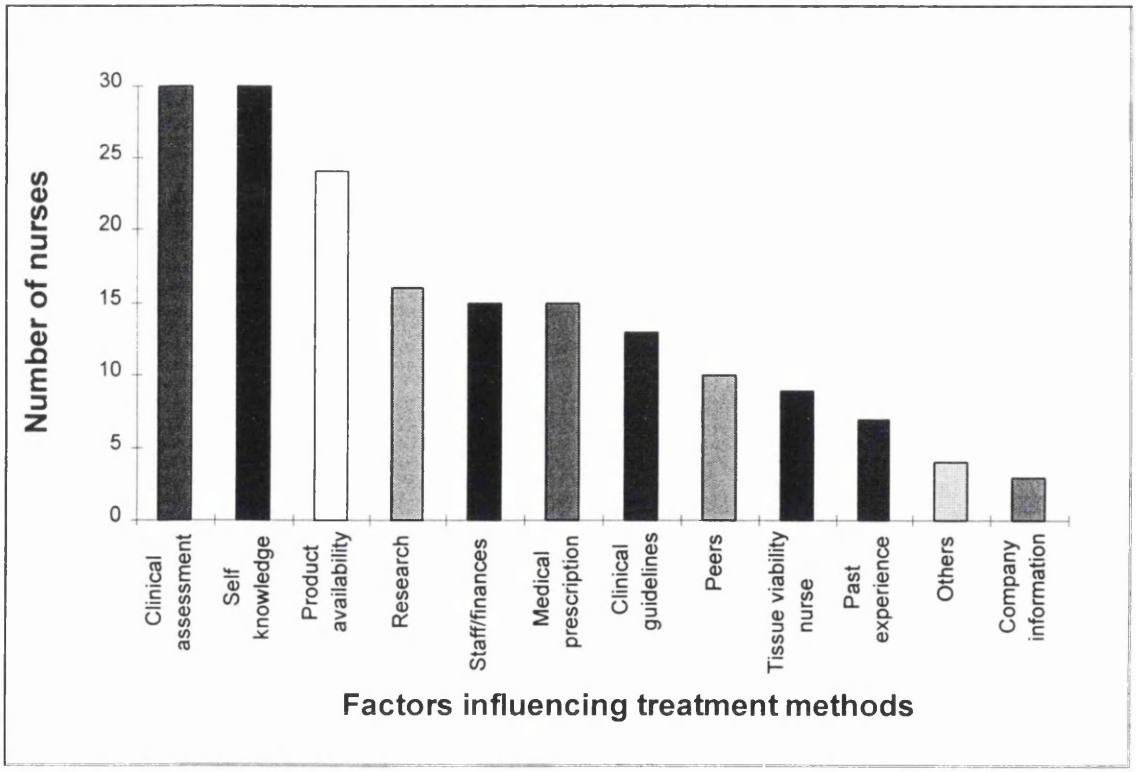
4.3 Pressure sore treatment

4.3.1 Factors influencing choice of treatment methods

Respondents were asked to indicate which factors influenced their decision regarding the methods they used to treat pressure sores. McNemar's test (see section 4.2.1) was used to determine if the proportion of respondents influenced by each factor differed significantly.

All respondents reported that clinical assessment and their own knowledge influenced their treatment decisions. However, many (n=24) were also influenced by product availability. With the exception of clinical assessment and self-knowledge, product availability was significantly more likely to influence respondents' treatments decisions than other factors ($p<0.001$). As shown in Figure 1, only half of the respondents said that research influenced their treatment decisions while less than half were influenced by clinical guidelines.

Figure 2
Number of nurses by factors influencing their choice of treatment methods



Respondents who did not consider product availability to be influential (n=6) suggested that treatments were "always available" or that they could "*get it* [the preferred treatment] *from somewhere*".

Only half (n=15) of the respondents reported that medical prescription influenced their treatment decisions. However, during the interview, and without prompting, respondents provided information which suggested that the way in which medical prescription influenced treatment varied across units. For example, in dermatology where chronic skin problems were commonplace, applications to the skin were necessarily constrained by medical diagnosis whereas in other units treatment decisions were made jointly by medical and nursing personnel, or by nursing personnel alone. In one unit the Consultant decided treatment and expected nursing staff to comply. The manner in which respondents handled this latter situation at times when they believed the Consultant's decision to be erroneous, is discussed in Chapter Five.

4.3.2 Methods used to treat pressure sores

Respondents were asked which methods they used to treat existing pressure sores. A total of 33 strategies were used. One third (n=13) of these were aimed at reducing pressure by utilising equipment or increasing patient activity and a few (n=3) were aimed at improving the patient's nutritional intake. All other pressure sore treatments consisted of applying pharmaceutical products to the skin.

When each method was compared to the stage(s) of sore (SPSSS) for which it was used, it was clear that respondents used most treatments for all patients regardless of the severity of sore. The exception to this was the use of a specialised bed/mattress; only a few respondents (n=5) used a specialised bed/mattress regardless of severity of sore. Most retained their use for patients with a pressure sore ≥ stage 2 (n=15) or ≥ stage 3 (n=9).

Table 4:6 shows the methods used to reduce pressure by utilising equipment, increasing patient activity and improving the patient's nutritional intake with the number of respondents who reported using each method. Responses are grouped into the four categories illustrated in Table 4:6 for ease of reading and based on the literature available at the time of the study.

Table 4:6
Methods used to treat pressure sores (non-applications) by number of nurses (n=30) using each method.

Pressure reducing equipment		**Activity**		**Nutrition**	
specialised bed	3	mobilisation	30	nutritional support	29
seating system	2	position change	30	referral to dietician	29
foam wedge/trough	3	patient education	29	vitamin supplements	2
heelmuff	5	referral to physiotherapist	26		
water filled gloves	4	pillows	5		
sheepskin (natural)	4	30° tilt	1		
patients own equipment	1				

On comparing the treatments illustrated in Table 4:6 with pressure sore prevention methods (Table 4:5) it is clear that many were considered by respondents to be appropriate for both prevention and treatment. The point at which one becomes the other is discussed in Chapter Five.

4.4 Applications to the skin and severity of sore

Respondents were asked to indicate what products they would use to treat pressure sores and for what stage(s) of sore they would use that product. Despite the fact that most respondents restricted the use of a particular application to pressure sores of a specific stage(s), there was little consistency regarding what products would be used in relation to severity of sore, as defined by the SPSSS, for which it was used. A few respondents used some products for all pressure sores whereas a few did not use some products at all. A statistician confirmed that in such circumstances, statistical tests were not appropriate.

Table 4.7 lists the applications used (column 1), the number of respondents using the application to treat pressure sores of stage ≤ stage 2 (column 2) and the number using the application to treat pressure sores ≥ stage 3 (column 3).

Table 4:7
Skin applications used to treat pressure sores by number of nurses (n=30) reporting use of that application in relation to severity of sore (SPSSS).

Application used		Number of nurses using application	
		≤ stage 2	stage ≥ 3
Barrier cream	(all types)	16	5
Dry dressing	• gauze swab	4	0
	• film	3	4
Iodine products	• betadine	9	2
	• iodine dressing	12	2
Foam	• polyurethane	18	10
	• cavity	0	16
Hydrocolloid	(all types)	10	13
Alginate	(all types)	0	28
Hydrogel	(all types)	0	30
Others	• flamazine[t]	1	2
	• varidase/hyoxil[t]	1	4
	• proflavine[t]	2	5
	• caustic pencil	1	0

[t] methods proposed by respondent, not prompted by the interview schedule

Most products were applied to pressure sores of all stages. However, alginate, hydrogel and cavity foam were used solely for pressure sores ≥ stage 3 whereas the application of barrier cream, polyurethane foam, betadine, and iodine was more popular for pressure sores ≤ stage 2.

As well as the treatments listed in Table 4:7, many respondents (n=22) said they would 'expose' pressure sores ≤ stage 2 and a few (n=4) confirmed they would debride more severe pressure sores using scissors and a scalpel. Unfortunately, the use of a structured interview schedule did not permit the researcher to ask respondents if they were trained to debride pressure sores in this way or if they required the Consultant's permission to perform the procedure.

4.5 Use and perception of the Waterlow Risk Assessment Scale

During the structured interview, respondents were asked to state if they used the WRAS and whether they found it useful. All respondents (n=30) stated that they used the WRAS. More than half (n=18) found it 'useful', while one third (n=10) found it useful to some extent. Only two nurses stated that they did not find the WRAS useful at all. A probe was used to explore the responses given. Responses were classified into four categories: assessment, planning, implementation and evaluation (see section 3.11).

4.5.1 Assessment

A number (n=8) of respondents felt that the WRAS identified patients who were at risk of pressure sores but did not appear to be so and *"might otherwise have been missed"* (R11). A few (n=3) respondents said they thought the Waterlow scale acted as a prompt for assessment; for example it encouraged one to '*stop and think*' (R12). Nevertheless, identification of risk was not always considered to be an effective way of ensuring appropriate care. This was evidenced by the comments of one respondent who reported that patients identified as at risk of pressure sore(s) were in danger of being overlooked because the assessing nurse would not necessarily be the one caring for the patient.

Some (n=6) respondents thought the WRAS to be subjective and therefore of limited use. The assigned score was said to be nurse-dependent; for example, it was reported that "*there is a lot of error in its* [WRAS] *use*" (R4); or "*it is useful if it is done properly; some patients are scored higher than need be* " (R14); or "*if it is used properly you can see the changes*" (R9). Others (n=3) stated that the patient's physical condition was not always scored accurately and that "s*ome nurses* [did not] *document skin rash* or "*previous MI*" [Myocardial Infarction] (R10). Interestingly, comments regarding misapplication of the WRAS arose solely from nurses working within the surgical unit (see section 5.3.1).

Some respondents from both the medical (n=5) and surgical (n=2) units believed they could assess patients without using the WRAS and considered their own professional judgement to be more accurate than the Waterlow score. This was evidenced by comments such as: '*it* [WRAS] *is a false reading*'; "*you can tell if the patient* [is] *at risk by looking at them*" (R1); or "*it* [WRAS] *is deceiving*; *a high score does not always mean the patient is at risk and vice versa*" (R3). Only one nurse from the total sample believed the Waterlow scale to be accurate. Although a few (n=3) respondents thought the Waterlow categories needed to be "refined", none offered any suggestion as to how this could be done.

4.5.2 Planning care

In the main, few respondents appeared to use the WRAS to plan patient care. Only one stated that the Waterlow score helped her determine how often pressure area care was required. Rather, most comments related to the way in which the WRAS improved recorded keeping; for example, it "*improve*[d] *documentation*" (R11) and made "*others aware that pressure area care was part and parcel of patient care*" (R4).

4.5.3 Implementing care

All respondents saw the WRAS as a way of helping them to acquire the use of a special bed. Most respondents believed a high risk score was necessary to justify the use of specialised equipment. Some (n=6) reported the WRAS to be used solely for the procurement of a special bed or mattress. Comments such as, *"if the score is high you can get a bed before the skin breaks"* (R2), *"a high score helps back the need for a bed"* (R18) and *"over 20 will justify a bed"* (R15) reinforce this point. In some instances the relationship between Waterlow score and resource allocation seemed to be linked to the philosophy of the ward or that of the nurse-in-charge. For example, one respondent (R15) reported that s(he) often altered the score to procure a special bed if s(he) felt the patient was not scoring sufficiently high to justify one while another (R29) said that staff were sometimes instructed to *"mark down"* the score to reduce the number of special beds required.

4.5.4 Evaluating care

Only a few (n=3) respondents made reference to the WRAS in relation to changes in the patient's health status. Two respondents thought that the WRAS helped them *"keep a check"* (R8) on the patient's condition by identifying changes and providing *"an update"* of the patient's progress (R5), while another (R21) said s(he) she considered the review date to be helpful *"if kept to"*. However, in general, the WRAS did not seem to be perceived by respondents as a useful tool for monitoring changes in the patient's condition.

4.6 Use and perception of the Stirling Pressure Sore Severity Scale

Respondents were asked to state if they used the SPSSS and whether they found it useful. Most respondents (n=29) used the SPSSS (Reid and Morrison 1994) to classify pressure sores. Most (n=26) found it useful or useful to some extent. A few (n=4) respondents did not find the SPSSS at all useful. A probe was used to explore the responses given. As with probes relating to the WRAS, responses were classified under the headings: assessment, planning, implementation and evaluation (see section 4.5).

4.6.1 Assessment

Many respondents thought the SPSSS classification system helped convey the severity of the sore, without the need to expose the wound unnecessarily. This was seen as particularly useful by respondents when they returned to work following days off. However, while the SPSSS was said to be "*good at handovers*" (R22) and a "*standard measure*" (R3) encouraging everyone to speak "*the same language*" (R11), some respondents (n=6) did not think it enabled them to classify pressure sore(s) appropriately. This was evidenced by comments such as "[*you*] *are forced to grade higher or lower than you wish*" (R12) and " *it is no use when the skin is black but it is ok* (intact); *there is no criteria for this*" (R6).

4.6.2 Planning care

Only two respondents made comments which suggested that the SPSSS helped them plan care. One respondent referred specifically to the usefulness of the SPSSS poster which was displayed on the ward. Another stated that the SPSSS helped her/him see the intervention required "*even before the patient* [*is*] *seen*" (R27). The possible consequences of planning treatment on the basis of a classification score without assessing skin status is discussed in Chapter Five.

4.6.3 Implementing care

A few respondents (n=4) seemed to see the value of the SPSSS in the way it could be used to 'prove' that the sore had developed before the patient was transferred or admitted to their ward and had not developed as a consequence of poor nursing care within their own ward. Thus the perceived benefit of the SPSSS classification system appeared to be linked to the legal and professional issues associated with documentation of patient care. This was evidenced by comments such as "*it covers you;* "*it is good when the patient* [is admitted] *with a sore*" (R6) and *"it is good for documentation purposes only"* (R4). One respondent stated that the SPSSS was only used to justify requests for special beds (R11).

4.6.4 Evaluation

While some respondents (n=5) seemed to use the SPSSS to monitor the progress of pressure sores, comments such as "*it shows where it has got worse*" (R1); " *you can assess if it has got worse or better*" (R14); "*it is an indicator of improvement or deterioration*" (R24) indicate that reverse staging was not uncommon.

4.7. Documentation of prevention and treatment strategies

During the structured interview schedule and in anticipation of the Phase II document analysis, all respondents were asked if they documented in the patient record the pressure sore prevention and treatment methods they used, and whether their response applied to 'always' 'sometimes' or 'never'.

4.7.1 Documentation of treatment measures

All respondents reported that they did document all the pressure sore treatment measures they used and that they always did so.

4.7.2 Documentation of prevention measures

Most (n=23) respondents confirmed that they documented all the pressure sore prevention measures they used. However one third (n=10) of respondents did so only 'sometimes' while a few (n=4) never documented the preventative methods they used. Respondents were probed to explore why prevention methods were not documented, or only 'sometimes' documented. The reasons given for not always documenting preventative care were in the main related to pressure of work and the belief that not everything needed to be written down.

Some respondents stated that preventative care would not be documented when there was *"insufficient time"* (n=4) or *"interruptions and distractions"* (n=4) or "*when pressure sore prevention* [*is*] *low priority*" (n=1) in relation to other demands. Another stated that s(he) would not document preventative action if s(he) anticipated the patient's length of stay to be short. Some respondents (n=6) attributed the lack of documentation to the fact that many pressure sore preventative methods were used routinely on a daily basis and were not specific to individual patients. Another said s(he) 'be'- "*grudged writing*" and assumed other nurses would know what to do and therefore s(he) "*took short cuts*". On one occasion, failure to document care was attributed to the documentation system itself by one respondent who said s(he) could not "*always find the appropriate sheet*" on which to record the information.

4.8 Phase II: Retrospective document analysis

Case notes were pulled as described in section 3.10.2 to procure a representative sample of patient records pertaining to individuals identified as at risk of pressure sores. Missing data indicates the case notes which had no record of the patient's age during the time period concerned (n=12) and where length of stay could not be ascertained but was more than 24 hours therefore could be included in the study (n=39).

According to patient records, two thirds of the patients identified as at risk of pressure sores were female, and as can be seen from Table 4.8, 70% (n=219) were at least 65 years of age. Table 4.9 demonstrates that 66% (n=189) had been hospitalised for at least seven days.

Table: 4.8
Patient age by number and % in each age group.

Age	(n=315)	%
14-49	43	(13.7)
50-64	53	(16.8)
65-74	82	(26)
75-80	68	(21.6)
> 80	69	(22)
Total	315	100

missing data =12

Table: 4.9
Length of patient stay in days by number and % in each group.

Length of stay (days)	(n=288)	%
< 7	99	(34.4)
7-14	90	(31.2)
15-27	66	(22.9)
28 - 41	21	(7.3)
42 +	12	(4.2)
Total	288	100

missing data =39

4.9 Association between Waterlow score and severity (SPSSS) of sore

Most studies (Gosnell 1973; Goldstone 1982; Waterlow 1985; Lincoln et al 1986; Harrison et al 1996) have used admission score to determine the association between pressure sore risk score and the subsequent development of pressure sores. However, Braden et al (1987[b]) pointed out that in areas where the patient's condition alters, using an admission score to determine pressure sore risk status may be inappropriate.

Therefore, to accommodate changes in the patient's condition, the highest Waterlow score and the highest SPSSS score documented over three separate occasions were used in analysis (see section 3.7). Where more than one pressure sore was recorded for an individual patient, the highest classification was used.

Skin status was not documented in any way in 85 (57.4%) medical patient records and 14 (7.8%) surgical patient records. It is unclear whether classification of skin status was omitted only when skin was intact. There was no way to confirm or refute this. Consequently, these (n=99) were excluded from analysis. Two further records were excluded due to a data collection error. Therefore, 226 patient records were analysed and 101 excluded for the above reasons.

A Spearman's correlation co-efficient was used to determine the association between Waterlow risk score and severity of sore. A moderate correlation (rs=0.46), ($p<0.001$) was detected. As the Waterlow score increased, the proportion of patients with a pressure sore increased and severity of sore increased.

Table 4:10 reports patients' skin status as classified by the SPSSS according to their level of risk as defined by Waterlow's risk categories.

Table 4:10

Severity of sore by Waterlow risk score and number of pressure sores (%)

	Waterlow Risk Score							
Severity of sore (SPSSS)	**10-14** (at risk)		**15-19** (high risk)		**20+** (very high risk)		**Total by severity of sore**	
	n	%	n	%	n	%	n	%
0	77	(92)	48	(76)	33	(42)	158	(70)
1	3	(3.6)	8	(13)	13	(16.5)	24	(10.6)
2	2	(2.4)	5	(7.9)	23	(29)	30	(13.3)
3	1	(1.2)	2	(3.1)	6	(7.6)	9	(4)
4	1	(1.2)	0	(0)	4	(5)	5	(2.2)
Total per risk score	84	(100)	63	(100)	79	(100)	226	(100)

Almost all patients with a pressure sore belonged to Waterlow's 'very high risk' (n=46) or 'high risk' (n=15) category. Only a few (n=7) belonged to Waterlow's 'at risk' category. Nevertheless, most (70%) (n=158) patients identified by the WRAS to be at risk of pressure sores remained pressure sore free.

4.9.1 Management of pressure sores and severity of sore

Data from all patient records with a documented SPSSS score (n=228) were used to ascertain the number and type of products being applied to pressure sores. However, only those which classified the pressure sore(s) consistently over three separate occasions (see section 4.9) (n=34), were used to determine the type of products used in relation to the severity of sore for which they were used. Table 4:11 illustrates the type of products used and the stage of sore(s) to which they were applied. More than one product could be in use at a time on a pressure sore.

Table 4:11
Applications used to treat pressure sores and severity of sore (SPSSS) for which they were used

	Severity of sore (SPSSS)			
Skin application	**Stage 1** (n=15)	**Stage 2** (n=13)	**Stage 3** (n=5)	**Stage 4** (n=1)
Dry dressing (gauze swab)		•	•	
Film dressing	•	•	•	•
Barrier cream	•	•	•	
Polyurethane foam	•	•	•	
Betadine	•	•	•	
Iodine dressing		•	•	
Hydrocolloid		•	•	
Hydrogel		•	•	
Alginate		•	•	
Medicated tulle (bactigras)		•		•
Cavity foam		•		
Parrafin gauze			•	
Hydrogen peroxide			•	

The number of applications used (n=13), in relation to the number of pressure sores treated precluded statistical analysis. Therefore the association between product type and severity of sore could not be determined. It is likely that on some occasions appropriate treatment necessitated the use of more than one product. However, the number and type of treatments used for individual patients with only one pressure sore suggest that treatments were often changed from one type of product to another for no obvious reason. As illustrated, only a few (n=4) products were used to treat stage 1 pressure sores. A greater selection were applied to pressure sores of stage 2 and to pressure sores of stage 3 with most products being applied to both stage 2 and stage 3 pressure sores.

4.10 Association between Waterlow score and management of care.

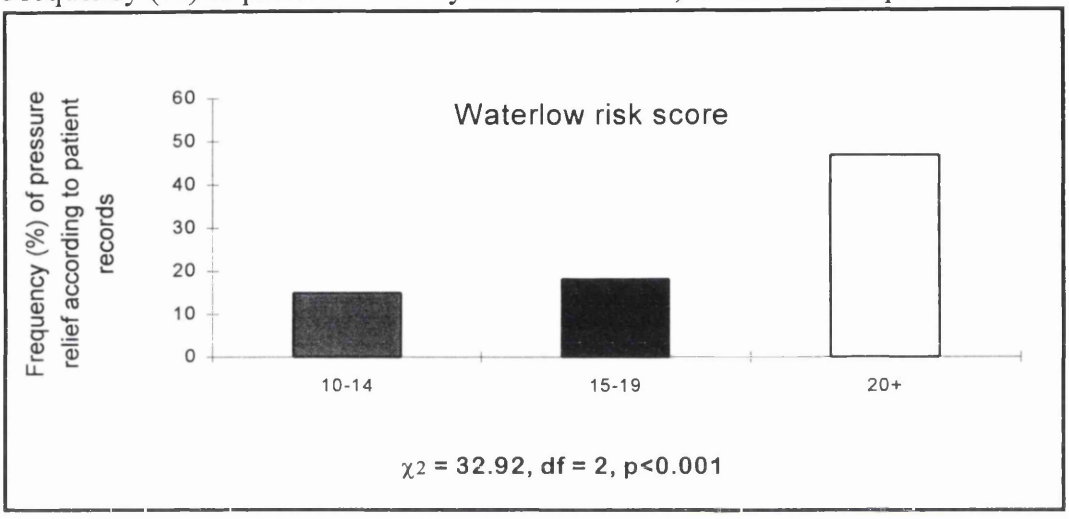
All patient records with a documented Waterlow risk score ≥10 were reviewed to determine if there was an association between Waterlow risk score and management of care. Where Waterlow risk score changed over time (see section 4.9), the highest score was used. As noted before, two patient records were excluded due to a data collection error. Therefore 325 patient records were included in analysis. A chi-square was used to test the association between Waterlow risk score and pressure relief, Waterlow risk score and patient education and Waterlow risk score and mobilisation.

4.10.1 Association between Waterlow risk score and pressure relief

According to patient records, approximately one quarter of patients (n=80) at risk of pressure sores were provided with pressure relief. A highly significant relationship between Waterlow risk score and pressure relief was detected. The higher the patient's risk score the more likely they were to receive pressure relief (χ^2=32.9, df =2, p<0.001). Patients with a risk score ≥ 20 (very high risk) were more than twice as likely to receive pressure relief than those with a lower risk score. However, as

illustrated in Figure 3, even when patients were identified to be at 'very high risk', less than half of them received any pressure relief.

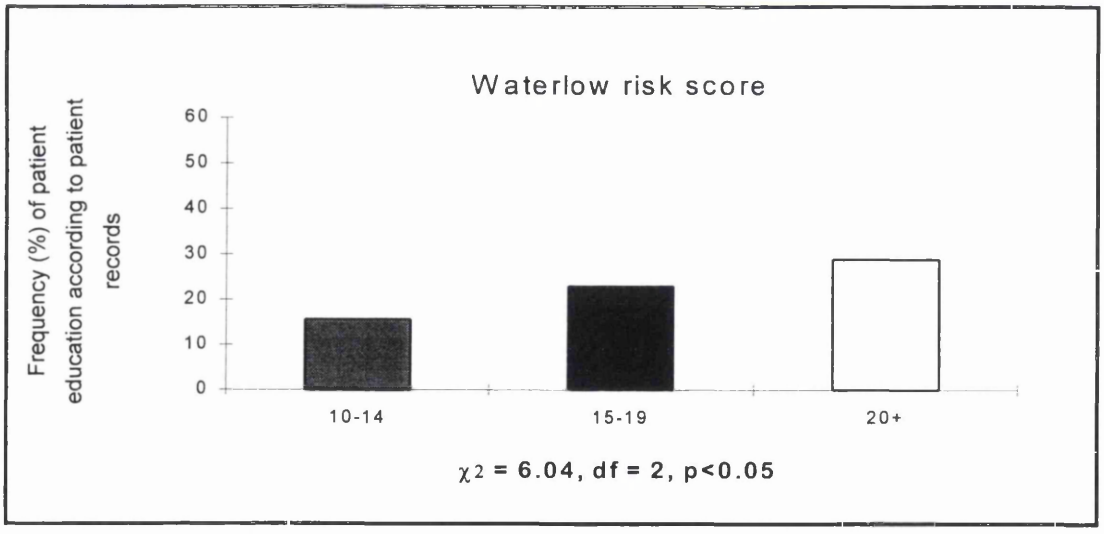
Figure 3
Frequency (%) of pressure relief by Waterlow score, as indicated in patient records.



4.10.2 Association between Waterlow risk score and patient education

A significant relationship was detected between risk score and patient education. According to patient records, and as can be seen in Figure 4, the higher the patient's Waterlow score the more likely they were to receive education on the prevention of pressure sores (χ^2=6, df=2, p<0.05).

Figure 4
Frequency (%) of patient education by Waterlow score, as indicated in patient records.



Patients with a risk score of ≥ 20 (very high risk) were twice as likely to receive education than those with a score of 10-14 (at risk). However, less than one quarter (22%) (n=70) of those 'at risk' and less than 30% at 'very high risk' received education on pressure sore prevention.

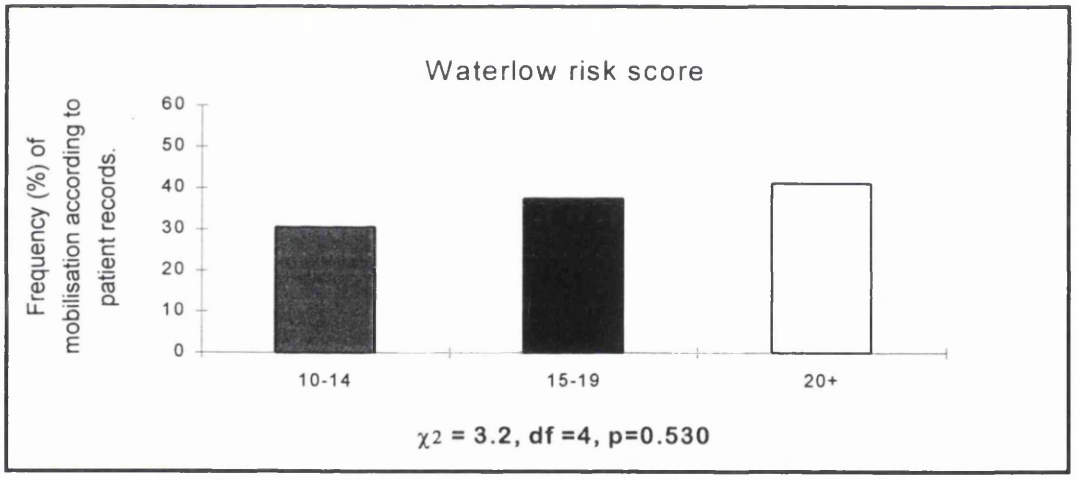
4.10.3 Association between Waterlow risk score and mobilisation

The relationship between Waterlow risk score and mobilisation was not significant (χ^2=3.2, df=4, p=0.530). Regardless of risk score, less than half (40%) (n=130) of the patients with a Waterlow score which indicated they were at risk of pressure sores were assisted to mobilise.

Figure 5 illustrates the frequency with which patients were assisted to mobilise according to each of Waterlow's risk categories.

Figure 5

Frequency (%) of mobilisation by Waterlow score, as indicated in patient records.



It is likely that some patients did not require pressure relief and others were too ill to mobilise or benefit from preventative education. However, on comparing the results from Figures 3-5 it is clear that, according to patient records, some patients with a Waterlow score of 10-14 (at risk) or 15-19 (high risk) did not receive any of the three preventative measures investigated. In order to determine the number of patients in this category, further analysis of the data was undertaken. This revealed that almost

half (n=137) (42%) of the patients identified to be at risk of pressure sores did not receive either pressure relief or mobilisation or education. While most of the patients in this position were in Waterlow's 'at risk' category (n=75) many were identified as 'high risk' (n=40) or (n=22) 'very high risk'.

4.11 Care plan type and management of patient care

Two different methods of nursing documentation routinely used throughout the Trust were compared (see section 3.3) to determine if nursing teams using a 'pressure sore care plan' (PSCP) managed the prevention and treatment of pressure sores more systematically than nursing teams who used a 'standard care plan' method. A chi-squared test was used to determine if there was an association between: care plan type and provision of pressure relief; care plan type and mobilisation; and care plan type and patient education. Due to a data collection error, the type of care plan used was not recorded on nine data collection forms. These were excluded from the data analysis. Therefore 318 patient records were used in the analysis of results.

4.11.1 Association between care plan type and prescriptions for care

Significant relationships were found between care plan type and pressure relief (χ^2= 38.3, df=2, p<0.001), care plan type and education (χ^2=40, df=2, p<0.001) and between care plan type and mobilisation (χ^2= 12.1, df=4, p=0.016). As can be seen in Figures 6-8, where a pressure sore care plan was used, prescriptions for pressure relief, education and mobilisation were more likely to exist. Where a standard care plan was used, or where a PSCP was in place but not utilised, prescriptions for pressure relief, mobilisation or education were less frequent.

Figure 6

Frequency (%) of prescriptions for mobilisation by care plan type as indicated in patient records.

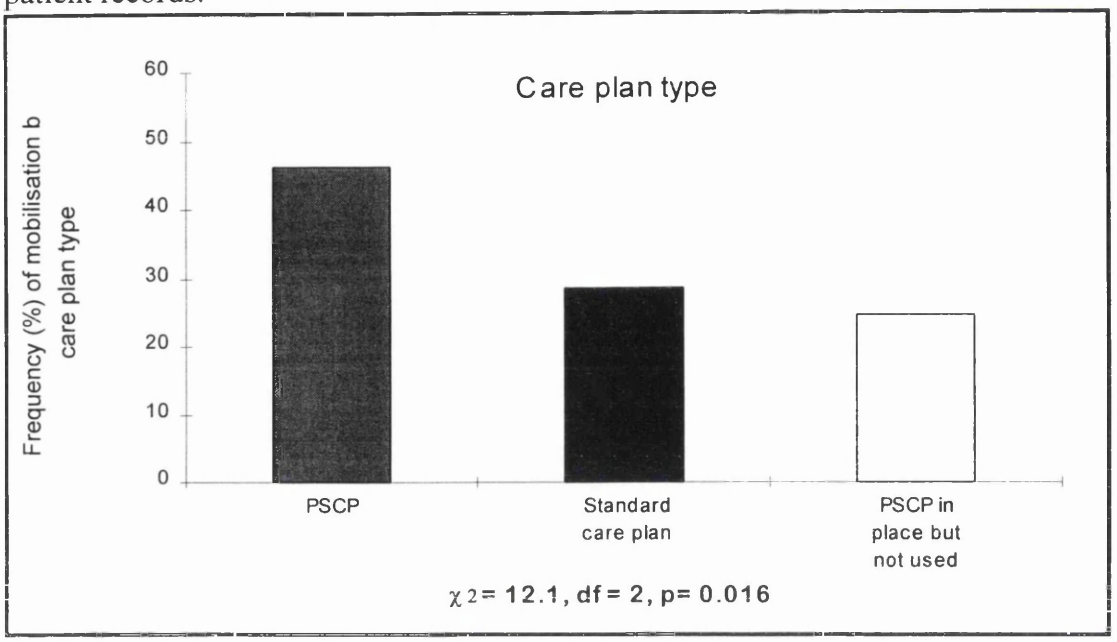


Figure 7

Frequency (%) of prescriptions for patient education by care plan type as indicated in patient records.

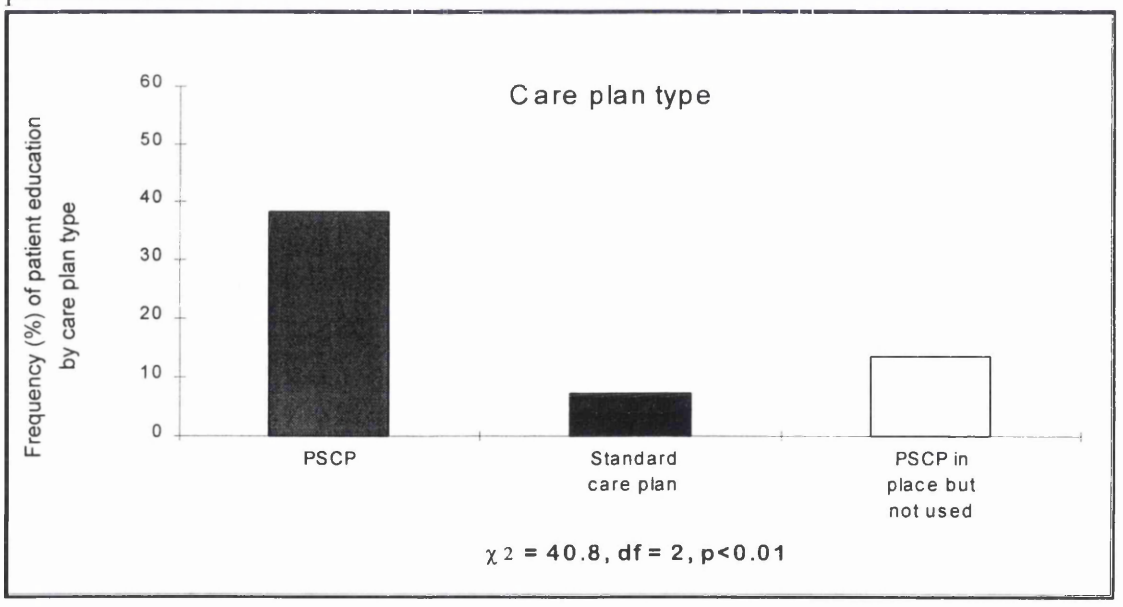
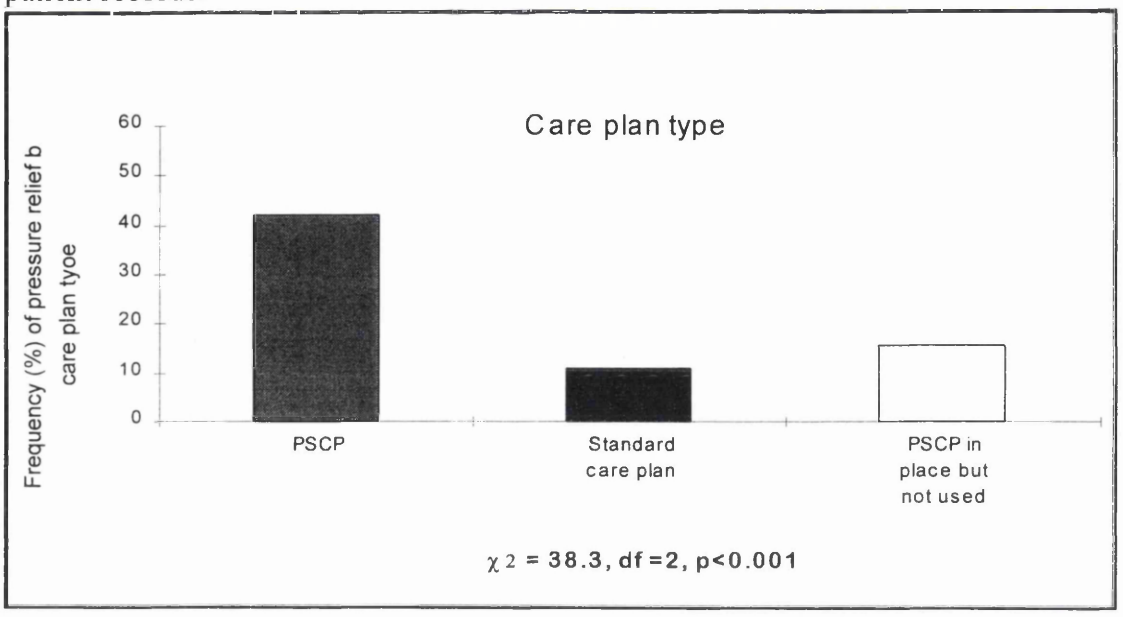


Figure 8
Frequency (%) of prescriptions for pressure relief by care plan type as indicated in patient records.



As discussed in section 4.10.3, it is likely that provision of pressure relief and mobilisation and education were not required by, or appropriate for, all patients at risk. However, further analysis of the data revealed that more than half of the patients with a standard care plan (54%) (n=79) and almost half of those with a PSCP which was not being utilised (45%) (n=19), had no prescription for pressure relief or mobilisation or education. Of those with a PSCP in use, only 20% (n=25) were without such prescriptions for care.

4.11.2 Care plan type and management of identified risk factors

Patient records (n=318) were reviewed to determine if there was an association between care plan type and management of body weight, appetite, continence, and skin status; four of Waterlow's risk criteria. A total of seven permutations were developed from the pilot study. Each patient record was examined to determine which of the seven categories applied. The categories used were as follows:

- problem identified and appropriate care plan exists;
- problem identified and planned for by another heath care professional;
- problem identified but care planned inappropriately or inconsistently in relation to the problem;
- no problem identified and no plan of care for an unidentified problem exists;
- problem identified but no plan of care to take account of the problem;
- no problem identified but written plan of care exists for unidentified problem;
- no problem identified but problem planned for by another heath care professional;

The spread of data across these variables did not permit the use of a chi-squared test. Therefore, in order to facilitate statistical analysis, and on statistical advice, data were aggregated into the three categories described below and re-analysed:

1. problem identified and care planned to take account of that problem.
2. problem identified but care planned inappropriately or inconsistently in relation to the problem.
3. problem identified but no plan of care exists to take account of the problem.

However, aggregation of the data from seven categories into three categories still did not permit the use of statistical tests for three of the four criteria being investigated. Further aggregation of the data would have resulted in data which was meaningless. Therefore, frequency tabulations are used to illustrate results.

Due to a data collection error, the type of care plan used was not identified for nine patient records. Consequently, the numbers used in analysis vary according to the criterion being investigated and are provided in each section.

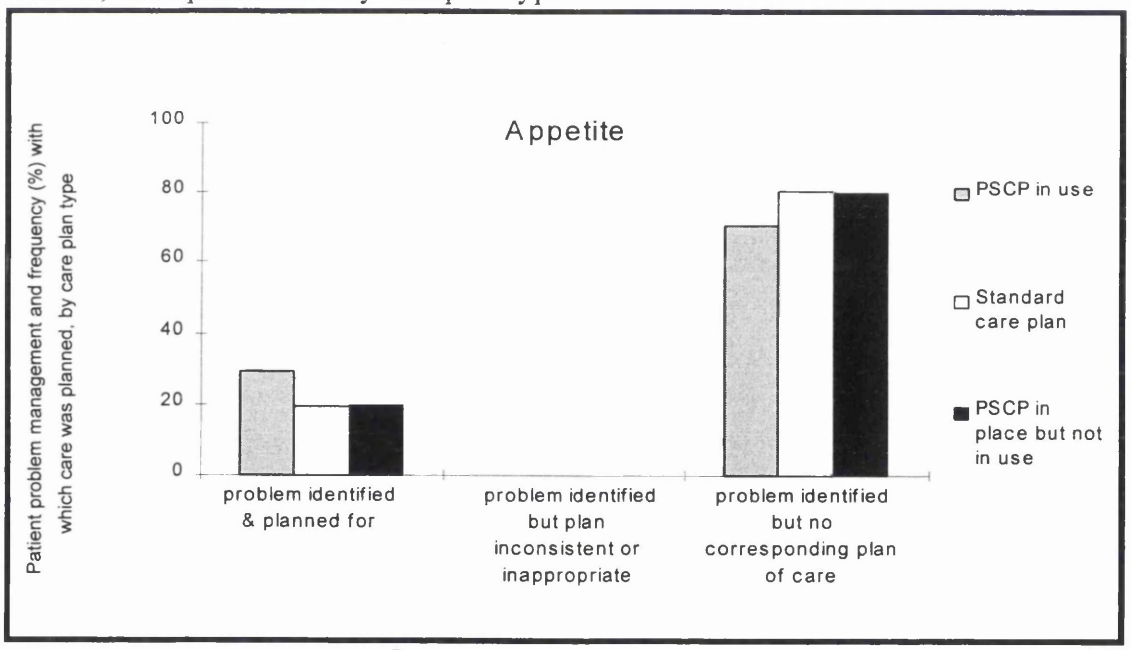
4.11.3 Care plan type and management of appetite

Just over half (n=167) (51%) of the patient records reviewed identified 'appetite' on the WRAS as a risk factor for the patient concerned. According to patient records, some patients (n=20) had the problem addressed solely by a member of the medical team. These patient records were excluded from analysis when data were aggregated (see section 4.11.2). A further six records were excluded due to the data collection error described earlier (see section 4.11). Therefore, 141 patient records were used in analysis.

There was no association between care plan type and management of appetite (χ^2=1.75, df=2, p=0.417). Furthermore, as can be seen in Figure 9, more than 70% of the patients who had 'appetite' identified as a problem on the WRAS had no associated plan of care. Despite the use of a PSCP, problems associated with 'appetite' were rarely planned for.

Figure 9

Frequency (%) with which problems associated with 'appetite', as identified on the WRAS, were planned for by care plan type



χ^2 = 1.75, df=2, p = 0.417

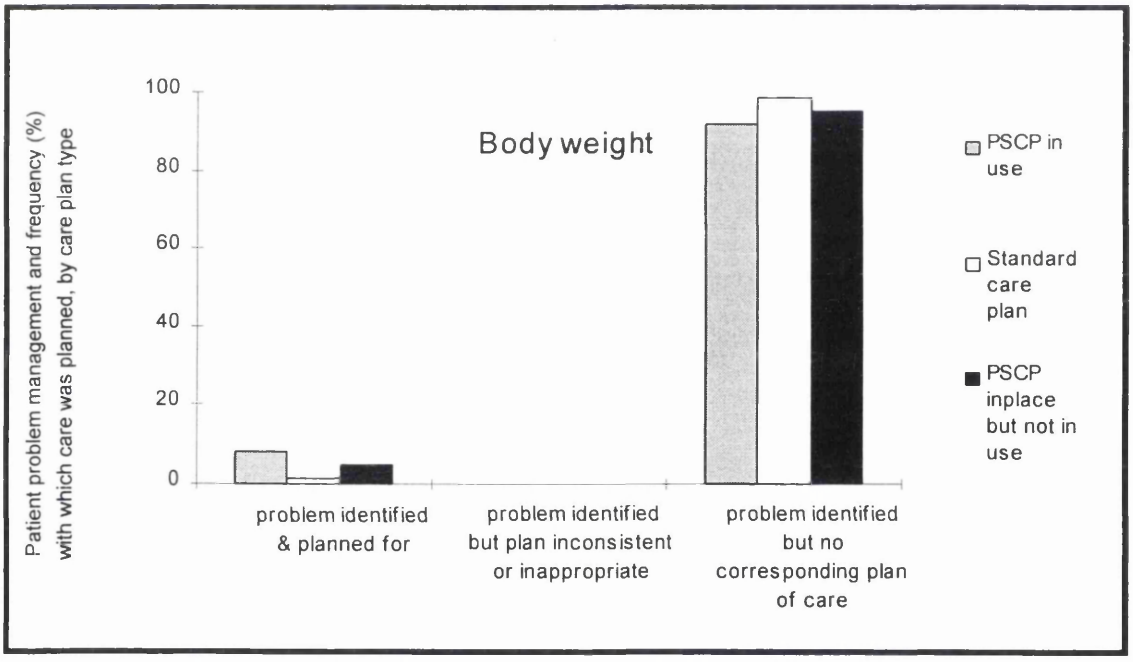
4.11.4 Care plan type and management of body weight

Just over half (n=167) (51%) of the patient records reviewed identified 'build/weight for height' (above or below average weight or obesity) as a risk factor for the patient concerned. Approximately half (n=75) of these patients also belonged to the group described in section 4.11.3. Seven patient records were excluded from analysis due to the data collection error previously described (see section 4.11). Therefore 160 patient records were used in analysis.

As shown in Figure 10, regardless of the type of care plan used, only a few (n=7), (4%) patients who had 'build/weight for height' identified as a problem on the WRAS, had a care plan which addressed the problem.

Figure 10

Frequency (%) with which problems associated with 'build/weight for height', as identified on the WRAS, were planned for by care plan type



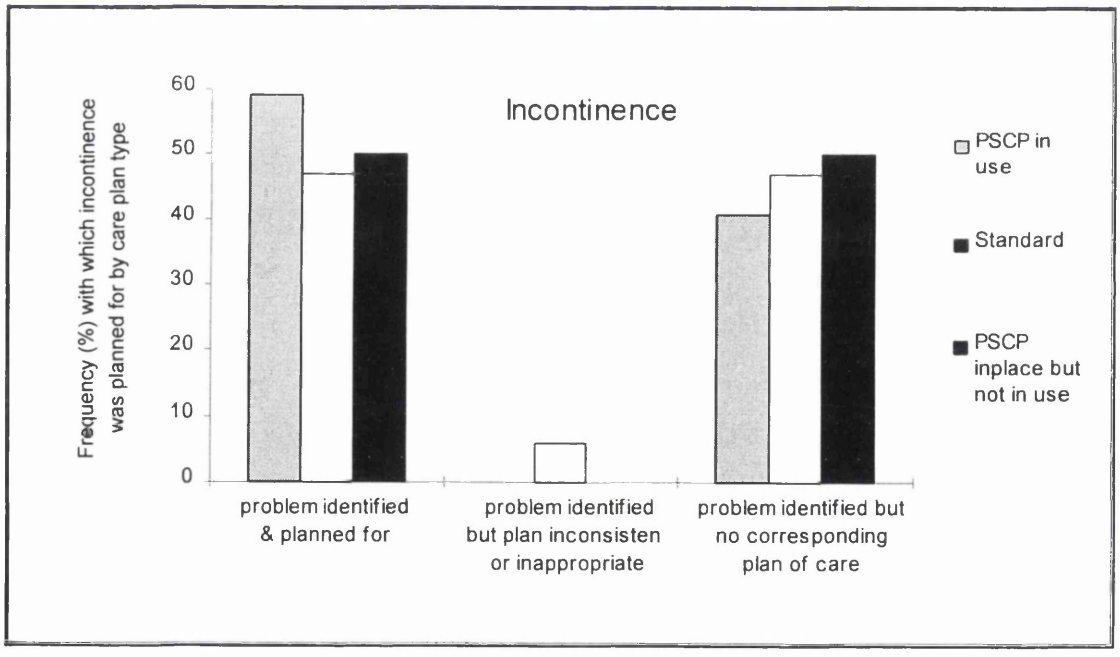
4.11.5 Care plan type and management of incontinence

Ninety two (28%) patient records identified 'continence' as a risk factor for the patient concerned. Some patients (n=20) had the problem addressed solely by a member of the medical team. Consequently these patient records were excluded from analysis when data were aggregated. A further three records were excluded due to the data collection error previously described (see section 4.11). Therefore, 75 patient records were included in the analysis.

As illustrated in Figure 11, almost half (n=36) of the patients identified on the WRAS as incontinent had no associated plan of care. While a few patients (n=5) with a standard care plan also appeared to have a care plan which was inconsistent or inappropriate, it seems that regardless of the type of care plan used, problems associated with incontinence were inadequately planned for.

Figure 11

Frequency (%) with which problems associated with 'continence', as identified on the WRAS, were planned for by care plan type



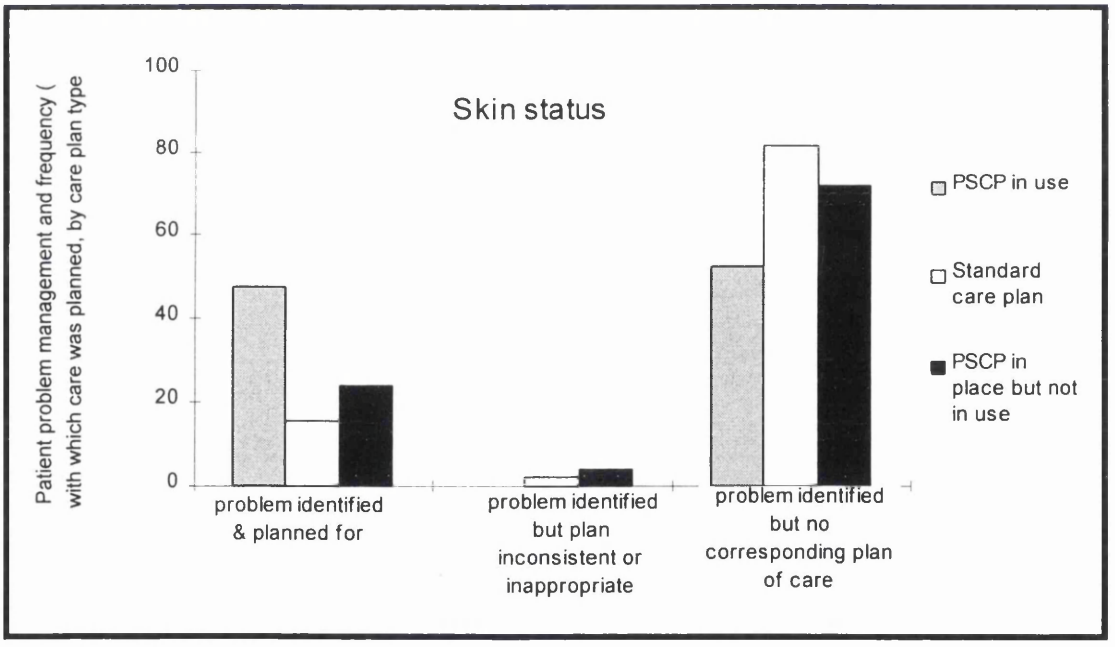
4.11.6 Care plan type and management of skin status

More than half (61%) (n=201) of the patient records reviewed, identified 'visual skin type' as a risk factor for the patient concerned. Again, some patients (n=10) had the problem addressed solely by a member of the medical team. These patient records were excluded from analysis. A further seven were excluded due to the data collection described in section 4.11. Therefore 184 patient records were used in analysis of results.

As shown in Figure 12, more than half (68%) of the patients identified on the WRAS as having a 'visual skin type' problem had no associated plan of care. A few (n=3) also appeared to have a care plan which was inconsistent or inappropriate. Therefore, it seems that regardless of care plan type, even when skin status was identified as a problem, the problem was rarely addressed.

Figure 12

Frequency (%) with which problems associated with 'skin status', as identified on the WRAS, were planned for by care plan type



In addition to the results described in the preceding section which illustrate that many patients had problems which were not planned for, some patients (n=16) were

provided with care for problems which, according to their records, did not exist. For example, some patients were provided with care which suggested they were incontinent.

A chi-squared test was used to determine if there was an association between care plan type and the presence of an evaluation statement. Nine patient records were excluded from analysis due to the problem described previously (see section 4.11). Therefore 318 patient records were included.

The association between care plan type and evaluation of skin status was statistically significant (χ^2=85.16, df=2, p<0.001). An evaluation of skin status was more likely to be present when a PSCP was in use than when a standard care plan was used, or when a PSCP was in place but not being utilised. Nevertheless, even when a PSCP was in use, evaluation of skin status was present only 53% of the time. Furthermore, regardless of the type of care plan method used, evaluation was limited. Only one patient record made reference to surface dimension. None referred to presence or absence of infection, pain, exudate, status of surrounding skin or undermining sinus formation. Evaluation was limited to descriptors such as 'slightly improved', 'discoloured', or 'satisfactory'.

4.12 Summary

The respondents participating in Phase I of this study were employed across a wide range of medical and surgical departments across the Trust. Almost half had been qualified for more than five years. In their capacity as ward-based nurses employed on day duty or on a rotational shift basis, all were responsible for the prevention and management of pressure sores.

The WRAS and SPSSS were used by respondents to assess pressure sore risk and classify skin status. Despite the fact that less than one third of respondents had received any education related to the use of either the WRAS or the SPSSS, most said they found the tools useful, or useful to some extent. While initial responses regarding

the utility of the tools were, in the main, positive, probes revealed some aspects regarding the tools' utility which were both unexpected and illuminating. Respondents' accounts of the way in which the WRAS and SPSSS were used raise some interesting questions concerning the reliability and validity of the instruments. These are discussed in the following chapter.

The methods used by respondents to prevent pressure sores were numerous and were significantly more likely to be influenced by clinical assessment and respondents' own knowledge than any other factor. With the exception of specialised bed/mattress replacements, most preventative methods were used for all patients identified at risk of pressure sores regardless of their Waterlow risk score. Similarly, many pharmaceutical products were used to treat pressure sores of all stages. As with preventative care, respondents' treatment decisions were more likely to be influenced by clinical assessment and respondents' own knowledge than any other factor. However, they were also influenced by the choice of products available and this is likely to have had a notable impact on the treatment decisions they made.

In Phase II, a purposive sample of patient records was used. The patient records represented 327 admissions to, and discharges from, medical and surgical units throughout the hospital and all contained a documented Waterlow score which indicated that the patient concerned was at risk of pressure sores. As such, the sample was representative of the patients cared for within an acute hospital and of the care planning systems in use throughout the hospital.

Chapter Five: Discussion of results

5.0 Introduction

The limitations of the study are discussed first to enable the reader to review the results of the study within the context of its limitations. The null hypotheses are then re-stated and results discussed in relation to each hypothesis. Those pertaining to Hypothesis One are discussed first followed by those pertaining to Hypothesis Two.

5.1 Limitations of the study

The sample procured for use in this study was obtained from a single hospital site and sample size was restricted by the time available to complete the study. Therefore, it cannot be presumed that results can be generalised to all acute hospitals. However, there is no reason to suspect that the acute care hospital in which the study was conducted and the RNs employed within it differed to any great extent from other acute care hospitals.

The data collection instruments used in the study were developed specifically for the purposes of the study. Consequently, validity of the instruments could not be established. In Phase I, the structured interview schedule did not permit the researcher to deviate from the questions asked. However, the use of probes within the structured interview schedule allowed the researcher to explore some of the responses given thus providing more detailed data (see pages 81 and 86-91).

In Phase II, the structured format of the data collection instrument facilitated the transfer of data from patient records with ease. However, in section three, the design of the instrument was found to be too inflexible to easily accommodate data which were not documented according to specific Waterlow risk criteria. Consequently, data relating to section three had to be re-coded prior to data entry resulting in data which were less detailed than anticipated (see section 3.10.2). Nevertheless, some unexpected insight regarding the way nurses utilised the WRAS was acquired (see

section 3.10.2).

Also in Phase II, an assumption was made that what was not documented was not done. Since some respondents reported that they did not always document all the preventative care they provided the assumption may have been inappropriate at times. The use of the structured interview schedule in Phase I is likely to have minimised some of the limitations associated with inadequate documentation. However, it is possible that some pressure sore preventative methods were neither documented nor reported. Also due to inadequate documentation the association between risk score and severity of sore was determined after excluding almost one third of the patient records reviewed. Therefore, results pertaining to the association between risk score and severity of sore must be interpreted with caution (see section 4.9). Furthermore, while care was taken to ensure that all data were collected and processed accurately, the possibility of data errors cannot be excluded.

5.1.1 Limitations of the study in relation to other studies

Many studies have investigated how different pressure sore risk assessment scales perform in relation to sensitivity, specificity and/or predictive value; essential measures of a scale's validity (NPUAP 1989; Bergstrom 1992). However, such studies are generally conducted with a small number of nurses who are specifically trained in the use of the scale and who are aware that a study is being conducted. Consequently, it cannot be assumed that a pressure sore risk assessment scale will attain the same results under everyday circumstances as it does in a research situation. Moreover, Waterlow (1998 personal communication) argues that the WRAS was not designed to predict pressure sore occurrence and that tests which measure the predictive ability of the WRAS are flawed. According to Waterlow, the purpose of WRAS is to indicate when preventative aids are required and to enable nurses to plan nursing care (Waterlow 1992). While no studies have investigated if the original WRAS serves this purpose, a recent study by Cook, Hale and Watson (1999) which investigated the use of an adapted Waterlow scale demonstrated poor inter-rater reliability. Results indicated the need for further research to identify if and under what

circumstances risk assessment tools are effective (Cook et al 1999).

A study by Salvadalena et al (1992) found that even when patients were identified to be at risk of pressure sores they were rarely provided with effective preventative strategies (see section 2.14). However, the main purpose of that study was to compare the predictive ability of the Braden scale to that of clinical judgement. Therefore results cannot be generalised. Furthermore, results were based solely on a review of patient records which are notoriously inadequate (Pieper et al 1990; Preevost 1992; Hale et al 1997).

Preevost (1992) minimised the limitations associated with patient record review by also observing the nursing care provided and found that patients at risk of pressure sores were provided with more preventative care. However, in Preevost's study nurses providing preventative care were doing so solely on the basis of clinical judgement. Therefore, the association between risk assessment and pressure sore prevention detected by Preevost was that between nurses' clinical judgement and pressure sore prevention rather than that between the Braden scale assessment and pressure sore prevention.

Only one study (Jones 1986) (see section 2.16) has investigated if nurses using a risk assessment scale planned care more systematically. Jones (1986) concluded that nurses using an intuitive approach resulted in patients receiving a blanket approach to care. However, results are based on a small sample (n=18) of nurses using the Norton scale, the Knoll scale, and intuition therefore cannot be generalised to a wider population.

Waterlow (1995[a]) suggested that pressure sore risk should be documented alongside any action taken and that a pressure sore care plan where all relevant information was held together would be beneficial. However, to date no studies have investigated if such a care plan is advantageous. The purpose of this study was to identify if there was an association between risk score, severity of sore and management of care and to determine if using a care plan which related specifically to pressure sores, was more

beneficial than using a standard care plan method.

5.2 Null Hypotheses

1. that there is no association between pressure sore risk score, severity of sore and management of care.
2. that nursing teams, who utilise a care plan relating specifically to the prevention and management of pressure sores, do not manage pressure sore prevention and treatment more systematically than nursing teams who do not use a care plan relating specifically to the prevention and management of pressure sores.

On the advice of a statistician, level of significance was set at $p<0.05$.

The results of this study indicate that the association between Waterlow risk score, severity of sore and management of care was statistically significant. Therefore Hypothesis One was rejected. There was insufficient evidence to reject Hypothesis Two. However, it should be noted that the results from this study are clinically significant and clearly indicate areas which need to be addressed. While the results of this study can be generalised to the population within the Trust, results may not be representative to the general population.

5.3 Association between Waterlow risk score, severity of sore and management of care

5.3.1 Methods used to prevent pressure sores

Ek and Boman (1982) found it difficult to distinguish between the methods used to prevent pressure sores and the methods used to treat patients with existing pressure sores. This is not surprising since most preventative measures continue when a pressure sore develops. To avoid a similar problem in this study a distinction was made between the methods used to prevent pressure sores and those used to treat

pressure sores (as noted in Section 3.7).

Many of the pressure sore prevention methods currently recommended are based on weak evidence or usual practice (AHCPR 1992). In this study, preventative care was, in the main, as recommended by current guidelines (CRAG 1995). Nevertheless, some techniques such as water filled gloves (thought to be detrimental) and [vigorous] "heel rubbing" (specifically contra-indicated) (AHCPR 1992) were also used. Surprisingly, the 30° tilt (AHCPR 1992) was not employed as a preventative measure; only as treatment. However, pillows were used as a pressure sore prevention method. Therefore, it is possible that they were used to implement the 30° tilt.

With the exception of specialised pressure relieving systems most prevention methods were, in general, used only when the patient's Waterlow score was at least 15. However, it is not clear if this was due to allocation of equipment on the basis of the score or allocation of equipment following manipulation of the Waterlow score (see section 4.5.3).

With the exception of specialised support systems, which were in general used only when the patient's Waterlow score was at least 15, most prevention methods were used irrespective of risk score and most were utilised throughout the hospital. However, the foam wedge was used solely within the orthopaedic department despite the fact that it is a recommended prevention method (CRAG 1995; AHCPR 1997). It is likely that use of the foam wedge within the orthopaedic department resulted primarily from the availability of foam wedges within the department because they were used primarily to prevent hip dislocation following replacement surgery.

The relationship between Waterlow risk score and pressure relief ($p<0.001$) and between Waterlow risk score and patient education ($p< 0.005$) was significant. As risk score increased, the provision of pressure relief and patient education increased. This is consistent with studies conducted by Bergstrom et al (1996) and Preevost (1992) who demonstrated that as patient risk increased, prescriptions for turning were more

frequent.

Norton (1989) and Waterlow (1996) believe that a higher risk score prompts nurses to instigate more preventative measures. However, Preevost's (1992) study showed that even when no risk assessment scale was used more preventative measures were provided for patients at risk (see section 2.14). Moreover, the results of the study described in this thesis demonstrated that nurses influenced the overall risk score allocated to patients (see section 5.3.1). Therefore, it seems reasonable to conclude that the association between Waterlow risk score and pressure relief and between Waterlow risk score and patient education was influenced by more than risk score alone. It could be argued that allocation of risk score was both complex and subjective and that patients were allocated risk scores on the basis of 'expert' clinical assessment rather than on the basis of summing the pre-determined risk scores available to them. This would support Benner's (1984) theory that 'expert' nurses attain and utilise a level of skills which are not discernible but are sometimes recognised as 'intuition'.

There was no association between Waterlow risk score and mobilisation ($p=0.530$). However, during the data collection phase of this study, it became clear that prescriptions for 'mobilisation' were apportioned for reasons other than pressure sore prevention. For example to aid re-habilitation after surgery or stroke where 'mobilisation' appeared to perform a dual role. Also, it is likely that some patients were nursed in bed because they were too ill to 'mobilise'. Nevertheless, at times it was apparent that other problems took precedence over pressure sore prevention. For example, on some occasions when patients were unsteady when walking, confused, or suffering from dementia, mobility was restricted to ensure patient safety. Consequently, prescriptions for care often included instructions to "restrict mobility" despite the fact that patients were at risk of developing pressure sores and identified as such on the WRAS.

5.3.2 Association between Waterlow risk score and severity of sore

There was a moderate correlation (r_S= 0.43) between Waterlow risk score and severity of sore. However, three factors must be taken into account with this result:

- the number of patient records which were excluded from analysis because skin status was not documented (see section 4.9);
- the way in which the WRAS was used in practice (see section 4.5);
- the number of patients who were identified by the Waterlow scale to be at risk of pressure sores but who remained pressure sore free.

A total of 70% of patients identified by the Waterlow risk assessment scale to be at risk of pressure sores remained pressure sore free. More than half of the patients in this category were identified to be at 'high risk' or 'very high risk'. The association between Waterlow risk score and severity of sore detected in this study supports Waterlow's assertion that the WRAS should not be used to predict pressure sore occurrence (Waterlow 1998 personal communication).

5.3.3 Utilisation of the Waterlow Risk Assessment Scale

Despite the fact that, in this study, all nurses used the Waterlow scale regularly and most reported it to be useful, or useful to some extent, many nurses believed their professional judgement to be more accurate. Nevertheless, many respondents relied on a risk score to guarantee the procurement of specialised support systems. Consequently, some respondents manipulated the scale to obtain a risk score which would enable them to obtain the resources they required. Thus, nursing decisions regarding the ordering of specialised equipment appeared to be based on an 'objective' assessment thereby justifying the action taken. At the time of the study, the Clinical Governance framework had not been implemented. Therefore it could be argued that using Waterlow risk scores in this way arose as a result of Waterlow scores being used to aid the monitoring activity within the NHS which was popular at that time (see section 2.3). Nevertheless, while the legal implications of modifying a

risk score to suit one's own purpose is likely to depend on individual circumstances, on a professional and ethical basis, it is questionable.

The reliability of the WRAS can be further questioned on the basis that obtained risk score was nurse-dependent. In this study, nurses reported that they did not always agree on which risk factors pertained to an individual patient. Interestingly, surgical nurses were more likely to comment on misapplication of the tool whereas medical nurses were more likely to comment on their ability to identify 'at risk' patients without the need for a risk assessment tool. It was not possible to determine why this was so. It may be that nurses within a surgical unit assess patients in a different way than nurses working within a medical unit. Unfortunately, due to limitations within the study design (see section 5.1), this topic could not be pursued. Further research would be required to determine if such a difference exists.

It is clear from the findings discussed above that the WRAS was sometimes manipulated to meet the requirements of the nurse and in this respect the WRAS is influenced by the nurses' clinical assessment of the patient (see section 5.4). Moreover, it seems that the WRAS is also open to individual interpretation which is likely to be subjective in nature (see section 4.5.1).

5.3.4 Methods used to treat pressure sores

Many of the pharmaceutical products used to treat existing pressure sores were as recommended in the literature available (Morgan 1993; VFM 1993; SMTL 1995; Collier 1996; Bux and Mahi 1996; Thomas 1997; Thomas et al 1997; VFM 1997). Nevertheless some of the treatments were controversial or were specifically contraindicated (Hermans and Bolton 1993). Moreover, even when nurses believed a particular treatment to be contraindicated, they continued to use it because they believed that, in some circumstances it was the only product which worked.

With the exception of barrier cream and film dressing (which were applied to intact skin as well as pressure sores), pharmaceutical products were used only when a pressure sore was already present. A small selection of products was used to treat

stage 1 pressure sores whereas a greater variety of products were applied to pressure sores of stage 2 and stage 3. Unfortunately, due to the number of different products used to treat existing pressure sores in relation to the number of pressure sores treated (see section 4.9.1), statistical significance could not be determined. However, the data obtained from the patient record and that reported by interviewees in respect of the skin care products used were generally consistent. Nevertheless, some discrepancies did exist. A few products were reported as used but not documented in the patient record or documented in the patient record but not reported. For example, respondents reported that alginate and cavity foam were only used for pressure sores of stage three and above while patient records indicated these products were also used to treat pressure sores of stage two. Conversely, respondents stated that hydrocolloid was used to treat all pressure sores regardless of severity, whereas according to patient records hydrocolloid was not applied to stage one pressure sores. Further research would be required to determine if these discrepancies were due to reverse staging (see section 4.6.4) , limitations of the study design (see section 5.1) or some other factor.

Since the process of pressure sore development differs from that of wound healing, pressure sore staging systems cannot be used to describe improvement (NPUAP 1997). Nevertheless, in this study there was evidence to suggest that pressure sore classification systems were used in reverse order to indicate improvement. In such circumstances, selection of wound care products according to pressure sore classification (see section 4.6.4) is likely to be inappropriate [and may result in financial and legal repercussions].

5.4 Factors influencing prevention and treatment methods

A number of factors impinged on the decisions nurses made regarding the prevention and treatment of pressure sores. For example, more than two thirds of respondents reported that the decisions they made regarding pressure sore prevention and treatment were influenced by the choice of products available. However, for others, treatment decisions were necessarily constrained by medical prescription (see section 4.3.1). Nevertheless, in some circumstances treatments were applied according to Consultant preference but later changed to that preferred by nurses (see section 4.3.1). This is consistent with research conducted by Flanagan (1992) and may account for the frequent changes of dressing type which, according to patient records, some patients were subject to (see section 4.9.1).

In this study, nurses believed their clinical assessment and own knowledge influenced the methods they used to prevent and treat pressure sores more than any other factor. However it is not clear if nurses' clinical assessment and nurses' own knowledge was derived from education, past experience or a combination of both. Nevertheless, it is clear that nurses who were influenced by clinical assessment and self-knowledge rather than research or clinical guidelines were ill-prepared to question a Consultant's decision or suggest alternative treatments when they believed a Consultant's decision to be erroneous (see section 5.1), Clearly, this is a problem which requires further investigation. Unfortunately, due to study limitations the issues raised by nurses who commented that their treatment decisions were constrained by Consultant preference could not be followed up.

5.5 Association between care plan type and management of care

The results of this study show that there was a significant relationship between care plan type and pressure relief ($p<0.001$) care plan type and patient education ($p<0.001$) and between care plan type and mobilisation ($p=0.016$). Where a PSCP was in use, pressure relief, patient education and mobilisation were prescribed more frequently than where a standard care plan was in place, or where a PSCP was in place but not utilised. This supports Waterlow's (1991) view that a care plan, where all pressure sore information is held together, may be beneficial. Nonetheless, it seems that the benefit of using a PSCP did not extend beyond blanket prevention strategies, that were applied universally to almost all patients identified at risk. According to patient records, even when problems specific to the individual were identified, and as such required implementation of individualised prevention policies (AHCPR 1992), patient individual care needs were rarely met.

While some pressure sore prevention methods can be applied almost universally to patients at risk, others require more deliberate and planned action. The results of this study, which supports those of Jones (1986), indicate that prescriptions for care are not individualised and that nurses using a pressure sore risk assessment tool do not use all the information available to them to make informed care decisions. When body weight or appetite or skin status or incontinence was identified as a risk factor for the patient concerned, a relevant care plan existed 4%-52% of the time. Therefore it must be concluded that the benefits of a PSCP are limited. More importantly, it is clear that, regardless of the type of care plan used, nursing teams did not appear to manage pressure sore prevention in relation to individual care needs. Again, this may be due, in part, to the way in which the WRAS was used within the Trust, as the overall Waterlow score was frequently documented without individual criteria being identified (see section 3.10.2). When used in this way, it is not possible to detect which problem(s) contribute to the current Waterlow risk score. Consequently, specific care needs cannot be identified, and hence met, solely on the basis of a Waterlow risk assessment. Polit and Hungler (1991) state that it is the application of an instrument which validates it. Therefore it is of some concern that in this study,

Waterlow scores were subject to bias due to manipulation, subjectivity and errors in addition. It must therefore be concluded that the application of the WRAS rendered it invalid.

Chapter Six: Conclusions and Recommendations

6.0 Conclusions

The effectiveness of some of the pressure sore prevention and treatment strategies currently endorsed as appropriate has yet to be demonstrated. In this study, most of the methods used were as recommended by the literature available at the time of the study (see Appendix XIV). However, some of the methods used were controversial. Others in use were not recommended. What is worrying is that some respondents continued to use methods even when they appeared to know that the methods were considered to be ineffective or harmful. Further research is required to identify why nurses knowingly use methods considered to be ineffective.

Of particular concern is that despite the fact that the WRAS is widely used throughout the UK its application in routine practice renders it unreliable. It is also of some concern that, despite the frequency of research results which discuss the poor quality of nursing records, the problem of inadequate documentation persists.

As shown in this study, pressure relief, mobilisation and patient education were documented more frequently when a PSCP was used. However care specific to the individual patient was not. Therefore, while the use of a PSCP may improve the situation it does not do so to any great extent. Nor does it improve evaluation of patient care. Not only does this make it impossible to determine if the care given has been effective, it is both a professional and legally precarious situation.

CSAG (1997) suggests that clinical effectiveness in the NHS may be best achieved by monitoring whether effective methods are being used and ineffective ones avoided. Clearly, new systems which facilitate this process are required as current systems are inadequate (CSAG 1997). Furthermore, if the current practice of using different documentation systems within and between different health care providers continues, attempts to monitor the effectiveness of care will be impeded. In today's health care culture where movement of patients and staff between different units and health care

providers increase, continuity of care and evaluation of patient care is increasingly important. It is therefore imperative that, if the principles of Clinical Governance are to be met, a system which facilitates continuity of care; encourages adequate assessment of care; permits evaluation of patient outcome to be determined care; and prevents duplication of information, be found.

6.1 Recommendations

1. Alternative methods of identifying patients at risk of pressure sores should be explored with consideration being given to assessing pressure sore risk from the overall assessment record rather than a separate pressure sore risk assessment tool. This would obviate the need for multiple assessment sheets which are likely to detract resources from areas of care where they may be more effective.

2. New systems for documenting care which facilitate evaluation of patient care should be developed and tested.

3. The routine use of the WRAS as a method of identifying the patients most at risk of pressure sores should be re-considered and the practice of monitoring pressure sore prevalence and incidence rates on the basis of Waterlow risk scores should be abandoned.

4. Guidelines relating to the prevention and treatment of pressure sores should be summarised to provide a clear and concise list of:

- all recommended pressure sore prevention methods;
- all recommended pressure sore treatment methods;
- methods to be used only under specialist advice;
- methods to be used only when recognised as competent in use of the method;
- methods to be discontinued.

APPENDIX I

The Waterlow Pressure Sore Risk Assessment Scale

WATERLOW RISK ASSESSMENT SCALE

RING SCORES IN TABLE / ADD TOTAL

A BUILD / WEIGHT FOR HEIGHT		**B** CONTINENCE		**C** RISK AREAS / VISUAL SKIN TYPE		**D** MOBILITY	
AVERAGE	0	COMPLETE/ CATHETERISED	0	HEALTHY	0	FULLY	0
ABOVE AVERAGE	1	OCCASIONAL INCONT URINE	1	TISSUE PAPER	1	RESTLESS/FIDGETY	1
OBESE	2	INCONTINENT OF FAECES	2	DRY	1	APATHETIC	2
BELOW AVERAGE	3	INCONT FAECES / URINE	3	OEDEMATOUS	1	RESTRICTED	3
				CLAMMY / TEMP ELEVATED	1	INERT / TRACTION	4
				DISCOLOURED	2	CHAIR BOUND	5
				BROKEN AREA	3		
E SEX / AGE		**F** APPETITE		**G** TISSUE MALNUTRITION		**H** NEUROLOGICAL DEFECT	
MALE	1	AVERAGE	0	TERMINAL / CACHEXIA	8	DIABETES / C.V.A.	4 - 6
FEMALE	2	POOR	1	CARDIAC FAILURE	5	M.S. PARAPLEGIA	
14 - 49	1	N.G. TUBE / FLUIDS ONLY	2	PERIPHERAL VASCULAR DISEASE	5	MOTOR / SENSORY	
50 - 64	2	N.B.M. / ANOREXIA	3	ANAEMIA	2		
65 - 74	3			SMOKING	1	**I** MAJOR SURGERY / TRAUMA	
75 - 80	4	**J** MEDICATION				ORTTHO. / BELOW WAIST SPINAL	5
81+	5	STEROIDS / CYTOTOXICS / ANTI-INFLAMMATORY	4			ON TABLE MORE THAN 2 HOURS	5

10+ "AT RISK" REVIEW WEEKLY	15+ "HIGH RISK" REVIEW ALTERNATE DAYS	20+ "VERY HIGH RISK REVIEW DAILY

APPENDIX II

The Stirling Pressure Sore Severity Scale

The Stirling Pressure Sore Severity Scale

Stage 0 No clinical evidence of a pressure sore
- 0.0 Normal appearance, intact skin
- 0.1 Healed with scarring
- 0.2 Tissue damage, but not assessed as a pressure sore

Stage 1 Discoloration of intact skin (light finger pressure applied to the site does not alter the discoloration)
- 1.1 Non-blanchable erythema with increased local heat
- 1.2 Blue/purple/black discoloration. The sore is at least stage 1

Stage 2 Partial-thickness skin loss or damage involving epidermis and/or dermis
- 2.1 Blister
- 2.2 Abrasion
- 2.3 Shallow ulcer, without undermining of adjacent tissue
- 2.4 Any of these with underlying blue/purple/black discoloration or induration. The sore is at least stage 2

Stage 3 Full-thickness skin loss involving damage or necrosis of subcutaneous tissue but not extending to underlying bone, tendon or joint capsule
- 3.1 Crater, without undermining of adjacent tissue
- 3.2 Crater, with undermining of adjacent tissue
- 3.3 Sinus, the full extent of which is not certain
- 3.4 Full-thickness skin loss but wound bed covered with necrotic tissue (hard or leathery black/brown tissue or softer yellow/cream/grey slough) which masks the true extent of tissue damage. The sore is at least stage 3. Until debrided it is not possible to observe whether damage extends into muscle or involves damage to bone or supporting structures.

Stage 4 Full-thickness skin loss with extensive destruction and tissue necrosis extending to underlying bone, tendon or joint capsule
- 4.1 Visible exposure of bone, tendon or capsule
- 4.2 Sinus assessed as extending to bone, tendon or capsule

Third digit classification
for the nature of the wound bed
- x.x0 Not applicable; intact skin
- x.x1 Clean, with partial epithelialisation
- x.x2 Clean, with or without granulation, but no obvious epithelialisation
- x.x3 Soft slough, cream/yellow/green in colour
- x.x4 Hard or leathery black/brown necrotic (dead/avascular) tissue

Fourth digit classification
for infective complications
- x.xx0 No inflammation surrounding the wound bed
- x.xx1 Inflammation surrounding the wound bed
- x.xx2 Cellulitis bacteriologically confirmed

(Reid and Morrison 1994)

APPENDIX III

The Pressure Sore Care Plan

Pressure Sore Care Plan

	PROBLEM	I.D. BY	REVIEW DATE	REVIEW DATE	GOALS	DATE RESOLVED

	RISK SCORE	GRADE	SITE / SIDE		NURSING INSTRUCTION	SIG	DATE DISCONT	DISCONT BY

DATE	EVALUATION	SIG		EVALUATION	SIG

	RISK SCORE ON TRANSFER	RISK SCORE ON DISCH	TRANSFER CODE	CARE PLAN DETAILS TO:	SIG

	DISCHARGE CODING		
1	DISCHARGE HOME	2	TRANSFER TO OTHER WARD
3	TRANSFER TO OTHER HOSP	4	PRESSURE SORE HEALED
5	NO LONGER "AT RISK"	6	OTHER

PATIENTS NAME:

APPENDIX IV

Criteria for Pressure Sore Risk Assessment

CRITERIA FOR PRESSURE SORE RISK ASSESSMENT	1962 NORTON	1974 GOSNELL	1980 GOLDSTONE & ROBERTS	1982 ANDERSON	1985 WATERLOW	1986 PRITCHARD	1987 PSPS	1987 BRADEN
Physical condition	•	•						
Mental condition	•	•						
Activity	•	•	•			•	•	•
Mobility	•	•	•	•	•	•	•	•
Continence/incont	•				•	•	•	
Nutrition/malnutrition		•		•		•		•
Age				•	•	•		
Unconscious				•			•	
Paralysis				•				
Emaciation				•				
Dehydration								
Skin type					•			
Build/weight					•			
Sex					•			
Appetite					•			
Tissue malnutrition					•			
Neurological deficit					•			
Surgery/trauma					•			
Medication					•			
Low Hb						•		
Sedation						•		
Periodic pain						•		
Unco-op behaviour						•		
General condition							•	
Friction & shear								•
Moisture								•
Sensory perception								•

APPENDIX V

Data Collection Tool:Phase I
Structured Interview Schedule

Interview Schedule - Part: 1 Demographics

For office use only

1 2 3 4

Grade?

1	2	3	4
C	D	E	F

5

Years Qualified?

1	2	3	4
<1	1-2	>2 < 5	> = 5

6

Current Speciality?

1	2	3	4
G Med	G Surg	Ortho	Derm
5	**6**	**7**	**8**
C of E	Haem	Renal	CCU
10	**11**	**12**	**13**
Inf. Dis	Urology	ENT	MRU

7 8

Years in Current Speciality?

1	2	3	4
<1	1-2	>2<5	> = 5

9

Post registration education in (pressure sores)?

1	2
Yes	No

10

Did this include?

Risk Assess		Wound Assess		Grading Scales		Dress-ings	
1	2	1	2	1	2	1	2
Yes	No	Yes	No	Yes	No	Yes	No

11 12 13 14

Other _____

15

Interview Schedule - Part 2

For office use only

1 2 3 4

2a *Do you use a pressure sore risk assessment tool?*

1 Yes 2 No ☐ 16

b *If Yes - Which one do you use?* 1 Waterlow 2 Norton 3 Braden ☐ 17

c *Other* _____

d *Do you find it* 1 useful 2 not useful ☐ 18

e *Probe:* can you expand on that? _____ ☐ 19

f *Do you use a pressure sore grading scale?* 1 Yes 2 No ☐ 20

g *If Yes - Which one do you use?* 1 Stirling 2 Torrance 3 Shea ☐ 21

h *Other* _____

I *Do you find it* 1 useful 2 not useful ☐ 22

j *Probe:* can you expand on that? _____ ☐ 23

Interview Schedule - Part 3

For office use only

		Prevention		Risk Category			
3	**Methods employed to prevent pressure sores**	1	2	1	2	3	1 2 3 4
		Yes	No	10-14	15-19	20 +	
a	*Patient Education*						24 25
b	*Position change/Pressure relief*						26 27
c	*Mobilise*						28 29
d	*Specialised bed*						30 31
e	*Support chair/cushion*						32 33
f	*Dietary referral*						34 35
g	*Nutritional support*						36 37
h	*Physio referral*						38 39
i	*Sheepskin*						40 41
j	*Heelmuffs*						42 43
k	*Barrier Cream*						44 45
l	*Water filled gloves*						46 47
m	*Other* _____						48 49
	_____						50 51
	_____						52 53

Interview Schedule - Part 4

For office use only

		Treatment		Grade				
		1	2	1	2	3	4	
4	**Methods employed to treat pressure sores**							1 2 3 4
a	*Patient Education*	Yes	No	1	2	3	4	54 55
b	*Position change/Pressure relief*							56 57
c	*Mobilise*							58 59
d	*Specialised bed*							60 61
e	*Support chair/cushion*							62 63
f	*Dietary referral*							64 65
g	*Nutritional support*							66 67
h	*Physio referral*							68 69
i	*Sheepskin*							70 71
j	*Heelmuffs*							72 73
k	*Water filled gloves*							74 75
l	*Other* _____							76 77
	_____							78 79
	_____							80 81
	_____							82 83

Interview Schedule - Part 4 contd.

For office use only

1 2 3

5	Applications/Actions employed to treat pressure sores	Treatment 1	Treatment 2	Grade 1	Grade 2	Grade 3	Grade 4	
a	*Barrier Cream*	Yes	No	1	2	3	4	84 85
b	*Dry Dressing (gauze)*							86 87
c	*Hydrocolloid*							88 89
d	*Hydrogel*							90 91
e	*Alginate*							92 93
f	*Cavity Foam*							94 95
g	*Foam*							96 97
h	*Debridement scissors/scaloel*							98 99
I	*Proflavine*							100 101
j	*Film*							102 103
k	*Iodine preparation*							104 105
l	*Betadine*							106 107
m	*Expose*							108 109
n	*Other* _____							110 111
	_____							112 113
	_____							114 115

For office use only

1 2 3 4

6a *Do you document all preventative methods you employ?*

1 Yes 2 No

116

b **If yes**

1 Always 2 Sometimes

117

c **Probe:** If no - what prevents this?

_____

118
119

d **Probe:** If sometimes - when is this prevented?

_____

120
121

e *Do you document all nursing treatment you provide?*

1 Yes 2 No

122

f **If yes**

1 Always 2 Sometimes

123

g **Probe:** If no - what prevents this?

_____

124
125

h **Probe:** If sometimes - when is this prevented?

_____

126
127

Interview Schedule - Part 6

For office use only

1 2 3 4

a *Which factors influence your choice of preventative measures?*

1	2	3	4
Clinical Assessment	Available Resources (staff/finances)	Product Availability (beds/dressings)	Knowledge (Self)

5	6
Published research	Clinical guidelines

128 129 130 131

132 133

b Other _____

_____

_____

134

135

136

c *Which factors influence your choice of treatment?*

1	2	3	4	5
Clinical Assessment	Available Resources (staff/finances)	Product Availability (beds/dressings)	Knowledge (Self)	Medical Prescription

6	7
Published research	Clinical guidelines

137 138 139 140 #

142 143

d Other _____

_____

_____

144

145

146

APPENDIX VI

Data Collection Tool: Phase II
Patient Record Review

ata Collection Tool: Patient Records

atient Records:Part 1

For office use only

	1	2	3	4	5		
ge Band	*14-49*	*50-64*	*65-74*	*75-80*	*>80*	1 2 3 4 5	
ex	1 *Male*	2 *Female*					6
ength of stay ays)	1 *<7*	2 *7-14*	3 *15-27*	4 *28-41*	5 *42+*		7
Waterlow risk score	1	2	3	4	5		
Initial	*N/R*	*10-14*	*15-19*	*20+*	*<10*		8
Mid	*N/R*	*10-14*	*15-19*	*20+*	*<10*		9
Final	*N/R*	*10-14*	*15-19*	*20+*	*<10*		10
Grade of sore according to Stirling Severity Scale	1	2	3	4	5	6	
Initial	*0*	*1*	*2*	*3*	*4*	*N/R*	11
Mid	*0*	*1*	*2*	*3*	*4*	*N/R*	12
Final	*0*	*1*	*2*	*3*	*4*	*N/R*	13

Methods of prevention/treatment

For office use only

	1 Yes	2 No	
Patient Education	☐	☐	14
Position change/Pressure relief	☐	☐	15
Mobilise	☐	☐	16
Specialised bed	☐	☐	17
Spupport chair/ cushion	☐	☐	18
Dietary referral	☐	☐	19
Nutritional support	☐	☐	20
Physio referral	☐	☐	21
Sheepskin	☐	☐	22
Heel muffs	☐	☐	23
Water filled gloves	☐	☐	24
Other (state)	☐	☐	25
Applications to skin/pressure sore			
Barrier Cream	☐	☐	26
Dry Dressing	☐	☐	27
Hydrocolloid	☐	☐	28
Hydrogel	☐	☐	29
Alginate	☐	☐	30
Cavity Foam	☐	☐	31
Foam	☐	☐	32
Debridement Scissors/scalpel	☐	☐	33
Proflavine	☐	☐	34
Film	☐	☐	35
Iodine preparation	☐	☐	36
Betadine	☐	☐	37
Expose	☐	☐	38
Other			39
_____			40
_____			41
_____			

Patient records: Part 3

For office use only

			IDENTIFIED		PLANNED FOR		
			1	2	1	2	
4	A	**Build Weight**	Yes	No	Yes	No	
a		Average					42 43
b		Above average					44 45
c		Obese					46 47
d		Below average					48 49
5	B	**Continence**					
a		Complete/catheterised					50 51
b		Occasional incont urine					52 53
c		Incontinent faeces					54 55
d		Incontinent urine/faeces					56 57
6	C	**Skin Type**					
a		Healthy					58 59
b		Tissue paper					60 61
c		Dry					62 63
d		Oedematous					64 65
e		Clammy/Temp elevated					66 67
f		Discoloured					68 69
g		Broken area					70 71
7	D	**Mobility**					
a		Fully					72 73
b		Restless/fidgety					74 75
c		Apathetic					76 77
d		Restricted					78 79
e		Inert/Traction					80 81
f		Chairbound					82 83

For office use only

			IDENTIFIED		PLANNED FOR		
			1	2	1	2	
8	E	**Sex/Age**	Yes	No	Yes	No	
a		Male					84 85
b		Female					86 87
c		14-49					88 89
d		50-64					90 91
e		65-74					92 93
f		75-80					94 95
g		81+					96 97
9	F	**Appetite**					
a		Average					98 99
b		Poor					100 101
c		NG Tube/Fluids only					102 103
d		NBM/Anorexia					104 105
10	G	**Tissue malnutrition**					
a		Terminal Cachexia					106 107
b		Cardiac failure					108 109
c		PVD					110 111
d		Anaemia					112 113
e		Smoking					114 115
11	H	**Neurological Deficit**					
a		Diabetes/CVA					116 117
b		MS/Paraplegia					118 119
c		Motor/Sensory					120 121
12	I	**Major surgery/Trauma**					
a		Ortho/Below waist/spinal					122 123
b		On table >2 hours					124 125
13	J	**Medication**					
a		Steroids/cytotoxics					
b		Inflammatory					126 127

For office use only

1 2 3 4

4

		Present 1 Yes	Present 2 No	Informative 1 Yes	Informative 2 No		
a	**Initial statement** (skin status)					128	129

		Present 1 Yes	Present 2 No	Informative 1 Yes	Informative 2 No	Improvement 1 Yes	Improvement 2 No	Deterioration 1 Yes	Deterioration 2 No	Static 1 Yes	Static 2 No					
b	**Review statement** (skin status)											130	131	132	133	134

		Present 1 Yes	Present 2 No	Informative 1 Yes	Informative 2 No	Improvement 1 Yes	Improvement 2 No	Deterioration 1 Yes	Deterioration 2 No	Static 1 Yes	Static 2 No					
c	**Evaluation statement** (skin status)											135	136	137	138	139

		1 Yes	2 No		
d	**Problem satement**			140	
	Goal statement			141	
	Plan of care			142	
	Review			143	
	Evaluation			144	

		1	2	3	4	
e	**Frequency of review** ie grade/score (times per hospital stay)	0	1-2	3-5	>5	145

		1	2	3	4	
f	**Frequency of evaluation** (statement) (times per hospital stay)	0	1-2	3-5	>5	146

APPENDIX VII

Exemplar of Protocol/Codebook

Master Coding Book - Patient Records Part 2 **Methods of prevention/treatment**			Office code
	Notes: Record as 'yes' if documentation indicates that the method has been used. Record as 'no' if there is no record / instruction associated with the method. Yes 1 No 2		
2a	Patient education	Evidence of advice given to the patient regarding self prevention/prevention of pressure sores	14
b	Position change/ pressure relief	Reference to or evidence of assistance to change position, relieve pressure, turning charts/schedules,	15
c	Mobilise	Reference to or evidence of assistance/encouragement to mobilise excluding physiotherapist intervention.	16
d	Specialised bed	Additional to or replacement for standard hospital mattress (excluding Softform)	17
e	Support chair/ cushion	Additional to or replacement for standard hospital chair	18
f	Dietary referral	Referral of patient to dietician	19
g	Nutritional support	Evidence of assistance or encouragement to eat, provision of supplementary drinks.	20
h	Physio referral	Referral of patient to physiotherapist	21
	Sheepskin	Synthetic or natural sheepskin	22
	Heel muffs	Sheepskin or foam heel shaped pads	23
k	Water filled gloves	Latex or plastic gloves filled with water & tied.	24
l	Other		25

LETTERS SUBMITTED DURING CONDUCT OF THE STUDY

December 18 1996

Dear Dr

I work within the Trust and am currently undertaking an MSc at Glasgow University under the supervision of Professor Lorraine Smith. My research will look at the current pressure sore prevention and treatment strategies employed by nursing staff, and the assessment methods used in planning patient care. I hope to highlight areas of good practice as well as areas where practice should alter. A report would be sent to you and results would be relayed to staff.

Since this is a retrospective study which will require access to nursing notes, I would greatly appreciate your permission to access patient case notes from archives.

Please do not hesitate to contact me if you require any more information regarding the proposed research study.

I look forward to hearing from you

Yours sincerely

E TOLMIE

December 18 1996

Dear

As you know, I am currently undertaking an MSc at Glasgow University under the supervision of Professor Lorraine Smith. My research will look at the current pressure sore prevention and treatment strategies employed by nursing staff, and the assessment methods used in planning patient care. I hope to highlight areas of good practice as well as areas where practice should alter. A report would be sent to you and results would be relayed to staff.

Since this is a retrospective study which will require access to nursing notes, I would greatly appreciate your permission to access nursing records from archives. I have also written to _____ and Dr _____ since the nursing records I require will be contained within patient case notes.

I look forward to hearing from you

Yours sincerely

E TOLMIE

January 17 1997

Dear

I work within the Trust and am currently undertaking an MSc at Glasgow University under the supervision of Professor Lorraine Smith. My research will look at the current pressure sore prevention and treatment strategies employed by nursing staff, and the assessment methods used in planning patient care.

Since the study will be retrospective, I require access to nursing notes.

_____ has given me permission to access patient case notes from archives with the proviso that you have no objection. I would greatly appreciate your consent to do this.

Please do not hesitate to contact me if you require any more information regarding the proposed research study.

I look forward to hearing from you

Yours sincerely

E TOLMIE

February 27 1997

Dear Dr

I work within the Trust as Support Nurse and am currently undertaking an MSc at Glasgow University under the supervision of Professor Lorraine Smith. My research will look at the current pressure sore prevention and treatment strategies employed by nursing staff. Since this is a retrospective study, patients will not be directly involved. Access to nursing notes will be required and nursing staff will be asked to participate by responding to a questionnaire. Dr_____ Dr, _____and _____ have given their consent to the study. No objections have been expressed by any physician or surgeon within the Medical or Surgical Directorate.

I plan to pilot the study later this year and commence the main study in January 1998 and would therefore appreciate confirmation from yourself that I may proceed.

Please contact me if you require any more information regarding the proposed research study.

I look forward to hearing from you

Yours sincerely

E TOLMIE

23 May 1997

Dear

I am writing to ask if you would participate in a research project on pressure sores being conducted within _____ Hospital. The study is being carried out in collaboration with Glasgow University under the supervision of Professor L Smith. The pilot study will begin during May 1997 with the main study commencing in September 1997.

As part of the study, a number of qualified nursing working within the hospital, who have been identified by random selection, are being invited to participate in the study. I hope to arrange a short interview with those who agree to take part. The interview is expected to last between 30 and 60 minutes. All responses will be treated confidentially. No tapes will be used during the interview, and your anonymity will be protected. On completion of the study, you will have access to the full report and an executive summary of results will be sent to you when available.

I will contact you again in 1-2 weeks to arrange a time to discuss the study with you. If this is not suitable, please contact me at the number below. I would like to re-assure you that consent is not obligatory and, if given, can be withdrawn at any time.

Yours sincerely

E Tolmie,

Consent Form

This is an informed consent form which, when signed, indicates your agreement to participate in an interview. The interview will form part of a research study being conducted within ---------- during 1997/8. The purpose of the study is to determine the nursing strategies being utilised within the Trust to manage pressure sores.

I agree to being interviewed in conjunction with the above study. I understand that the study is being conducted in collaboration with Glasgow University under the supervision of Professor L Smith. The nature of the study has been fully explained to me and I give my consent freely. I understand that I will be interviewed within the hospital at a time that is convenient to me. I also understand that the interview will last between 30 and 60 minutes and that responses will be documented. I have been informed that no tapes will be used to record the interview. It has been explained to me that all information will be treated confidentially and that my anonymity will be protected. It has also been explained that I may withdraw from the study at any time.

Signature of Respondent _____ Date_____

Signature of Researcher _____ Date_____

14 July 1997

Dear

I am writing to ask if you would participate in a research project on pressure sores being conducted within_____. The study is being carried out in collaboration with Glasgow University under the supervision of Professor L Smith. The pilot study has been completed and the main study is now in progress.

As part of the study, a number of qualified nursing working within the hospital, who have been identified by random selection, are being invited to participate in the study. I hope to arrange a short interview with those who agree to take part. The interview is expected to last between 30 and 60 minutes. All responses will be treated confidentially. No tapes will be used during the interview, and your anonymity will be protected. On completion of the study, you will have access to the full report and an executive summary of results will be sent to you when available.

I will contact you again in 1-2 weeks to arrange a time to discuss the study with you. If this is not suitable, please contact me at the number below. I would like to re-assure you that consent is not obligatory and, if given, can be withdrawn at any time.

Yours sincerely

E Tolmie

Dear

MANAGEMENT OF PRESSURE SORES:

I am writing to thank you for taking part in the above study. I know how difficult it can be to find time away from the ward therefore your participation was very much appreciated. The additional comments you made during the interview will be extremely helpful when I am compiling the report.

An executive summary of results will be sent to you when the study has been completed and you will have access to the full report. I also hope to arrange a series of short presentations within the Trust to report on the overall results. A place will be automatically booked on this for you and you will receive a personal invitation to attend.

Yours sincerely

E Tolmie,

APPENDIX XVI

Prevention and management of pressure sores as recommended by literature available at time of study

Pressure sore prevention

Recommended methods

Equipment

- provide appropriate pressure relieving aids such as lifting devices;
- use pillows foam wedges;
- use pressure reducing devices such as mattresses/cushions;

Activity

- relieve pressure on a regular basis by repositioning and use of a turning schedule;
- use 30 degree tilt;
- increase mobility;
- provide structured organised and comprehensive educational programmes directed at health care providers, patients, and family or care givers and evaluate their effectiveness.

Nutrition

- correct dehydration and malnutrition where possible;
- all patients categorised as high risk or who have established sores should be referred to a dietician for nutritional assessment;
- provide assistance with meals.

Skin care

- inspect skin daily;
- develop and implement an individualised programme of skin care;
- cleanse skin daily;
- use a mild cleansing agent moisturisers on dry skin;
- treat and minimise effect of underlying condition;
- treat and control incontinence with bladder training or use of an incontinence device;
- use barrier dressings such as transparent films and hydrocolloids;
- document results of skin inspection.

Methods which should no longer be used

- hot water and excessive friction (rubbing) particularly over bony prominences;
- backrests;
- ring shaped devices;
- heat lamps.

(NPUAP 1992; CRAG 1995)

Pressure sore treatment

Recommended methods

- hydrocolloid (Hermans and Bolton 1993; VFM 1995);
- polysaccharide beads (VFM 1995);
- foam (VFM 1995);
- alginate (VFM 1995);
- semi-permeable films (VFM 1995);
- hydrogel (Hermans and Bolton 1993; VFM 1995);
- cavity foam (VFM 1995).

To be used for a limited time only when specifically indicated

- flagyl (VFM 1995);
- flammazine (VFM 1995);
- inadine (Thomas 1994);
- paraffin gauze - medicated and non medicated (Serotulle; Bactigras; Sofratulle; Fucidin) (VFM 1
- sharp debridement (Hermans and Bolton 1993).

Contra-indicated methods

- gauze (Hermans and Bolton 1993; Thomas 1994);
- exposure (Hermans and Bolton 1993).

Controversial methods

- hydrogen peroxide solution;
- hioxyl;
- aserbine;
- varidase;
- proflavine;
- caustic pencil (silver nitrate).

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