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Nursing Workload Measures and Case-mix:

an investigation of the reliability and validity of nursing workload measures

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SUMMARY

The general aim of this one-year project, funded by the Department of Health and in collaboration with CASPE, has been to investigate the relationship between case-mix and nursing workload measures. Specifically, this report focuses on the underlying issue of examining the methodologies and instruments used for measuring workload and the assessment of the sensitivity of chosen measures. The relationship between diagnosis and the process and outcome of patient care is also described at the individual patient level and the overall relationship of case-mix and nursing workload is explored at ward level.

The rationale for the choice of Nursing Workload Management Systems (NWMs) and the study design adopted to assess the NWMs chosen is described. Thus, data were collected on three wards over a 6-day period to generate workload estimates, actual nursing hours worked, case-mix (DRG) information, and outcome measurement.

The intra-system differences described focus on the financial implications of the choice of parameters used to generate workload estimates. Inter-system differences are described in terms of comparison with actual hours worked and the financial implications of over- and under- staffing estimates. Although the correlations between workload estimates are high, there are variations which loosely reflect other known differences between the NWMs.

Correlations between workload estimates of over-staffing, per capita hours paid, case-mix and outcome measurement were low, showing that there was little difference between three of the NWMs (FIP, EXCELCARE and SENS) and confirming that Criteria for Care behaved differently. Analysis at an individual case level was conducted to see whether it was necessary to take account of diagnostic group. This suggested that there was a relationship between the main diagnostic group and the quality and outcome of patient care even after taking into account the strong association between diagnostic group and patient dependency levels, although this relationship disappeared after taking ward effect into account.

The overall conclusion reached is that the NWMs reviewed produced inconsistent and unreliable estimates of nursing workload. These estimates also make insufficient allowance for the skill-mix manipulation required to deliver good quality care. Recommendations are made based on these findings.

PROLOGUE

PURPOSES AND AIMS

This one-year study has been commissioned by the Department of Health at a time of change and uncertainty regarding the organisation of the National Health Service. The White Paper 'Working for Patients', the advent of general practitioner contracts and the newly established purchaser-provider framework raises many questions, not the least of which is the means of providing reliable information as a basis for decision-making. The development of appropriate patient information systems, the acceptance of the necessity to provide such information, is widespread and generally agreed. Similarly the development and acceptance of ways of measuring nursing workload is gaining ground. These movements spawn a series of 'second generation' questions and problems such as the relationships between patient diagnostic information and nursing workload.

AIMS

In collaboration with CASPE, the overall aim of this project is to investigate the relationship between case-mix and nursing workload measures. The issue is the extent to which nursing workload required by patients varies according to case-mix.

This part of the project is concerned with a prior issue which underpins the overall aim; namely the methodologies and instruments used for measuring nursing workload and the assessment of the sensitivity of chosen measures. In a separate section, on the limited data available, the relationship between

diagnosis and the process and outcome of patient care is described at the individual patient level, and the overall relationship of case-mix and nursing workload is explored at the ward level.

PLAN OF THE REPORT

The NWM systems are described in detailed manuals. It is not always easy to understand exactly how the workload measures are calculated or derived. In part this is because they have evolved over a number of years as they were introduced in different hospitals and also as they have adapted to new nursing philosophies. This pattern of evolution also characterises, to a lesser extent, the DRG system and so a brief description of the development of both these systems is provided in Chapter 1. The next chapter sets out the design of the study and, in particular, the choice of systems for assessment, and the approach adopted to that assessment. The 'background' section of the report is completed in Chapter 3 by a description of the particular instruments used, methods of data collection and analysis.

The 'Results' section of the report contains three chapters. In chapter 4, intra- and inter- system differences between the NWMs are examined in some detail; in chapter 5 the analysis turns to comparing the estimates generated by these NWMs with other data - on actual hours worked, on case mix, and on outcomes. Finally, in Chapter 6, an attempt has been made, at the level of the individual case, to assess whether quality and outcome of care are affected by any case-based characteristics.

COLLABORATION WITH OTHER PROJECTS

Skill Mix

The Department of Health funded project entitled "Skill Mix and the Quality of Nursing Care" has been underway in the Centre for Health Economics since 1989. Extensive literature reviews and pilot studies led to the choice of the QUALPACS instrument for determining quality of nursing care and the SENS NWM for manpower calculations. In addition to these process measures, the Skill Mix team has devised a unique set of patient outcome measures. These outcome measures have been developed in order to determine whether certain standards of patient well-being have been met or not. There are 9 outcome measures, as follows:-

hygiene
nutrition and hydration
pressure sores/skin integrity
I-V therapy
discharge planning
pain control
education/rehabilitation
elimination
anxiety, orientation and information

It has always been the intention that some of the instruments developed and tested by the Skill Mix project should be used in this study since there are areas of overlap between the aims and objectives of the two projects.

CASPE

Collaboration with the CASPE team at the King's Fund Centre has been on-going throughout all stages of the project. It was originally intended that this study serve as a pilot exercise, with the conclusions of the review of NWM methodologies being incorporated into the CASPE project. In the event,

both projects started at the same time; the one described in this report being funded for one year, and the CASPE project funded for three years.

It has been encouraging that initial conclusions emanating from NWM reviews by both groups have been remarkably similar. Both Centres have concluded that the choice of NWM systems for the projects relies upon describing the different approaches to measurement and both Centres have broadly agreed on the systems to be included in the projects. Having completed the review and choice of NWM systems, the two projects' research strategies diverge. CASPE examines the relationship between case-mix and nursing workload as measured in sites where one of these systems is already in operation. This, more methodological, project focuses on the internal coherence of the workload measures and on their relationship to actual hours worked and to each other.

CHAPTER 1

INFORMATION SYSTEMS FOR PATIENT CARE

The purpose of this chapter is to provide a short discussion of the origins of Nursing Workload Management Systems and The Diagnostic Related Group System.

1.1 Nursing Workload Management Systems

The need to develop methods of measuring nursing workload is not new, but the search for accurate methods to calculate the demand for nursing has assumed a greater significance in recent years due to the advent of resource management and the necessity to measure the most costly resource in the NHS: that of nursing. Attempts are being made to measure nursing workload and an increasing number of management systems are being introduced into hospitals and the community.

Background

The systematic collection of nursing manpower data started in earnest in the UK nearly two decades ago, and even at this early stage in the evolution of workload systems, there were different approaches. As these approaches have been re-defined, so too have the systems, resulting in a complex picture which seems to defy clarification. There have even been two different definitions of the word "workload" according to DHSS/ORS (1985); the first definition describing workload as an aggregation of the time spent on individual activities for each patient, and the second definition relating the number of nurses working on the ward to aggregate measures of activity on

a ward. These two definitions of workload are at the core of patient dependency studies discussed later in this section.

Of the six foundation methods of measuring nursing manpower, five adopted the former definition of workload and it is these methods which form the basis of most of the systems currently on the market. The first five systems (The Northern RHA application of the "Aberdeen formula", the Cheltenham DHA patient dependency method, the Oxfordshire DHA patient dependency method, the Leicestershire DHA patient dependency method, and the Telford Consultative Approach) use the former definition of workload and the Trent RHA "Senior-Gratton" formula uses the second definition. These have been extensively reviewed in DHSS/ORS, 1985.

Nursing manpower planning has become important at all levels within the NHS; from national and regional structures to ward level. In the past, national and regional manpower planning has favoured the "top-down approach" to manpower estimation whilst ward level planning has tended to adopt "bottom-up" approaches. The "top-down", managerial approach embodies the aggregation of manpower estimates in order, for example, to cost nursing establishments, and is therefore the approach commonly adopted for strategic planning: an example of the "top-down approach" is the Trent RHA "Senior-Gratton" formula. These methods, according to the 1985 DHSS/ORS publication "relate manpower numbers in broad terms to measures of output or activity. It is also often extended to relate manpower and activity to cost constraints and strategic priorities." These methods lack flexibility and do not take into account variations in nursing care required, for example, for different patient groups, bed occupancy or ward design. The original aim of such methods was to provide nursing manpower statistics as a point prevalence exercise although

this important limitation has sometimes been overlooked, and these methods wrongly applied to forecasting nursing manpower.

The "bottom-up approach" to measuring nursing manpower has achieved more universal approval by the nursing profession as a whole because this approach has taken into account patients' needs for nursing care and is therefore seen to be more user friendly to nurses at the ward level. Systems embodying the "bottom-up approach" take into account the nature and timing of tasks undertaken by nurses on the wards and relating these to the condition of the patient: hence they are sometimes referred to as patient-nurse dependency studies. Dependency studies on the market prior to 1978 have been reviewed by Wilson-Barnett (1978) and DHSS/ORS (1983). These studies rely on measuring the process of patient care, allocating patients into groups according to the amount of nursing care received or required.

Duberley and Norman (1990) describe two main types of dependency studies; those allocating a standard time for nursing care of patients within each dependency group, and those allocating a standard time for each activity which is then summed. Early examples of these manpower studies are those of Goddard (1963) which subsequently influenced the emergence of the Aberdeen formula. Other examples were those of Barr, Rhys-Hearn and the Leicestershire, Oxfordshire and Cheltenham methods. It is these early versions of workload common to all of the methods cited above which form the basis of most of the Nursing Workload Management Systems (NWM systems) currently available.

Although all the systems cited thus far involve a degree of objectivity, one approach evolving around this time took professional judgement as the core

element for manpower planning. This system is known as the Telford Consultative Approach (1979) and relies upon ward staff setting acceptable levels of staff numbers for each day and night in order to provide minimal/safety care and acceptable care. These standards of minimal/safety care and ideal care, are not documented; instead, they are agreed at the individual ward level. Subsequent staffing levels are then discussed, agreed and reviewed and then applied to patient groupings.

These "foundation" systems, based on some form of activity analysis, have spawned a plethora of second and third generation systems, and have become increasingly complex and sophisticated. This complexity has arisen partly because methods have been generated which attempt to take into account the advent of new nursing philosophies, such as the nursing process and care planning. Whilst the "top-down approach" has served a purpose for costing nursing establishments, "bottom-up" approaches did not initially lay claim to this function. One section of this report rectifies this omission by applying costing activities (which are not integral to the NWM systems) to approaches of the bottom-up genre.

1.2 Diagnosis-Related Groups (DRGs)

The need to describe case-mix for service planning has been recognised for at least three decades, attention focusing on the DRG classification system in 1983 when the US federal government decreed a fixed price per DRG for providing hospital in-patient services to Medicare patients. This functional change, from describing patients' diagnoses following discharge from hospital and patients' length of stay to a cost-oriented system embodying hospital output and cost functions, has meant subsequently that increasing

attention is being paid to such systems within the changing framework of health care provision in the NHS.

The methodology and development of the DRG classification will not be discussed here but instead this section of the report will concentrate on the resource implications for nursing of categorising patients into a medical diagnostic framework. Sanderson et al (1989) note four major criteria embodied in the development of the DRG system: these are that:-

(1) the groups should be comprehensive and mutually exclusive

(2) it should be possible to allocate cases to groups on the basis of routinely captured information

(3) the resulting groups should be clinically coherent

(4) the groups should be homogeneous in their use of resources.

In striving to meet criteria 1 and 3 above, the initial groupings have risen from 383 diagnosis-related groups to 467, and these groups, originally accommodated in 83 major diagnostic categories (MDCs), have been reduced to 23.

Some DRGs are less vaguely defined than others, with consequent resource implications: for example, lens procedures (DRG 39) and inguinal and femoral hernia procedures age 18-69 without morbidities or complications (DRG 160) offer more precise definitions for categorisation in contrast to foot procedures (DRG 225), heart failure and shock (DRG 127), diabetes (DRG 294),

and transient ischaemic attacks (DRG 15). In addition to problems associated with wide-ranging definitions, there are also resource implications in the failure of the system to distinguish between elective and emergency admissions - these examples are quoted by Sanderson et al in terms of, presumably, medical resource use, but they clearly also affect nursing resource use.

Coding

The reliability and accuracy of systems, be they for nursing workload requirements or for descriptions of case-mix, ultimately rests upon the ability to code information accurately. There are two broad areas for inaccuracies in records relating to DRG classification; firstly the differences resulting in inappropriate classification into DRGs due to 'internal' factors, and secondly, inaccuracies may occur due to poor quality control for the actual process of coding. The 'internal' factors referred to are those relating to the diagnostic and operation procedure codes; Sanderson et al report an incorrect assignment rate of 1.5% of diagnostic codes and 1% of operative codes. This is in part because the coding system used in the US is derived from the clinical modification of the ICD 9 version (the ICD 9 CM) whereas in the UK, two separate systems are used to produce diagnosis and operation - the ICD 9 4-digit diagnostic code and the OPCS 3 or 4 digit operation code.

Smith et al (1991) reported that 24% (including both the internal and external factors referred to above) of 139 joint replacement procedures had been assigned to incorrect DRGs over a 3 month period at a Leicester hospital; of these 36% were due to converting the correct OPCS 3 code to DRGs and the remaining 64% were due to coding errors. Coding errors are of some

considerable concern in the US, where Hsia et al (1988) report a study of DRG coding using a sample of 7050 medical records from 239 hospitals. Medical record specialists reabstracted ICD 9 CM codes to assign correct DRGs and then compared this DRG assignment to be original ones recorded by physicians and hospital administrators. Hsia et al report an error rate of 20.8% with a statistically significant 61.7% of errors in coding favouring the hospital (by causing the costs of the case-mix to increase by 1.9%). The overall conclusion drawn from this study was that hospitals received overpayment for patients covered by Medicare and that DRG 'creep' occurs with errors benefiting the hospital financially. In the UK coding errors may have implications for resource allocation.

For the purposes of this project, every effort was made to ensure that the 'correct' diagnostic information had been collected. We did not have access to medical records nor to any patient diagnostic information recorded by the hospitals. The diagnosis was taken as that recorded on the nursing records, supplemented where necessary with information given by ward staff.

Nursing Resources and DRGs

The issues surrounding nursing resource utilisation and hence nursing costs within and across DRGs are at the core of this project and are in accordance with research interest being shown in the USA in this area. McKibbin et al (1985) reported a pilot study from two hospitals in Wisconsin which had been commissioned by the Health Care Financing Administration in order to answer the criticism that DRGs ... "were developed without explicit attention to nursing resource use or nursing costs in hospitals". This observation prompted another study by Fetter et al (1987) entitled "DRGs and

Nursing Resources" whose aim was "to develop a per patient allocation statistic for nursing costs incurred for care received during a stay in an acute care hospital". Nursing costs are a major component of hospital care in the USA and in the UK; in the United States it has been estimated that institutional nursing costs amounted to $62.3 billion in 1985 (Halloran, 1987) and in the UK, nearly half (46.3%) of all salary costs in the NHS were attributable to nursing in 1988.

At the present time in the USA, nursing input to DRGs is costed according to the patient's length of stay, irrespective of the amount of time spent during each day on direct nursing care. This is the 'per diem method' according to Curtin (1984) where total nursing costs are divided by the number of in-patient days thus deriving an average daily cost per in-patient day. No account is taken of the dependency of the patient on nurses to undertake the basic activities of daily living and to aid their recovery and subsequent discharge from hospital. The second method described by Curtin is the Relative Intensity Measure (RIM) where patients are clustered according to length of stay. The average minutes of care are derived for a particular length of stay, but again, a major criticism of this method is that patient activity is not taken into account.

The third, acuity method, as its title suggests, classifies patients according to the number and complexity of their nursing care needs. An average daily classification is determined leading to an average time needed to provide nursing care to which nursing costs can be attributed. Length of stay is also taken into account and, with the patients' DRG classification added after discharge, the nursing costs per DRG can be derived. According to Brooten (1988), a major disadvantage of this method is "the reliability of

patient classification systems' (author's underlining). These three methods, according to Curtin, are the main types of costing models which may be used to cost nursing input into DRGs.

Thompson and Diers (1985) undertook an inquiry into the possibility of using patient classification systems as a means of measuring nursing intensity observing that "it is somewhat ironic that nursing intensity measurement would be the last element in the DRG system to be developed". They chose five workload systems, two being 'task documents' and three being mixed 'indicator and task systems'; the schemes were the St Lukes' system, GRASP, the D J Sullivan system, a revision of Rush Medicus, and the HANY system. GRASP is the only NWM system from this group to be imported into the UK at the present time; however, Criteria for Care, a NWM system reviewed in this report, is an adaptation of the original Rush Medicus Nursing Process Methodology. Thompson and Diers concluded that there was considerable variation in the minutes of nursing care ascribed to patients across five hospitals (the basic unit of analysis was minutes of nursing care per patient per stay per DRG). There was consistency in the relative nursing intensity of DRGs and the authors concluded that, ideally, nursing costs should be derived at the unit level within a hospital, having separated out intensive care units from routine care wards. Thompson and Diers also observed that it should be possible "to collapse classification data into categories of relative nursing intensity" - to define 4 or 5 levels of care into which all patient classifications could be placed thus providing the mechanism for producing "comparable patient data across institutions at the DRG level".

CHAPTER 2

MAIN STUDY DESIGN

Rapid decisions had to be taken in three key areas (as this was only a one year study). First the choice of system to study from among the 23 available (Greenhalgh 1991); second the choice of parameters for defining the workload measures; and third whether the focus should be on internal or external validation and therefore exactly how to design the study.

2.1 Choosing a System

There are 23 Nurse Management Systems currently available (Greenhalgh, 1991); of these 23, some are ward nurse tracking systems/nurse deployment or rostering systems such as ANSOS, Crestbond and Merit, and others are designed to provide workload requirements, such as SENS, NISCM and PENFRO. Other systems, which tend to be those introduced most recently, serve a care planning function and include EXCELCARE, up-dated FIP, I-Care and Data-Med.

Initial thoughts centred on choosing ward nursing management systems implemented in the Resource Management Initiative (RMI) sites because these sites would have gone through the process and experience of choice and implementation of nursing management systems. The systems and sites are as follows:

(1) Royal Hampshire Hospital - TDS

(2) Guy's Hospital - FIP

(3) Huddersfield Hospital - EXCELCARE

(4) Freeman Hospital - C for C

(5) Arrowe Park Hospital - C for C and NISCM

(6) Pilgrim Hospital - C for C and NISCM

The issues and progress of implementation of nursing management systems at the RMI sites have been reviewed by Norman et al (1988) who concluded that their evaluation was somewhat premature in that systems, at sites where choices had been made, were at various, usually early, stages of implementation; this therefore did not provide a good 'sampling frame'.

At the time of these initial explorations it was becoming clear that the 23 systems currently listed in the Greenhalgh guide could be grouped into categories depending on each system's approach to workload measurement. Broadly speaking, these approaches are:-

1. dependency driven; this category refers to systems which produce workload requirements based mainly on the dependency of ward patients on nursing care in order to perform the basic activities of daily living.

2. 'task oriented'; this category refers to systems which rely on recording and predicting nursing interventions for individual patients.

3. Care-plan driven; these systems measure workload by producing nursing care plans which are then used to predict workload.

4. ward-based; this category includes systems which produce ward over-

views of staffing requirements by concentrating on patient through-put/ bed occupancy.

There are inevitably areas of overlap between these categories; they are not meant to be mutually exclusive. The flexibility of systems means that other modules can be added to the framework - for example, the parallel development of patient information systems. These 'approaches' describe the developmental frameworks.

The NWM systems chosen by the six original RMI sites can be placed within approaches 1-3 and it is systems falling in these categories that have been chosen for this study. They are as follows:-

1. Dependency level approach. The systems chosen are Criteria for Care and SENS. SENS, although not implemented by any of the RMI sites, has been used on a DoH funded project on Skill Mix underway at the Centre for Health Economics at the same time as this project.

2. 'Task oriented' approach. The system chosen is the Financial Information Project (FIP). At the time when choices were being made, FIP was working on the development and implementation of incorporating care planning activities into their framework. The workload measures produced for this report are based on the initial, and not the modified, system.

3. Care planning approach. The system chosen is EXCELCARE which essentially describes present and future workload in terms of Units of Care produced from process and outcome standards for each patient.

All of these systems have their research and development origins in the USA but C for C and FIP have been extensively developed in the UK for a number of years.

Criteria for Care

Criteria for Care arose out of the North-West Nurse Staffing Levels Project in 1978 (Ball, Goldstone and Collier, 1984) and is arguably the oldest system which is still in operation and indeed continues to be the first choice by a number of hospitals.

Patient dependency classification forms the foundation of this NWM system and unlike other systems, it does not differentiate between different types of care (for example, between basic and technical care). Its main purpose is "designed to provide a means of prospectively identifying the 'workload' and therefore the staff required on particular wards to enable better distribution of staff" (Greenhalgh, 1991). The workload measure is derived from combining patient dependencies on the ward with predetermined timings expressed as ratios. Ball et al (1984) maintain it is simple to use and indeed it has been used as a manual system in Lincolnshire Health Authority for a number of years. The computerised version is now available and installed at the Freeman Hospital, Newcastle-upon-Tyne.

South-East Nursing System (SENS)

This system has been developed by the South-East RHA and bears a number of resemblances to Criteria for Care. It is a patient dependency driven

system and the criteria for classifying patients into dependency groups is similar to C for C. In calculating workload estimates, information is also collected on day-cases/ward attenders, theatre cases and extra individual patient timing excluded from patient dependency time.

The inclusion of SENS in this review of NWM systems has been influenced by the choice of this system for the Skill Mix and the Efficiency of Nursing Care study funded by the DoH and running concurrently with this project. It was the system of choice following an extensive review of measurement systems largely on the basis that SENS can produce workload calculations based on clinical grade of staff; this was a crucial ingredient for the Skill Mix project.

SENS, as its origins suggest, has been implemented in a number of hospitals in the South-East Thames Regional Health Authority, notably Ashford, Greenwich and various Medway hospitals.

Financial Information Project (FIP)

FIP's origins were based in the West Midlands RHA as a Research and Development project financed by the DHSS, starting in 1979. Its original form centred round a costing module which produced planned and actual nursing costs. Two other modules composed the ward nursing system; in addition to the costing module, activity and manpower components were incorporated into the framework. This computerised version arose out of the conversion of the manual Cheltenham DHA patient dependency method referred to earlier in the report.

The activity module is based on an assessment of patients' individual nursing requirements by clinical grade of staff and assesses patients according to general (or basic) nursing care, essentially patients' ability to undertake activities of daily living, and also technical care, divided into shared technical activities, such as drug rounds and individual technical activities. As in SENS, time admitting, discharging and attending to day-cases/ward attenders and theatre cases is included in the workload calculation.

The initial 'task-oriented' approach of recording individual patient requirements has been superseded in later versions of FIP which have been up-graded to produce care plans. This NWM system is being implemented extensively in hospitals throughout the UK.

EXCELCARE

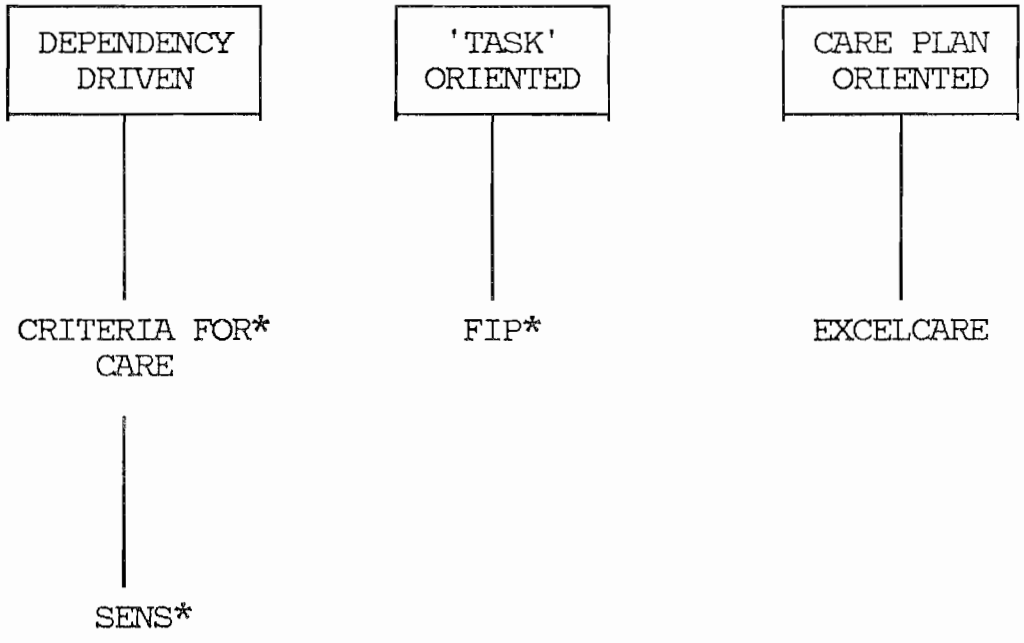
This system has been imported from the USA with only limited distribution in the UK, notably at one of the six original RMI sites, Huddersfield Royal Infirmary and more recently Basildon and Orsett Hospitals. It is claimed to be the 'leader' of the comprehensive NWM packages based on a care planning approach.

The core of this system from which workload calculations are derived is the recording of Units of Care for each patient. Each Unit of Care describes nursing input for specific needs and the choice of each Unit of Care automatically selects observations and interventions pertinent to that care, previously defined. Because grades of staff are specified, workload, staffing and hence costing can be calculated. Because of the flexibility of this

system, nurses can amend care plans at any stage during a shift and therefore work completed and still outstanding can be noted and dealt with. It is therefore used retrospectively as well as prospectively for planning nursing care.

These four systems have been chosen for the review of nursing workload measures described in this report, thus fulfilling the main objective of the project. They represent working examples of 3 of the 4 different approaches to measurement shown in Figure 2.1.

Figure 2.1 Choice of Nursing Workload Measure



* ALSO CHOSEN BY CASPE (CASPE are also reviewing NISCM, SASHA and PENFRO)

2.2 The Parameters of NWM Systems

Integral to every NWM calculation is a series of parameters or assumptions. These parameters are derived, in most cases, from the results of activity analysis undertaken at the site where the chosen NWM is being implemented. Ideally, activity analysis should be undertaken on each ward, day and night, for a given time period and repeated at intervals for reliability and changes in ward activity. Clearly this is a costly, labour intensive, and potentially disruptive exercise and it is not surprising that these activities are rarely undertaken on a hospital-wide basis. Prior to implementing a chosen NWM system therefore, some hospitals "import" information resulting from activity analyses undertaken on other wards in the same hospital, or from other sites, or they may use information provided by the company supplying the system.

The decision relating to the extent to which activity analysis is carried out ward by ward is crucial and all NWM systems rely upon these data in order to set their own timings to calculate workload. These minutes of time (fractions of an hour) represent nursing time spent on caring for patients with differing dependency levels (as in time bands or ratios in C for C and SENS, time spent on individual tasks (as in FIP where, for example, the time required for giving an enema has been set at 5 minutes and the time taken for doing a minor dressing 10 minutes[1]), and time spent on individual Units of Care as in EXCELCARE (for example the time required to change/straighten bed linen is 15 minutes and the time taken to discuss a patient's discharge is estimated at 20 minutes).

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[1] These examples have been taken from a consensus of timings from activity analysis undertaken at 10 different hospital sites.

The funding for this project did not allow for extensive (or even any) activity analyses to be undertaken. Activity analysis underpinning all NWM systems involves observing and recording the activities of all nursing staff at regular intervals over a 24 hour period, day and night. This recording is usually carried out at 15 minute intervals (although for the Skill Mix project, observations were carried out at 10 minute intervals over a 2 hour shift). The activities are then grouped into categories depending on the NWM: for C for C and SENS, the 4 categories are direct care, indirect care, associated work and personal time; and for FIP, the categories relate to basic and technical care divided into factors and subfactors within these two groups which are timed with the most appropriate grade of staff identified to undertake each factor; EXCELCARE allows considerable flexibility in categorising activities in that each site can define which criteria may be grouped under direct, associated and personal care time.

Nevertheless, it is clear that the choice of these basic parameters is a crucial factor in the estimates derived from the NWM system. The decisions taken on the choice of parameters were as follows:

For Criteria for Care

Initially, it was presumed that timings and ratios from published data based on 'model' wards would be used (Ball and Oreschnick, 1986), but after a site visit to a hospital where extensive activity analyses had been undertaken, it was decided that timings generated by the latter site should be adopted for this project. The timings were implemented in this particular hospital from 1st May 1990 (personal communication) and were as follows:

	Dependency Level				
	I	II	III	IV	(V)
Minutes	75	90	187.5	307.5	(937.5)
Ratios	1	1.2	2.5	4.1	(12.5)

The numbers of patients multiplied by these ratios generate a workload index (WLI). Because of the cumbersome nature of converting this WLI into workload hours required, the index is multiplied by a constant (k) which summarises the following observations:-

i) direct care activity = 50%

ii) 8% deducted for meal breaks

iii) 10% added for sickness, annual leave and continuing education and

iv) WTE - taken as 37.5

In this instance k_1 = 0.4956. By adjusting observations i) to 55% direct care activity and ii) allocating 92 minutes to dependency level I patients (as in the model ward timings described in Section III) k_2 = 0.552669. The significance of altering timings, ratios and % of time spent on direct care activity will be described in the following section, Section III.

For FIP

The standards adopted by this project for the basic activities of mobility, hygiene, continence, nutrition and psychological assessment were those timings resulting from activity analysis exercises undertaken at another site. Timings were recorded for each of the statements relating to the items listed above by day and night and whether the patient was male or female. The timings relating to technical care resulted from activity analysis taken from the same site. The timings for shared profiles (such as drug rounds, hand-over times and consultant rounds) were also taken from the above activity analyses but were confirmed by direct observation at the first site visited as part of this project.

Examples of some timings are as follows:

giving an enema	:	15 minutes
recording fluid balance	:	2 minutes
giving a subcutaneous injection	:	6 minutes
major dressing	:	35 minutes
TPR	:	2 minutes
BM stix	:	5 minutes

For SENS

SENS allows users flexibility in deciding the amount of time necessary to undertake a wide range of patient and ward activities. The parameters used to generate workload requirements using SENS were those adopted from the Skill Mix project since we were able to install this system at the Centre for Health

Economics. Thus timings on, for example, emergency admissions of dependency group IV patients, intermediate dressings, extra time allowed for theatre patients and extra time allowed for ward attenders/day cases, were agreed with the nurses working on the Skill Mix Project. The average guide percentages of nursing time spent on different types of care were taken from the SENS manual: the proportion of direct care being 52%, that of indirect care 24%, associated care 14%, and personal time 10%.

For EXCELCARE

The timings used to describe the Units of Care integral to this particular workload system are those resulting from timing studies undertaken within one health authority (personal communication). They are extensive, recent, and have now been agreed by users and providers implementing the system.

Examples of some timings, per shift, of activities which comprise various Units of Care are as follows:

Care of pyrexial patient	:	20 minutes
Checking of naso-gastric tube	:	10 minutes
Administering medication	:	2 minutes
Recording B/P on admission	:	2 minutes
Recording fluid intake and output	:	1 minute

The proportion of time spent on direct care has been calculated as 80%. Although this is wildly different from the proportion of time spent on direct care in any of the other three systems described above, the reasons for this

difference are the criteria used to describe direct, indirect and associate care. For EXCELCARE many of the criteria used in other systems to allocate activities to indirect or associated care are considered more appropriately classified as direct care.

2.3 Assessing NWM Systems

The assessment of validity obviously cannot be internal because of the practical impossibility of carrying out activity analysis. It was therefore decided to collect data which would bear both on the stability and consistency of the NWMs, and on their external validity.

The first approach involved an analysis of the sensitivity of the NWM estimates to small variations in the basic parameters (see 2.2 above) and collecting data on a number of NWMs simultaneously on several ward days. These analyses are reported in Chapter 4 below.

The second approach involved collecting other kinds of ward level data which might be related to the estimates of nursing workload. The most obvious set of data are the actual hours worked but there are also indicators such as average dependency, case mix and others; these are examined in Chapter 5.

All these analyses are at an aggregate ward level and, in order to confirm the stability of at least some of the relationships observed, it was also decided to collect individual case data including both diagnosis and measure of quality of care. These are analysed in Chapter 6.

The final design adopted was as follows:

- collection of sufficient data to calculate workload estimates for the chosen four NWM systems on a number of ward-days.

- collection of parallel data on actual hours, case-mix and outcomes to assess whether any one system provides more 'realistic' estimates than any other.

- analysis of individual data to see whether there is any relation between case type and the quality and outcome of care which ought to be taken into account.

CHAPTER 3

INSTRUMENTS AND DATA COLLECTION

This section describes the methods and mechanics of data collection for this project, the instruments used and the decisions taken in order to generate nursing workload requirements using the 4 NWM systems described in the preceding section.

3.1 INSTRUMENTS

Patient Assessment

A schedule was designed which incorporated all the items necessary to allocate patients into dependency groupings integral to any of the NWM systems chosen for this study. The four items common to all the measures were those relating to mobility, personal hygiene, nutrition and continence. The additional item of clinical intervention/nursing attention is required for Criteria for Care assessment. Two additional determiners for above average care are those referring to involuntary drainage and major interventions (these are extra requirements). Similarly, there was the additional item of psychological assessment required for FIP. Each item contained a series of statements; one of which had to be chosen as describing the condition of the patient. These statements were taken from the manuals for Criteria for Care, FIP and SENS.

Criteria for Care

The five items referred to above allowed each patient to be placed in a dependency group of I (least dependent) to IV (most dependent). Although some hospitals have added a dependency group V to their categories, this was not considered to be essential to this study since dependency group V is used for patients requiring continuous 24-hourly nursing care, such as may be provided in Intensive or Coronary Care Units. Since data collection for this study took place on general medical and surgical wards, there were no patients who would be included in this fifth dependency group.

An example of one item, mobility is shown in the box overleaf.

The statement pertaining to each item was then allocated to A, B and C categories and the dependency level was derived from the numbers of A-C describing the five items above exactly as instructed in the Criteria for Care manual.

SENS

Statements relating to the four common items above, namely personal hygiene, nutrition, mobility and clinical intervention were also applicable to SENS and the original intention had been to record the patients dependency level on the same questionnaire. However, in order to facilitate data preparation and entry, each patient's dependency level was recorded on a specially designed SENS form (pink) also used for the Skill Mix project. This form also allowed for information to be collected on ward attenders/day cases, theatre cases, admissions, discharges, transfers in and out, and escorting patients in addition to patient dependency information.

MOBILITY COMPONENT

This component refers to the nursing care required by the patient to keep him/her physically active within the limitations of the disease or condition. his includes positioning, exercising, assistance to move while confined to bed, getting out of bed into a chair, going to the bathroom or walking.

DETERMINERS

A) Up and About - Minimal Nursing Involvement

The patient does not require assistance with getting in and out of bed, is up as tolerated or is independent in a wheelchair. Consider the rehabilitation paraplegic patient and patients who have learned to manage potentially restricting tubes or appliances such as T-tubes, urethral catheters, I.V's and plaster casts while walking.

B) Bedrest, Up with Assistance - Average Nursing Involvement

The patient requires some assistance from nursing staff either because he is confined to bed or because he needs help to walk safely. Consider the following examples:-

- The patient is on bedrest, but is able to change his position as desired, or if reminded, or if encouraged and assisted minimally.

- The patient is on bedrest, but may be up with the assistance of one nurse to the bathroom, or to the commode chair for bowel movements.

- The patient requires the assistance of one person to get in and out of bed and requires the assistance of one person to walk.

C) Bed or Chair with Position and Support - Above Average or Maximum Nursing Involvement

This patient is completely dependent upon the nurse for correct positioning, support and mobility. Consider the following examples:-

- The patient stays in position placed by the nurse and does not move. Repositioning in bed or chair is required with use of sand bags, foam rubber, sheepskin or pillows every two hours, and exercising of limbs is required at regular intervals. The diagnosis in this example might be post CVA or head injury.

- The patient is restless, unpredictable and frequently reverts back to an undesirable position on the decubitus ulcer on his hip despite the nurse's repeated efforts to keep this area free of pressure.

- The patient is confused, unsteady, obese and elderly; he is hampered by a catheter, plaster cast and I.V. and two nursing staff members are required to walk and assist up and back to bed.

Source: Ball J A, Goldstone L A, Collier M M. Criteria for Care. Newcastle-upon-Tyne Polytechnic Products Ltd, 1984.

Permission to use the SENS package had been given by the South East Thames RHA, East Sussex.

FIP

In addition to the four common items, there were two additional ones relating to psychological assessment and whether the patient had been to theatre or not. Accompanying these items relating to activities of daily living were two further sets of information referred to as 'technical activities' as opposed to the 'basic activities' of daily living. The information relating to technical activities necessary for calculating workload on both general medical and general surgical wards was more or less identical with only minor differences; these data were grouped into broad areas such as fluid balance, observations, elimination, special procedures and medication.

The information necessary to generate workload according to this measure was supplied by FIP and was based on results of FIP's data collected from 10 hospital sites as part of their research and development programme.

EXCELCARE

The information required for EXCELCARE is totally different from that required to generate workload requirements using the systems described above. The form, supplied by EXCELCARE, consists of a series of procedures/ interventions (102 in total) which may be applicable to patients in general surgical or general medical wards (there is a facility for adding other procedure not included in those listed). This series of procedures/

interventions form Units of Care to which timings are allocated.

Each day, those Units of Care applicable to individual patients are noted (including day cases/ward attenders); any number of Units can be noted for a particular patient.

For each patient over the 6-day period therefore 4 different daily assessments are made - viz:

Criteria for Care	White forms
FIP	
EXCELCARE	Peach forms
SENS	Pink forms

These schedules are attached in Appendix A.

All assessments were made daily, based on the patients' condition and interventions/procedures appertaining to the previous 24 hours. For example, if patients were assessed on Ward A, starting at 12 noon, all nursing care given and the ability to undertake activities of daily living were recorded from 12 noon the previous day. Although NWM systems are designed to forecast nursing hours required over the ensuing 24 hour period, the inaccuracy inherent in forecasting was considered to be too great for the purposes of this project. Thus a more accurate and reliable record of nursing workload could be generated by using in many instances, the nursing records, care plans, drug charts, theatre information, and records of minor procedures relating to the previous 24 hours, in addition to information obtained by direct observation and/or enquiring of ward staff and patients.

In addition to these demand data, information on supply is also integral to all NWM systems; thus data were also collected for:-

Shift Patterns (blue forms)

Each day, information about staff on duty was collected, by grade of staff. Information was also collected on sickness absence and annual leave, and ward clerks (if any). It was subsequently decided that hours worked by ward clerks should be excluded from analysis; this decision was based upon the fact that activity analysis results from the Skill Mix project concluded that ward clerks' time spent on patient care, and the hours actually worked (only applicable to one of the 3 sites visited) impinged little, and would not influence, workload requirements.

The data presented in subsequent sections of the report refer to 'shift hours' as opposed to hours paid. Thus there have been no subtractions for meal breaks (unpaid leave) or coffee breaks (paid leave). The reason for this decision is that each NWM system has its own method of calculating hours paid (for example, SENS allows the user to decide appropriate time deductions and EXCELCARE suggests subtracting 8.58% from the total shift hours). Thus, in order to maximise reliability, the workloads generated are set against the actual shift hours worked by grade by day.

Case-Mix Groupings/DRGs

The diagnostic descriptor chosen is that of Diagnosis Related Groups (DRGs), the software for this being supplied by the Department of Health. The

patient information required to allocate patients to a DRG are as follows:

age

sex

discharge status

discharge destination

admission date

discharge date

diagnosis and/or reason for admission

and surgical procedures (if any)

The mandatory variable is that of diagnosis/reason for admission. In most cases, it was possible to collect all the information required, but in situations where, for example, age was missing, data were entered twice: once entering an age less than the cut-off age of 70 years, and once entering an age greater than 70 years. In all instances where this action was taken, the resulting DRG grouping was unaffected. Similar trials were undertaken if any of the other variables was missing. This exercise was of particular relevance when assigning DRGs to patients on whom quality of care assessments, QUALPACs, had been made as part of the Skill Mix Study.

Thus nearly all patients were assigned thence to a DRG and an MDC (Main Diagnostic Category). The schedule on which these data were collected was colour-coded green, and is attached in Appendix A.

Outcome Measurement

The outcome measures designed by the Skill Mix team were used in this

study in order to accompany the process measures of quality (QUALPACS) and nursing workload measurement. The measures chosen were distilled from discussions with senior nurse managers and academics and, when tested in the field, were found to be reliable and valid. (The observers trained by the Skill Mix team to collect these data were also employed for this study.)

The 9 measures included were:

hygiene
nutrition and hydration
pressure scores/skin integrity
I-V therapy
discharge planning
pain control
education/rehabilitation
elimination
anxiety, orientation and information.

For each measure, there were between five and nine statements, with an average of six statements relating to each. As for patient assessment observations, the observers had to indicate whether the statements relating to each of the above measures had been met or not; the options for each statement ranged from outcome met (whether observed directly or indirectly), outcome not met, or measure not observed or not applicable.

The observation schedules were colour-coded yellow and attached in Appendix A.

QUALPACS

The quality of nursing care was measured using the instrument, QUALPACS. This process measure was chosen by the Skill Mix team in preference to other quality measures for two main reasons: firstly, it allowed for the recording and rating of the grade of staff giving care and secondly, it allowed for more direct observation of the process of nursing. A slightly modified version of QUALPACS consisting of 60 items grouped into 5 sections was adopted; the 5 sections were as follows:

QP1 - Psychosocial care (communication between patient and carer)

QP2 - Physical care

QP3 - General care

QP4 - Communications on behalf of patient

QP5 - Professional implications

Scoring within each item ranged from 1 to 5 with 1 indicating 'poorest' care and 5 indicating 'best' care (average care = 3.0). An 'average' score indicated that the standard had been met.

The relationship between these two studies is described in a subsequent part of this Section entitled 'Methods of Data Collection'.

3.2 METHODS OF DATA COLLECTION

Pilot Study

Case-mix and patient data required to generate nursing workload estimates were essential for all patients on the ward. This presented no problem. However, it was also necessary to collect data on patient outcome measures and it was not obvious how feasible this would be. Previous experience in collecting such data in the Skill Mix project showed that quality of nursing care data and outcome measures could be collected on two patients per session with each session lasting two hours. The choice in most cases was restricted to the more highly dependent patients.

A feasibility study was therefore undertaken prior to the main study in order to estimate the length of time required to measure individual patient outcomes across a ward, and also to assess inter-rater reliability. Two wards were chosen: in a London hospital; one general medical and one general surgical ward. Both wards had 4-6 bedded bays with 2-4 single cubicles. Two observers worked together for two sessions of 2-3 hours.

The main conclusion reached was that 3-hour observation periods would be necessary to observe patients in a 6-bedded bay and that patients in side wards/single cubicles should be excluded for the purposes of outcome measurement (patients in side wards were however included in data collection for the NWMs and case-mix information). The reasons for excluding patients in side wards were i) observation would be too intrusive and ii) that some items of measurement would be missed unless the observer(s) were in each cubicle throughout the period of data collection.

The two observers for the pilot study were the author (SJC) and a nurse working on the Skill Mix team observing the same patients in a 6-bedded bay. Although the inter-rater reliability was satisfactory over all 9 outcome measures, some measures provided less reliable data than others; these sections referred to planning for patient discharge and education/ rehabilitation.

Main Sites

The original plan was to collect data for the main study on two wards at three sites; the two wards to be one medical and one surgical. At site 1, due to circumstances entirely beyond our control we became one of the first casualties of the Gulf War since one of the wards chosen was subsequently closed for all admissions. Data were therefore collected on a male medical wards with a Nightingale design. Two observer were employed for this exercise and trained, by the skill mix team, to reliably record individual patient outcomes.

Data were collected over two shifts of 2.5 hours duration for 6 days continuously, in order to include a weekend; from 11-13.30 hours and 15.30-18.00 hours. These shift patterns were deliberately chosen to reflect nurse:patient interaction at the time of most ward activity, namely observers collected data on 4 to 6 patients at each session for attention to hygiene, drug rounds, meal times and treatment patterns.

In addition to outcome measurement, data were collected on patient dependency levels plus data required to generate the 4 NWM systems described

in the preceding section. At the first site, the daily patient dependency levels were recorded as a consensus view of all the observers on the ward (3) for the 6-day period, and for 3 days the patient data required for C for C, FIP and SENS were recorded by the 3 observers.

At the second site, two wards were chosen; they were designed as four 6-bedded bays, with 6 side-wards. The shift patterns were extended to three hours, and, after the first day, the hours of data collection were changed to 7.30-10.30 and 11-14.00 hours. These changed times still reflected the nurse:patient interaction at the time of the most ward activity. Team nursing was the model of nursing care adopted by the first ward, and primary nursing was the model adopted by the second and third wards.

Patient dependency levels and outcome measurement data were collected at approximately the same time each day, although some flexibility had to be allowed for due to the daily fluctuations in ward activity (operation days, for example). Patient dependency levels were recorded by the research nurses. All schedules were collected at the end of each shift, checked, and any queries dealt with either during the same observation session or the session following immediately after. The author (SJC) collected all the case-mix data.

Due to delays in gaining access to a third site and the time constraints on the project, no further data collection was undertaken.

The final sample therefore includes:

- extensive data on 18 ward days including not only the estimates of workload from four NWMs and, of course, the actual hours worked but also aggregated data from individual dependencies diagnoses and outcomes.

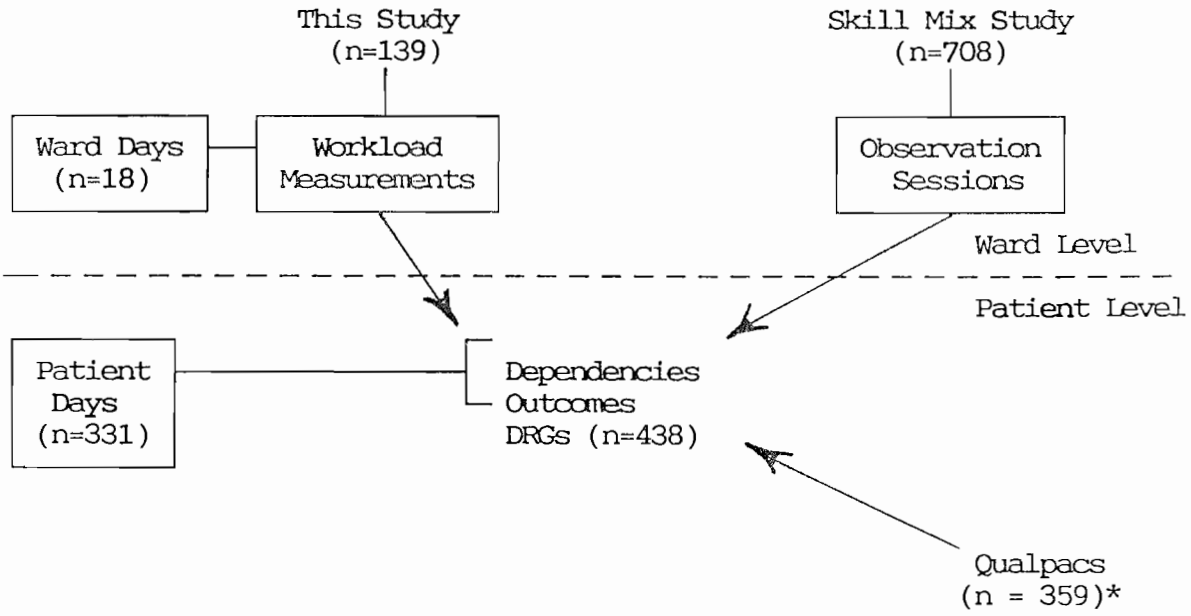
- individual data on 139 patients' diagnoses

- data for 331 patient-days on dependency and outcome

- Qualpac data on 359 pairs of patients, with dependency and outcome data on 708 patients (from the Skill Mix study).

Figure 3.2 below shows the relationship and interlinking of the two projects. Data collected for the Skill Mix Study described the quality of nursing care given, outcome measures met (or not) and DRG information, but no NWM (other than SENS). Conversely, the DRG project collected information on outcome measures, NWMS and DRGs, but no data were collected on QUALPACs.

Figure 3.2 Sources of data for this study and the relationship to the Skill Mix Study.



* Only 290 patients had both Qualpac and diagnostic data.

3.3 METHODS OF DATA ENTRY

The majority of data were entered at the Centre for Health Economics, namely outcome measure information (and the QUALPACS data from the Skill Mix Project, all of which were entered at the Centre for Health Economics). The DRG grouper package and the SENS programme (by kind permission of the South East Thames RHA) were installed at the Centre for Health Economics and therefore these data were entered here.

The data required to generate the FIP and EXCELCARE NWM systems were entered at the FIP headquarters, in Birmingham, and the EXCELCARE data were entered at Price Waterhouse, Leeds. The EXCELCARE data were processed as a collaborative exercise between Price Waterhouse and the Centre for Health Economics.

3.4 METHODS OF DATA ANALYSIS

The basic analysis of sensitivity of the sets of estimates generated by each of the NWM systems and the comparisons between the estimates in Chapter 4 relies on a simple graphical and tabular presentation of the material. The examination of the relations between the sets of estimates and other sets of data in Chapter 5 is based almost entirely on correlation analysis.

The analysis in Chapter 6 of individual patient data is more complex. First, it incorporates the data on quality as well as outcome of care; secondly the issue as to whether the case-type variable has an effect which is additional to other ward-based variables on the quality and outcome of care can only be assessed in a multivariate context. These analyses have been carried out using the SPSS^{x} package.

CHAPTER 4

INTRA AND INTER DIFFERENCES IN NURSING WORKLOAD MEASUREMENT SYSTEMS

The purpose of this chapter is to examine the extent to which the NWMs generate stable and consistent estimates. Stability is assessed in terms of the sensitivity of each of the NWMs to their crucial parameters which were discussed in Chapter 3 above. Consistency is assessed by comparing the estimates generated between the different workload measures for the same ward days.

4.1 Intra System Differences

It was explained in Chapter 3 that the basic parameters are derived from activity analysis. Yet these are very expensive to undertake and so parameters are sometimes 'imported' from another hospital or another ward on the same site. The consequences of importing parameters from activity analyses undertaken on other wards/specialties, or other sites can best be illustrated using the following examples. Although two NWM systems have been chosen for illustration, all the NWM systems reviewed in this report can be subjected to a similar type of scrutiny.

Example 1: Differences in minutes

This example illustrates the differences occurring when differing numbers of minutes are attributed to patients in the lowest dependency level. The first set of minutes are those published by C for C for their 9 model ward

timings; 92 minutes (Ball and Oreschnick, 1986). The second set of timings are those established following extensive activity analysis in a hospital with a long tradition of research and familiarity with this particular NWM (personal communication). This hospital (B) calculated that patients in the lowest dependency category (I) required 75 minutes of nursing care over a 24-hour period.

The workload index (WLI) is calculated as follows (using patient data from one of the sites visited for this project):

Table 4.1 Workload Index Calculation

	Dependency Level				
	I	II	III	IV	
Number of patients	12	16	2	1	= 31 patients
x ratios	1	1.2	2.5	4.1	
	12	19.2	5	4.1	= 40.3 WLI

Calculation of the nursing workload from the WLI of 40.3 representing 31 patients assuming the difference in minutes between Hospitals A and B described above and 50% of time spent on direct nursing care is shown in Table 4.2.

Table 4.2 Costs Attributable to Workload

	Hospital A	Hospital B
Dependency Level I	92 mins	75 mins
Required workload (in WTE)	24.604	19.973
Using April, 1991 salary ratings - mid-point (£13,777.5)	£338,982	£275,178
DIFFERENCE IN SALARY COSTS =	£63,804 pa	

Thus the implications of importing Hospital A's or Hospital B's timings could make a difference in staffing costs of £63,804 per annum, simply by a timing difference of 17 minutes for Dependency I patients.

Example 2: Differences in ratios

There are almost countless ways of producing different results for nursing workload requirements; the examples included here are not theoretical and are the standards/parameters employed in a variety of hospitals throughout the country where Criteria for Care has been implemented. The following example uses the same ward data as in Example 1, but illustrates the differences found when comparing the model ward ratios with ratios calculated from activity analysis in a substantial number of wards within one health authority (personal communication).

31 patients allocated to the same dependency groupings as in Example I are shown below, the only difference being a ratio of 1.7 for dependency level II patients instead of a ratio of 1.2 (the latter being the standard used in both Hospital A and B in the previous example).

Table 4.3(a) Workload Indices Derived from Differing Ratios

	Dependency Level				
	I	II	III	IV	
Number of patients	12	16	2	1	= 31 patients
Hospital A's ratios	1	1.7	2.5	4.1	
	12	19.2	5	4	= 48.3 WLI

Table 4.3(b)

	Dependency Level				
	I	II	III	IV	
Number of patients	12	16	2	1	= 31 patients
Hospital B's ratios	1	1.2	2.5	4.1	
	12	19.2	5	4	= 40.3 WLI

The calculation of nursing workload requirements from the two workload indices in Tables 4.3(a) and (b) above using identical patients, in the same dependency categories, assuming Hospital B's standards of 72 minutes and 50% of time being spent on direct nursing care (from Example 1), results in the following differences in salary costs.

Table 4.4 Costs Attributable to Different Workload Indices

	Hospital A	Hospital B
Workload Index	48.3	40.3
Required workload (in WTE)	23.937	19.973
Using April, 1991 salary ratings - mid-point (£13,777.5)	£329,792	£275,178
DIFFERENCE IN SALARY COSTS =	£54,614 pa	

Thus if a hospital, having chosen Criteria for Care as its workload measure, selects Hospital B's ratios for dependency levels in preference to Hospital A's, a saving of £54,614 could be made. This cost difference is derived solely from a single alteration in ratios for dependency II - type patients, from 1.2 in Example 1 to 1.7 in Example 2.

Example 3: Differences in time spent on direct nursing care

Another source of difference arises when the proportion of nursing time devoted to direct nursing care is changed. It seems logical to assume that the amount of direct nursing care differs from specialty to specialty and that, for example, a higher proportion of direct nursing care time is allocated to patients in a geriatric ward in comparison to patients in a general surgical ward. An 'across the board' estimate of, for example, 52% of direct nursing care for all specialties may lead to errors in staff forecasting (both over-and under-estimates). Using the same criteria for activities described as direct care, as opposed to indirect, associated on personal time, most hospitals opt for a range of 48-53% direct care.

The following example illustrates the implications for choice of proportions of time spent on direct nursing care, using SENS.

Table 4.5 shows the financial implications of adopting a lower estimate of the amount of time spent on direct nursing care (48%) when compared with a higher estimate of 53%; the latter figure could be taken to represent the amount of nursing care which may reasonably be expected on a geriatric ward, and the former figure might represent the amount of direct nursing care calculated for a surgical ward, for example.

Table 4.5 Differences in the amount of direct nursing care for one ward over 6 days

% time spent on direct care	48%	53%
Day 1	137.0	123.09
2	126.71	114.1
3	134.63	121.15
4	125.17	112.99
5	127.15	114.32
6	119.76	107.91
Total Hours	770.42	693.56
Hours difference	76.86	
In WTE	2.05	
Salary difference (@ £13,777.5 pa)	£28,238	

Thus if a ward manager chose to allocate 48% of time to direct nursing care as opposed to 53%, this decision could 'cost' a hospital £28,000 per annum.

The actual amount of time spent on patient care is integral to the SENS system and is constant; the differences shown in Table 4.5 above refer to 48% or 53% of actual time allocated to patients in the SENS dependency groups. For example, for patients in dependency level II SENS allocates 2 hours/120 minutes and it is 48% or 53% of 120 minutes which is reflected in Table 4.5.

NWM systems such as SENS and Criteria for Care have their roots buried in categorising patients into dependency groupings for generating workload requirements. Spurious results may be produced if rigorous training is not undertaken to explain, in considerable detail, the criteria for classifying patients into dependency groupings. The difficulties of training and up-dating staff responsible for allocating patients into dependency groups may be well recognised but cannot be over-emphasised. The daily requirement of these systems to allocate dependency levels to all patients on the ward may seem burdensome unless senior ward staff feel some commitment and understanding of this necessary exercise in order to produce reliable workload estimates.

Example 4: Differences in dependency groupings

The final example in this section illustrates the differences occurring when two groups of nurse categorise the same patients into dependency groups; one indicative set of dependency groupings being kindly given by senior ward nursing staff (Group A) and the other set allocated by research nurses working on the ward (Group B).

The tables relating to this example show differences attributable to categorising the same 16 patients into dependency groups for one day only, chosen at random from six days' data. The resulting workload indices, calculated from dependency level grouping, use the same ratios as in Example 1 and Hospital B's standards of 72 minutes for dependency level I patients and 50% of time spent on direct nursing care.

Table 4.6(a) Group A Categorisation of Patients

	Dependency Level				
	I	II	III	IV	
Group A ratings	-	11	2	3	= 16 patients
x ratios	1	1.2	2.5	4.1	
	-	13.2	5	12.3	= 30.5 WLI

Table 4.6(b) Group B Categorisation of Patients

	Dependency Level				
	I	II	III	IV	
Group B ratings	10	2	2	2	= 16 patients
x ratios	1	1.2	2.5	4.1	
	10	2.4	5	8.2	= 25.6 WLI

The calculation of nursing workload requirements resulting from the two different workload indices as described in Tables 4.6(a) and (b) using identical patients and parameters produce different costs, as shown in Table 4.7 overleaf.

Table 4.7 Costs Attributable to Different Workload Indices

	Group A	Group B
Workload Index	30.5	25.6
Required workload (in WTE)	15.116	12.687
Using April, 1991 salary ratings - mid-point (£13,777.5)	£208,261	£174,795
DIFFERENCE IN SALARY COSTS =	£33,466 pa	

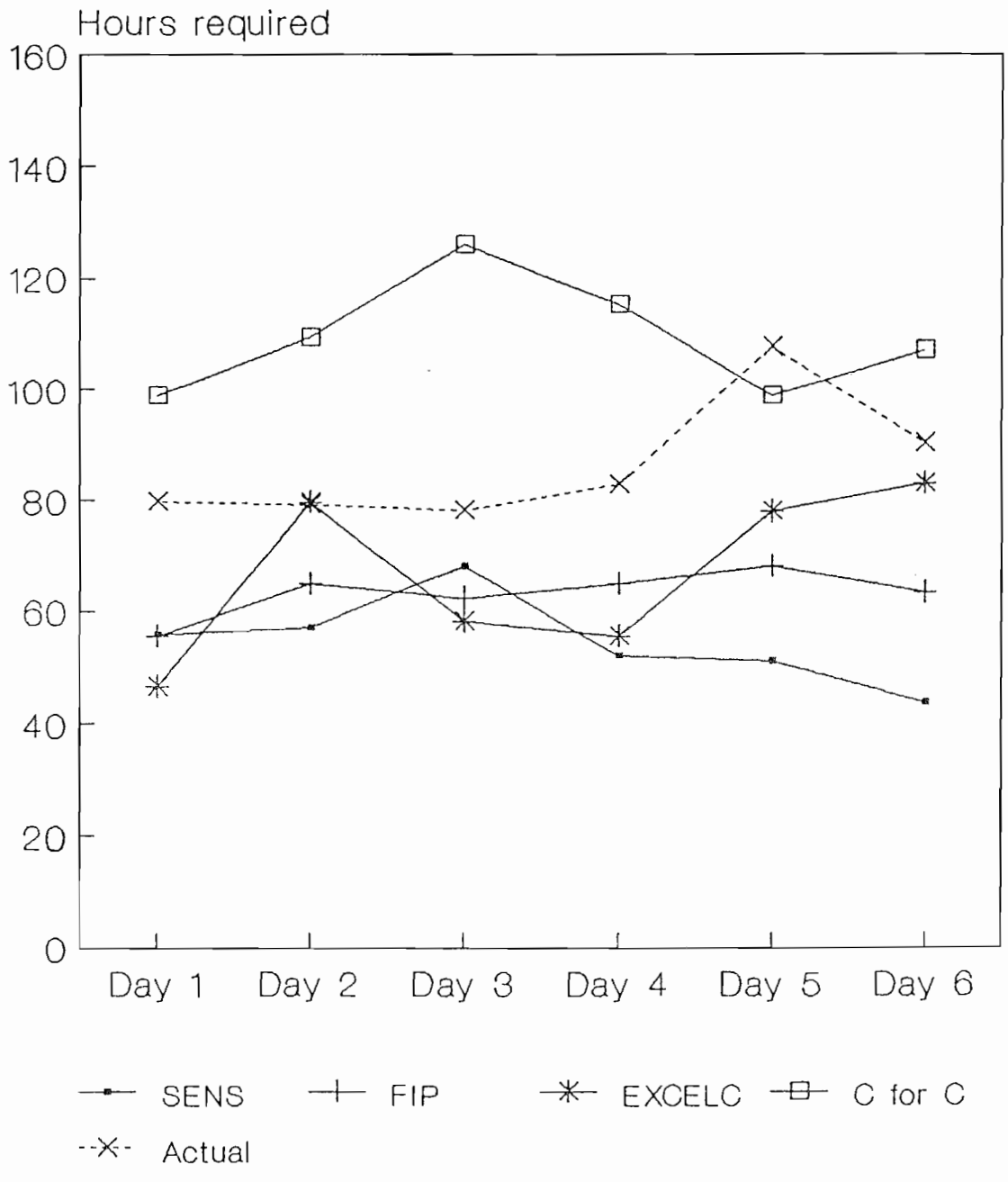
This last example illustrates the implications attached to allocating patients into dependency categories, crucial to a number of NWM systems currently available. Examples 1-3 in this section describe the cost implications of a series of managerial decisions (the consequences of differing timings, ratios and proportions of nursing care) whereas Example 4 begs the question of professional judgement implicit in this particular exercise. These judgements are passed on a daily basis on all wards implementing workload systems which are dependency-driven and rely upon accurate staff training to produce reliable results. It should be pointed out in Example 4 the dependency category ratings were allocated retrospectively - ie, allocated to patients resident in the ward in the preceding 24 hours. The implications of prospective decisions, the 'real' function of NWM systems, will be considered in the light of these retrospective findings in Chapter 7.

4.2 Inter-System Differences

The preceding section essentially deals with problems associated with structure and process measures of some NWM systems, and the implications associated with applying different parameters to these systems. This section deals with outcomes resulting from using identical data sets to generate nursing workload requirements.

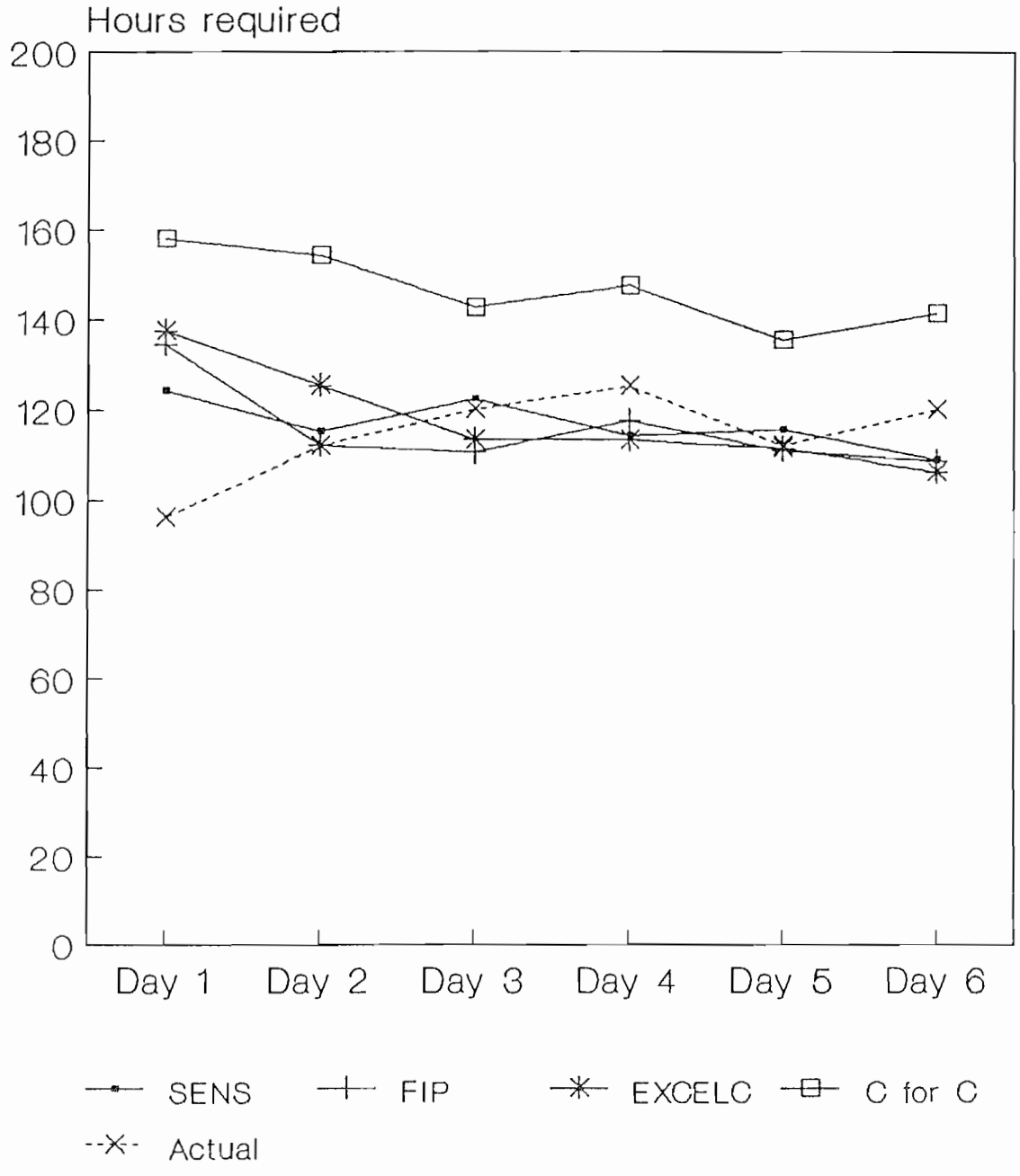
The methods of data collection for each of the chosen NWM systems were described in Chapter 3 and the results presented below illustrate the differences between systems and the cost implications of such differences. This part of the study was essentially designed as an 'in vivo' experiment controlling for all external variables (such as ward design, models of nursing, patient type, case-mix and nursing skill mix) and using these identical data to generate nursing workload requirements using the methodologies specific to each NWM.

Fig.4.1a Hours required by 4 NWM systems over 6 days - Ward A (medical)



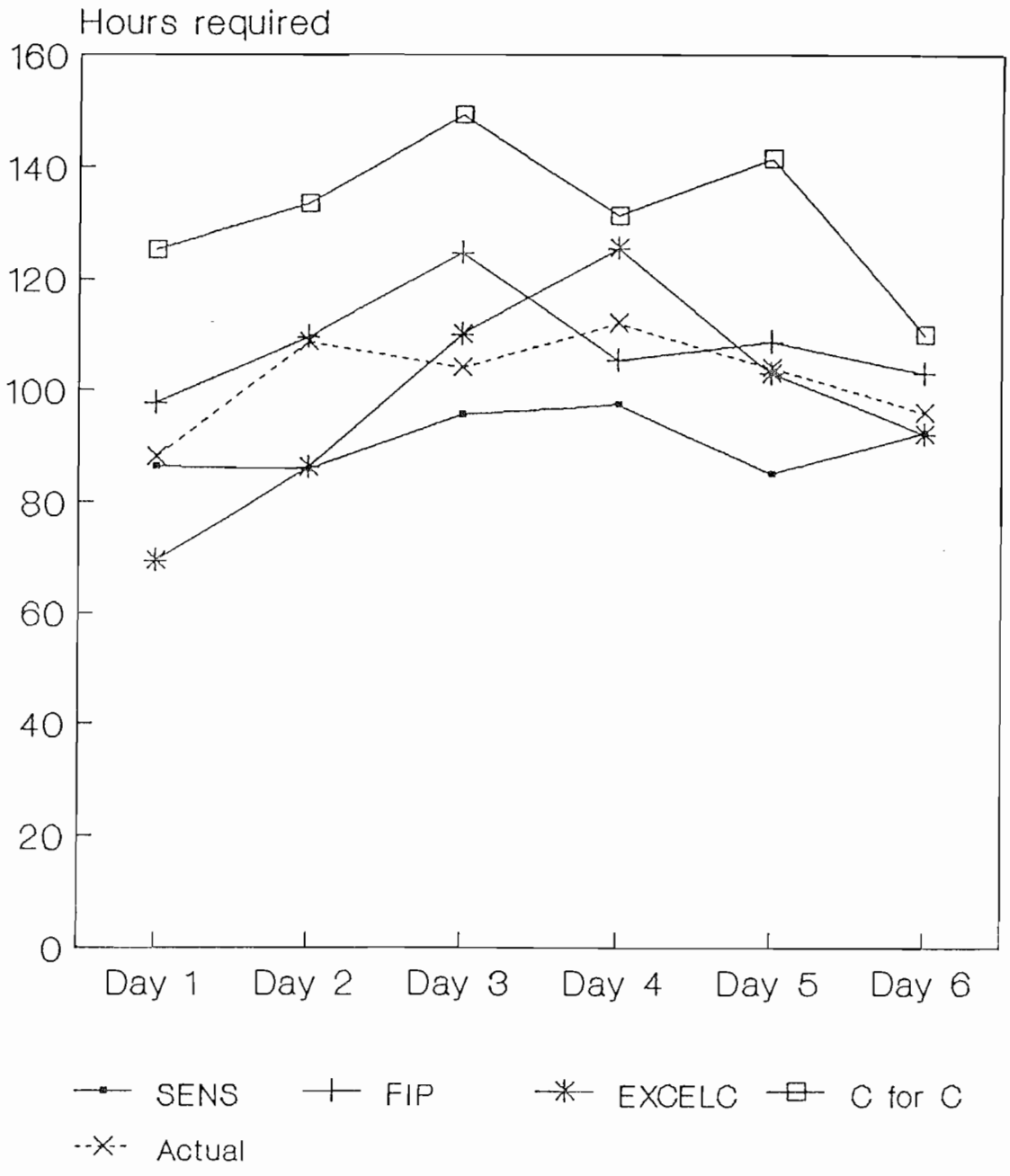
The data on which Fig.4.1a is based is attached in Appendix B, Table B 1.1

Fig.4.1b Hours required by 4 NWM systems over 6 days - Ward B (medical)



The data on which Fig.4.1b is based is attached in Appendix B, Table B 1.2

Fig.4.1c Hours required by 4 NWM systems over 6 days - Ward C (surgical)



The data on which Fig.4.1c is based is attached in Appendix B, Table B 1.3

The total hours required over the 6 day period of data collection results in similar ranking of measures across the 3 wards; for two of the three wards SENS produces the least number of workload hours required and across all wards Criteria for Care results in consistently more hours than any of the other systems. On Ward A the total difference between SENS and C for C is exactly double the SENS value and on the ward with the least variance (Ward B) there is a difference between FIP and C for C of 185.1 hours; this amounts to 4.9 WTE. Taking the mid-point of the most recent salary ratings (April 1991), this represents a minimum cost difference of £68,006.

Figures 1-3 above show the NWM systems - and the actual/shift hours worked - for each day; there do not appear to be large daily within-system fluctuations in workload across 6 days. The greatest within-system fluctuation in workload over this time period is found in ward C; this is a surgical ward where one would expect workload to differ more from day to day than in a medical ward. The NWM consistently producing the greatest fluctuation day by day is EXCELCARE.

The raw correlation between the four estimated workload requirements is given in Table 4.8. Because the estimates are estimating the same workload requirement, there is an expectation that the four estimates should move together. The correlations are very high and close to one. Note, however, that with the simple 'null hypothesis' that they should be one, these values are still outside the usual confidence interval. Moreover, there is a statistically significant difference between the correlations of SENS with Criteria for Care and of SENS with Excelcare. This is partly to be expected as SENS and Criteria for Care adopt a similar approach to workload measurement (see Figure 2.1 in Chapter 2 above).

Table 4.8 Correlation Between the Estimated Workload Requirements

	EXCELCARE	SENS	FIP
Criteria for Care	.84	.91	.91
EXCEL CARE	1	.83	.86
SENS		1	.91

Pearson's correlation:

With n = 18, r = 0.40 is significantly different from 0 at 0.05.

r = 0.58 is significantly different from 0 at 0.01.

4.3 Financial Implications

Turning to the question of staffing requirements the following tables illustrate the differences between NWM systems in terms of nursing workload hours required and shift hours. The financial implications relating to the choice of NWM systems in this section are calculated from the mid-point of the clinical grading structure for staff ranging from Grade A to Grade I, thus excluding student nurses' pay. The salaries have been taken from those payable from April 1st 1991. The grade-mix of staff on the wards has not been shown for reasons of clarity. The financial implications of the choice of ratios of trained:untrained staff would clearly affect the cost differences shown in Tables 4.9-4.11.

Table 4.9 Total Staffing Requirements over 6 days by NWM in Ward A (taken from Table B 1.1)

Total Number of shift hours over 6 days	Total number of hours required calculated by: SENS	FIP	EXCELCARE	CRITERIA FOR CARE
517.9	327.6	378.7	400.8	655.3
Hours difference	-190.3	-139.2	-117.1	+137.4
In WTE	-5.07	-3.71	-3.12	+3.66
Salary costings	-£69,916	£51,114	£42,986	+£50,426

Thus, if SENS had been the NWM of choice for Ward A, a saving of nearly £70,000 could be made on reducing the number of staff since it appears that 327 hours of nursing time are required over this period of 6 days, and there is a total of 518 shift hours available. If FIP had been chosen, a saving of 3.71 WTE could have been achieved (£51,000) and if EXCELCARE had been the NWM of choice £43,000 could be saved. This contrasts to the situation occurring if Criteria for Care had been implemented on this ward, the nursing requirement being calculated as an additional 3.66 WTE; costing £50,000. The difference between SENS and C for C would be over £120,000.

Table 4.10 Total staffing requirements over 6 days by NWM in Ward B (taken from Table B 1.2

Total number of shift hours over 6 days	Total number of hours required calculated by: FIP	SENS	EXCELCARE	CRITERIA FOR CARE
685.2	694.4	700.4	706.9	879.6
Hours difference	+9.2	+15.2	+21.7	+194.4
In WTE	+0.25	+0.4	+0.58	+5.18
Salary costings	+£3,387	£5,511	+£7,991	+£71,367

For ward B, all NWM systems indicate that more staff would be needed to meet the workload over the 6 day period. The choice of NWM in terms of cost implication ranges from employing an additional 0.25 WTE to 5.18 WTE, a range of £3,000 to £71,000. These costings are minimal estimates since they are set against 'shift hours' and not actual hours worked. Here, the difference between SENS and C for C would be 'only' £68,000.

The final table in the Section refers to staffing requirements in Ward C; a surgical ward (Wards A and B are both general medical wards).

Table 4.11 Total Staffing Requirements over 6 days by NWM in Ward C (taken from Table B 1.3)

Total Number of shift hours over 6 days	Total number of hours required calculated by: SENS	EXCELCARE	FIP	CRITERIA FOR CARE
612.8	542.7	586.0	649.4	790.6
Hours difference	-70.1	-26.8	+36.6	+177.8
In WTE	-1.87	-0.71	-0.98	-4.74
Salary costings	-£25,764	-£9,846	+£13,447	+£65,305

Table 4.11 above shows that two NWM systems calculate an overstaffing situation, and two show the ward to be understaffed for the required workload. Depending on whether SENS or EXCELCARE is the NWM of choice, 'savings' ranging from £10,000 to £26,000 could be made: this is in contrast to Criteria for Care and FIP which over-estimated staff requirements - in the case of Criteria for Care an extra 4.74 WTE would be required, amounting to £65,000. The overall difference between SENS and C for C in this case would be £91,000.

The financial implications relating to the NWM systems described in this report have excluded any reference to the skill/grade-mix of nursing staff. This important, complex issue is the subject of another report from the Centre for Health Economics. Altering the grade-mix of staff whilst maintaining the same standards of care may cost more (by 1% according to Ball et al (1989)), but this influence on nursing workload has been forfeited for the sake of clarity here.

CHAPTER 5

COMPARING ESTIMATES FROM NWMs WITH EXTERNAL CRITERIA

There are three sets of data which can be used to compare with the estimated workload requirements. There are the actual hours worked; the outcome data averaged over the ward, and the case-mix data.

5.1 Actual Shift Hours Worked

Each of the workload measures has its own operational definition of effective hours, hours paid, hours available and hours worked. The hours available described in this report are represented as 'shift hours' as opposed to 'paid hours' since three of the four NWM systems deduct meal breaks, coffee breaks, sickness absence, annual leave and any other time out differently. The actual hours on duty on the six days across three wards are given in Table 5.1.

Table 5.1 Shift/Actual Hours across 3 Wards

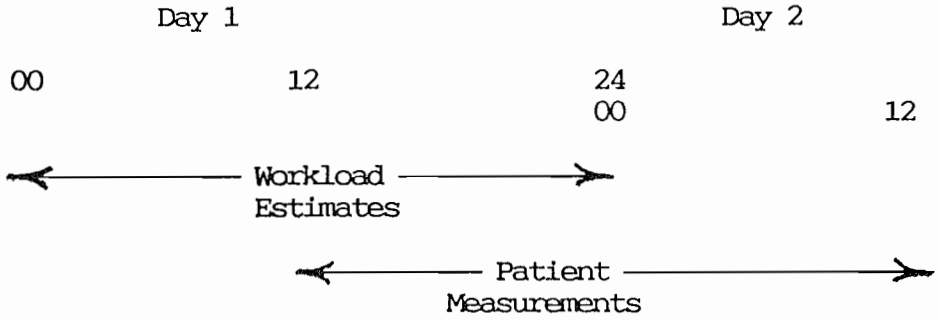
Ward	A (Medical)	B (Medical)	C (Surgical)
Day 1 (Sun)	79.7	96	88
Day 2 (Mon)	79.2	112	108.8
Day 3 (Tues)	78.2	120	104
Day 4 (Wed)	82.9	125.2	112
Day 5 (Thur)	107.6	112	104
Day 6 (Fri)	90.3	120	96
Total	517.9	685.2	612.8

The 18 ward-days observed may, of course, have been over- or under-staffed, so that there is no expectation that the estimates from the NWMs should match the actual hours worked very closely. On the other hand, there were no obvious instances of severe over- or under- staffing observed, so the range of estimated requirements around the actual hours worked presented in the previous chapter (Figures 4.1a to 4.1c) is, to say the least, curious.

The raw correlations between the actual shift hours on duty and the estimated workload requirements are very similar (0.71 with SENS, Excelcare and FIP and 0.60 with Criteria for Care). Because of the possible over- or under- staffing it is difficult to argue what should be the correct level. But although the values are quite high, they are nowhere near - in a statistical sense - 1 or even 0.9 (see the discussion of Table 4.8 above). The question arises, therefore as to whether one of the sets of estimates is 'better' in the sense of 'correctly' allowing for the intensity of nursing required by the case mix on the ward, or providing better quality care. This is the focus of the next two sections.

In order to proceed with this analysis, several adjustments have to be made to the data. First, as the data refer to different time periods, estimates have had to be made for the actual shift hours worked and for the estimated requirements which correspond to the period over which patient measurements were taken. It would have been impracticable to collect the data simultaneously and, in any case, impossible to impose our research schedule upon the wards. Very approximately, the relationships between the observations were as in the Figure 5.1 overleaf.

Figure 5.1



The importance of this adjustment is illustrated by the relatively low correlation (0.48) between actual hours paid on a calendar day and shift hours worked during the 24 hours from noon the previous day.

Second, there has to be some adjustment for size to the number of hours paid: here the actual shift hours have been standardised by the number of patients on the ward. There is no perfect adjustment for size: clearly a ward manager will take into account not only ward capacity and bed occupancy but also the type of care required, in organising staff levels. However any other divider (incorporating dependency for example) would have made it difficult to interpret the correlations between the estimated workload requirements and the possible influencing factors. The actual shift hours paid per patient and the percentage of hours worked by untrained staff are shown in Table 5.2.

Third, an index of over-staffing (according to the workload measures) has to be constructed. Various different indices were devised and the one reported here - for the shameless reason that it leads to results which were interpretable! - is simply the ratio of the estimated requirements to actual shift hours worked.

There are high correlations between per capita hours paid and over- or under- staffing calculated in this way. The correlations are not significantly altered by controlling for type of ward - which might have been an explanation. According to the estimates of staffing required therefore, the variations in shift hours actually worked are either serendipitous or simply reflect the indivisibility of nursing labour.

It is also interesting to note that there are also substantial correlations - although not as high - between the estimates of over- and under-staffing and the percentage of the shift hours which were worked by untrained staff. This suggests that the NWM estimates of over-staffing are not very sensitive to the actual grade mix on the ward which, given the conclusions of the Skill Mix Study about the importance of the proportion of Grade D nurses and above in affecting the quality and outcome of care, is a lacuna.

Table 5.2 Per Capita Hours Paid and Percent Untrained Hours

WARD	A (MEDICAL)		B (MEDICAL)		C (SURGICAL)	
	Per Capita Hours Paid	Percent Untrained	Per Capita Hours Paid	Percent Untrained	Per Capita Hours Paid	Percent Untrained
Day 1	5.7	45	3.3	72	3.6	43
Day 2	5.6	57	4.0	67	4.6	56
Day 3	4.9	45	4.3	76	3.6	44
Day 4	5.2	49	4.5	57	4.3	48
Day 5	6.8	48	3.9	76	4.2	44
Day 6	5.6	52	4.1	93	4.2	47
Average	5.6	49	4.0	74	4.1	47

Table 5.3 Correlations of Percapita Hours Paid with Estimates of Over or Under Staffing

	SENS	Excelcare	Criteria for Care	FIP
Per Capita Hours Paid	.78	.73	.80	.97
Percent Untrained Hours	.50	. 48	.51	.72

5.2 Case Mix Data

At the ward level, the problem is to define a measure of case mix. The crudest index is the proportion of medical or surgical cases. However, as wards A and B were both medical and ward C surgical this index cannot be used. A straight forward set of indicators can be derived from the proportion of each of the main diagnostic groups but this poses problems of aggregation. (Because of the small numbers in the DRG groups, these data have been aggregated into Main Diagnostic Categories (MDCs) recognising that this will tend to mask detailed differences in case-mix). Another possibility is to take nursing indicators of case mix: average dependency level or a nursing cluster index derived in the USA from the nursing workload requirements of different DRGs (see Figure 5.2).

Figure 5.2 Guidelines for Assigning DRGs to Nursing Clusters

1. The assignment of a DRG to a nursing cluster was based on the expectation that the relative direct care nursing requirements per day on routine care units would be similar for all patients in that cluster.

2. Risk is the most important partitioning variable

   - the highest cluster rank is six. DRGs assigned to this category include high-risk patients who require very intense monitoring and nursing intervention throughout their entire hospital stay which is usually long.

   - the lowest cluster rank is one. DRGs assigned to this category include low risk patients who often are treated in an outpatient setting. When patients in this cluster are admitted, the nursing care is uncomplicated, risk is low, and length of stay short.

3. Other variables which modify the risk factor and therefore cluster placement include:

   - DRGs partitioned according to ages in years of 0-17 or 70 or greater are assigned to a higher cluster than their companion DRGs which include patients 18-69 years of age.

   - DRGs which are likely to include patients with impairments in their activities of daily living (ADLs) are assigned to higher cluster than their companion DRGs which include patients without a significant comorbidity or complication.

   - DRGs which are likely to include patients with impairments in their activities of daily living (ADLs) are assigned to higher clusters than those DRGs with patients who are independent in the ADLs. Dependency can be functional, behavioral or imposed as a result of the prescribed clinical protocol.

   - DRGs which involve considerable teaching and/or psychosocial support generally use more total nursing time than DRGs without these needs. this may not be obvious in the per diem nursing time for DRGs with long length of stays.

4. Qualifications for Guidelines 2 and 3 include the following:

   DRGs which include diagnoses and procedures with a wide range of risk are assigned to a cluster according to the estimated frequency of the diagnoses or procedures; the most common diagnoses or procedures determine placement.

   - DRGs with patients aged 0-17 years or 70 years or greater may not be placed in a higher cluster than the companion DRG if the diagnosis or procedure was more important than age in predicting the use of nursing resources. An example is DRGs 27-30, traumatic stupor and coma, which are all found in the same nursing cluter.

Figure 5.2 Continued

- The psychiatric DRGs were placed in clusters 3 or 4 with the assumption that nurses provide psychotherapy as well as physical care.

- Patients with malignancies consume different amounts of nursing resources depending upon whether their admission is for initial diagnosis, evaluation or terminal care. Since this information is not available, most of the malignancy DRGs are assigned to the same cluster.

- DRGs 294 and 295 were intended to differentiate between insulin-dependent and non-insulin dependent diabetes by partitioning at age 35, the age at onset that distinguishes the two types. However, DRGs use age at admission which eliminates this difference. Thus, both these DRGs are assigned to the same cluster.

Source: Fetter et al, Diagnosis Related Groups (DRGs) and Nursing Resources, Yale University, Health Systems Management Group, 1987.

The variation in these various case mix indicators between the wards are shown in Table 5.4. The most common diagnoses in ward A were of the respiratory system; diseases and disorders of the circulatory system were most common in wards B and C. Overall, however, the distributions are very skewed. Even among the seven most frequent (1, 4, 5, 6, 9, 11, 17) groups 9 and 17 occurred in less than a third of the eighteen ward days and have been omitted from the subsequent analysis. It can also be seen from Table 5.4 that average dependency measures across the wards are not reflected in the nursing cluster averages, yet both are usually seen as proxies for nursing intensity.

Table 5.4 Variations in Case Mix Indicators between Wards

		A (Medical)	B (Medical)	C (Surgical)
Average Dependency		2.1	2.2	1.9
Average Nursing Cluster		3.3	3.1	3.0
Percentage of Cases Falling into Main Diagnostic Group Categories	(1)	12	07	00
	(4)	23	18	00
	(5)	10	31	49
	(6)	03	04	25
	(9)	04	01	08
	(11)	00	14	05
	(17)	22	00	00

Diseases and Disorders of the
(1) Nervous System
(4) Respiratory System
(5) Circulatory System
(6) Digestive System
(9) Subcutaneous Tissue and Breast
(11) Kidney and Urinary Tract
(17) Myeloproliferative and Poorly Differentiated Neoplasms

The correlations between these variables and both per capita actual shift hours and the estimates of over or under staffing are given in Table 5.5. It can be seen that the average nursing cluster variable does not correlate with any of the workload variables, and it is not considered further. Average dependency (1 = low dependency, 4 = high dependency) is correlated positively with actual per capita hours paid and negatively with the estimate of overstaffing according to SENS as one might expect, given that the SENS estimates are driven by dependency levels, and, correspondingly, much less so with Excelcare and FIP, which measure workload using different approaches. The counter-intuitive correlation observed between dependency level and the Criteria for Care estimate (also dependency driven) of over-

staffing raises the question of exactly how this workload measure has been constructed.

The picture with the diagnostic case mix variable is more complex. First, the actual hours paid are correlated positively with the proportion of patients with diseases and disorders of the nervous or respiratory systems and negatively with the others.

In principle, if the proportion of a certain category of cases does imply a heavier workload, then higher precapita hours paid do not constitute over-staffing. That is the correlations with the estimates of over-staffing ought to move in the opposite direction to those with actual shift hours paid. In fact, the only 'patterns' - although it is by no means systematic - is for the correlations with the estimates of over- or under staffing to move in the same directions as the correlations with actual shift hours paid.

Table 5.5 Correlation of Case Mix Variables with Per Capita Hours Paid and Estimates of Over(+) or Under (-) Staffing

		Per Capita Hours Paid	Estimates SENS	Excel Care	Criteria for Care	FIP
Average Dependency		.29	-.27	.24	.13	.26
Average Cluster		-.11	.01	.07	-.23	-.16
Main Diagnostic Categories	1 Nervous	.03	.13	-.33	-.25	-.05
	4 Respiratory	.04	-.25	.08	.00	-.05
	5 Circulatory	-.06	-.19	.23	.19	-.04
	6 Digestive	-.34	-.24	-.28	-.08	-.34
	11 Kidney and Urinary Tract	-.56	-.47	-.23	-.45	-.56

Of the three largest diagnostic categories, the correlations of actual shift hours paid with groups 5 and 6 are negative. Detailed examinations of the specific DRGs suggested that this was a reasonable reflection of the actual intensity of nursing required. Thus an extremely rough estimate of the nursing intensity implied by the specific conditions in diagnostic groups 4, 5 and 6 (the largest groups) suggests that there were fewer actually occurring (cases) in group 4 which required only "light" nursing (see Table 5.6).

Table 5.6 Estimate of the Intensity of Nursing Required

Diagnostic Group	"Heavy"	"Medium"	"Light"	
Respiratory (4)	5	8	1	24
Circulatory (5)	17	10	7	34
Digestive (6)	2	5	12	19
-	24	33	20	77

5.3 Outcome Data

At the ward level, the average proportion of outcome items which are met on each of the ward-days is shown in Table 5.7. The variation between the wards is substantial in terms of outcomes not achieved as is the variation across days in any one ward.

Table 5.7 Average Proportion of Outcomes Achieved on Eighteen Ward-Days

Days	Wards A	B	C
1	78	84	76
2	90	83	84
3	90	92	93
4	84	87	97
5	85	85	91
6	89	87	93
Overall	81	86	91

A more detailed analysis, distinguishing between the different outcomes, (although averaging across days) shows similar variations (see Table 5.8). Outcomes in the surgical ward are much better than the other two wards in respect of nutrition, pain control and elimination. Given the importance, in surgical wards, of accurately monitoring and recording fluid intake and output, and attention paid to post-operative analgesia, this is not an unexpected finding. Outcomes in the first medical ward are much worse than the other two wards in respect of skin integrity and pain control.

Table 5.8 Percentage of Cases Meeting Standard Averaged Over 6 Days in Each Ward

			WARDS		
			A (Medical)	B (Medical)	C (Surgical)
1	Patient Hygiene	75	82	79	67
2	Nutrition	25	15	14	46
3	Skin Integrity	75	12	82	75
4	IV Therapy	57	46	58	68
5	Patient Discharge	84	70	93	83
6	Pain Control	65	37	66	81
7	Education and Rehabilitation	78	74	78	81
8	Elimination	61	49	50	78

In principle if there is any over- (or under-) staffing according to the NWM systems estimates of workload requirements then there is more (or less) time available for providing better quality care - at least according to the particular NWM system. The correlations between the outcomes and both the percapita hours paid and the estimates of over and under staffing are given in Table 5.9.

It can be seen that the correlations are mostly in the opposite direction to that expected (ie that of an extra pairs of hands leading to better outcomes) although some are in the 'right' direction. For example, with percapita hours paid, the overall outcome score is negatively correlated whilst the scores on patient hygiene and patient discharge are positively correlated. With the estimates of over/under staffing, the general observation is that the correlation of SENS, Excelcare and FIP with the first, second, third and eighth outcome dimension and with the overall score are roughly the same and different from those with Criteria for Care. However,

we have already shown, in Table 5.3 above, that NWM estimates of over-staffing are not sensitive to the proportion of trained staff on the ward. The correlations (between outcomes and the estimates of over-staffing) have therefore been recalculated controlling for the percentage of untrained hours in the hours actually worked. The picture is then very different (see Table 5.10):

- first the correlations with per capita hours paid, although small, is now positive.
- second, the correlations with each of the estimates of over staffing (except for Criteria for Care) are now also positive.

Table 5.9 Correlations of Proportion of Outcomes Achieved With Percapita Hours Paid and Estimates of Over(+) and Under (-) Staffing

Proportion of Cases Meeting Outcomes	Per Capita Hours Paid	Estimates of Over/Under Staffing SENS	Excelcare	Criteria for Care	FIP
1 Patient Hygiene	.16	.40	.38	-.04	.20
2 Nutrition	-.67	-.63	-.61	-.32	-.63
3 Skin Integrity	-.11	-.49	-.22	.09	-.07
4 IV Therapy	-.45	-.40	-.33	-.25	-.35
5 Patient Discharge	.14	.01	.33	.23	.26
6 Pain Control	-.22	-.40	-.00	-.14	-.15
7 Education and Rehabilitation	-.57	-.37	-.21	-.28	-.49
8 Elimination	-.61	-.47	-.56	-.25	-.57
Overall	-.33	-.03	-.05	-.45	-.37

It should also be noted that, across the 15 wards of the skill mix study, the estimate of overstaffing according to SENs is positively correlated with both average quality (0.15) and outcome (0.11) of care.

Table 5.10 Correlations of Outcomes with Percapita Hours Paid and Estimates of Over (+) and Under (-) Staffing Controlling for Percentage of Untrained Nursing Hours

Outcome	Per Capita Hours Paid	SENS	Excelcare	Criteria for Care	FIP
1 Patient Hygiene	-.05	.25	.41	-.36	-.12
2 Nutrition	-.33	-.57	-.34	-.18	-.31
3 Skin Integrity	-.32	-.73	-.33	-.06	-.27
4 IV Therapy	.00	-.16	-.01	-.15	-.23
5 Patient Discharge	-.02	-.23	.33	.12	.14
6 Pain Control	.01	-.40	.24	.44	.10
7 Education and Rehabilitation	-.48	-.25	.11	-.02	-.36
8 Elimination	-.26	-.35	-.20	-.23	-.32
Average Proportion Overall	.35	.59	.47	-.12	.36

5.4 Conclusions

The purpose of this chapter has been to see whether there is any sense in which one of the NWM systems is 'better' than any of the others. A simple comparison with the actual shift hours worked showed wide variations, and there was no obvious pattern to the correlations between any of the estimates of over staffing and per capita hours paid.

There were some associations between the proportions of the main diagnostic categories on each of the observed eighteen ward-days and both the per capita hours paid and the estimates of over staffing. The former associations could mostly be explained by the specific conditions within the main diagnostic categories presenting on the wards. The latter showed no obvious pattern.

The crude associations with outcome data were not interpretable. However, on the basis of results from the Skill Mix Study, and the observation that NWM estimates of over/under staffing are not very sensitive to grade mix, correlations controlling for the percentage of untrained hours were examined. A clearer pattern then emerged: in general, the estimates of overstaffing according to SENS, Excelcare and FIP are correlated with outcomes, but not the estimate according to Criteria for Care. This confirms the earlier observation that Criteria for Care is out of line and that there is little to choose between the other NWMs, each of which is weakly associated with the chosen external criterion - outcomes.

CHAPTER 6

INDIVIDUAL ANALYSIS

Thus far the focus of the study has been on data at the ward level. However, the introduction of a case mix variable into this framework is predicated upon the presumption that case type is related to the process of nursing care (and therefore the estimates of workload required). Given we have shown the sensitivity of the estimates of overstaffing to the percentage of untrained hours, it becomes important then to examine whether or not there is an association between case-mix and the measurements of quality and outcome of care. This analysis can only be carried out at the level of the individual patient's characteristics.

Data are available both on quality and outcome of care (as well as dependency level and case type). The analysis here is based on data collected at three wards over six days (see Figure 3.2, Chapter 3 above). Data have been collected in this study on the nursing outcomes for 336 cases. To this can be added 708 cases from the skill mix study where there are diagnostic and outcome data available. At the same time, a more detailed analysis relating quality of care to the case type can be conducted on the 708 cases.

6.1 Basic Analysis

The analysis for the skill mix study showed that the quality and outcome of care varied sharply with the ward (Table 6.1) and that both varied with the proportion of trained staff.

Table 6.1 Overall Ward Rankings on Qualpac and Outcome Measures Compared to Proportion of Trained Staff Across the Fifteen Wards in the Skill Mix Study

Ward Number	Proportion of staff Grade D and above	Overall Quality	Proportion with good Outcomes
15	39	2.80	81
7	41	2.94	91
18	44	2.72	88
1	45	2.69	87
3	46	2.62	74
14	46	2.60	76
4	48	2.43	66
6	51	2.75	77
19	53	2.95	84
8	57	2.58	91
17	60	3.04	85
5	61	2.66	74
2	66	3.15	95
16	68	2.81	79
20	75	3.36	94

Rank correlations, proportion of staff grade D and above with: Quality = 0.57, Outcome = 0.30.

The issue here is therefore whether or not the casetype (whether defined in terms of ICDs or DRGs) makes any difference to the quality and outcome of care. Based on experience with analysing this kind of data in the Skill Mix project, a step by step approach has been adopted.

6.2 Introducing Case Types

There are several different possibilities for measuring case mix.

(a) The use of main diagnostic category (derived from the Ninth Revision of the International Classification of Diseases). This has been recoded

to eight groups for further analysis (Table 6.2). It can be seen that the most frequently occurring groups were diseases and disorders of the nervous system (1), respiratory system (4), circulatory system (5) and digestive system (6).

(b) An assignment of DRGs to clusters representing nursing needs. These are taken from Fetter et al (1987) and are based on needs as perceived by nursing consultants (see Figure 5.2 in previous chapter).

(c) Dependency levels I, II, III and IV (allocated according to SENS). The cases were distributed as in Table 6.3.

Table 6.2 Cases in Main Diagnostic Categories

	Name	M	S	Total	Recoded
1	Diseases and disorders of the nervous system	84	14	98	1
3	Diseases and disorders of the ear, nose and throat	0	1	1	8
4	Diseases and disorders of the respiratory system	83	0	83	2
5	Diseases and disorders of the circulatory system	82	43	125	3
6	Diseases and disorders of the digestive system	41	67	108	4
7	Diseases and disorders of the hepatobiliary system and the pancreas	4	22	26	4
8	Diseases and disorders of the musculoskeletal system and connective tissue	7	46	53	5
9	Disease and disorders of the skin, subcutaneous tissue and breast	7	39	46	
10	Endocrine, nutritional and metabolic diseases and disorders	6	7	13	8
11	Diseases and disorders of the kidney and urinary tract	29	13	42	7
12	Diseases and disorders of the male reproductive system	0	3	3	8
13	Diseases and disorders of the female reproductive system	1	0	1	8
16	Diseases and disorders of the blood and blood-forming and the blood-forming organs and immunological disorders	1	0	1	8
17	Myeloproliferative diseases and disorders and poorly differentiated neoplasms	6	0	6	8
21	Injury, poisoning and toxic effects of drugs	14	0	14	8
23	Factors influencing health status and other contacts with health services	1	0	1	8
24	Unclassified	3	3	6	8
		369	258	627	

Table 6.3 Dependency Level of Patients Across all Eighteen Wards

	Medical	Surgical	*Totals	Percent
I	85	31	117	11.3
II	246	123	399	38.4
III	175	190	396	38.1
IV	57	50	127	12.2
	563	394	1039	

Note*: Sum of row cells do not equal row totals because one of the wards on the Skill Mix study included cases which were not categorised.

The first preliminary question is whether there is any relationship between the diagnostic category and the dependency levels. As one can see from Table 6.4, there is, in fact, a highly significant association between dependency level and diagnostic group.

The main question, however, is whether case type affects the quality and outcome of care.

Table 6.4 Percentages of Each Diagnostic Group Assigned to Each Dependency Level

Main Diagnostic Group	I	II	III	IV	N
Nervous System	14	22	42	22	97
Respiratory	29	27	39	5	82
Circulatory	21	58	19	2	125
Digestive and Associated Diseases & Disorders	13	33	41	13	134
Musculo-skeletal & connective tissue	4	34	42	21	53
Subcutaneous Tissue and Breast	22	50	24	4	46
Kidney and Urinary Tract	12	45	33	10	42
Accidents and Others	17	45	33	10	46
	107	238	214	66	625

Overall F Test for difference between diagnostic groups in average dependency = 7.05, $p < 0.0001$

The analysis of the association between quality and outcome of care by these different variables is shown in Tables 6.5 and 6.6. For quality of care, it can be seen that there are significant associations with diagnostic group for overall quality and four of the five Qualpac sections. On the other hand, there are very few associations with either dependency level and type of cluster. For outcomes, there are significant associations with six of the outcome dimensions and with the overall proportion. This time, however, there are several associations between four of the outcome dimensions and dependency level although only one with type of nursing cluster.

Table 6.5(a) Association between Quality of Care and Diagnostic Group F Test for Differences between Groups

	N	F	Sig
Overall Quality	286	3.61	.0003
Qual 1	286	2.75	0.0042
Qual 2	284	4.41	0.0000
Qual 3	272	3.31	0.0007
Qual 4	188	1.31	0.2315
Qual 5	242	2.30	0.0169

Table 6.5 (b) Association between Quality of Care and Dependency and Nursing Cluster F Test for Trend

	(i) Dependency Level			(ii) Type of Cluster		
	N	F	Sig	N	F	Sig
Overall Quality	624	2.24	0.08	290	2.04	0.07
Qual 1	622	1.796	0.15	290	1.53	0.18
Qual 2	622	3.38	0.02	288	2.17	0.06
Qual 3	610	1.16	0.32	276	2.17	0.06
Qual 4	438	0.76	0.52	192	1.30	0.27
Qual 5	523	0.895	0.44	246	1.78	0.12

Table 6.6 (a) Association Between Outcome of Care and Diagnostic Group. F Test for Differences Between Groups

		N	F	P
1	Patient Hygiene	622	3.10	0.001
2	Nutrition	609	5.95	0.000
3	Skin Integrity	521	2.66	0.005
4	IV Therapy	183	1.75	0.08
5	Patient Discharge	570	1.65	0.10
6	Pain Control	552	3.76	0.0001
7	Education and Rehabilitation	603	2.81	0.003
9	Elimination	596	2.19	0.02
Proportion of all Items		627	4.89	0.000

Table 6.6(b) Association between Outcome and Dependency and Type of Cluster: Test for Linear Trend

		(i) Dependency Level			(ii) Type of Cluster		
		N	F	P	N	F	P
1	Patient Hygiene	1030	82.1	0.001	329	1.51	0.22
2	Nutrition	1010	32.1	0.000	315	3.79	0.05
3	Skin Integrity	910	34.8	0.000	243	1.16	0.28
4	IV Therapy	352	0.03	0.87	66	1.92	0.17
5	Patient Discharge	945	0.05	0.82	301	0.29	0.59
6	Pain Control	933	2.01	0.16	281	2.32	0.13
7	Education and Rehabilitation	1002	27.0	0.00	319	1.01	0.32
9	Elimination	995	0.10	0.75	311	1.15	0.28
Proportion of all Items		1039	8.7	0.03	331	0.68	0.41

6.3 An Additional Effect Due to Case Type

It has already been shown that there is an association between the quality and outcome of care and the clinical grade of staff. In order to test whether or not there is any additional effect due to the casetype of the patient, multi-variate analysis with the quality of care as the dependent variable (with the cases from the Skill Mix study only) and with the outcome of care as the dependent variable (with all the cases) has been carried out (shown in Tables 6.7 and 6.8).

When quality is the dependent variable (Table 6.7) the main effect for ward is always highly significant and neither dependency level nor diagnostic group are. When outcome is the dependent variable (Table 6.8), ward is (again) always significant, dependency level is often significant and the recoded main diagnostic group (see Table 6.2 above) is significant for the proportion of all items achieved and for the first outcome dimension but for no others.

Table 6.7 Analysis of Variances for Quality of Care: Mean Squares Attributable to Ward and Diagnostic Group Main Effects

	Ward	Dependency Level	Recoded Main Diagnostic Group	Within and Residuals
Overall Quality	.76**	.06	.00	.09
Qual 1	.63**	.04	.00	.08
Qual 2	.95**	.18	.02	.13
Qual 3	.75**	.15	.01	.15
Qual 4	1.66**	.26	.47	.26
Qual 5	2.18**	.13	.03	.21

Table 6.8 Analysis of Variance for the Outcome of Care: Means Square Attributable to Diagnostic Group and Dependency Level After Controlling for Ward

		N	Ward	Dependency Level	Recoded Main Diagnostic Group	Within Residual
Proportion of Overall Outcome		625	.15**	.03*	.02*	.01
1	Patient Hygiene	620	.72**	3.05**	.46*	.18
2	Nutrition	607	1.57**	.57*	.25	.17
3	Skin and Integrity	521	1.10**	1.82**	.19	.16
5	Patient Discharge	568	.76**	.03	.08	.14
6	Pain Control	550	1.07**	.31	.37	.18
7	Education and Rehabilitation	601	1.42**	1.09**	.12	.15
8	Elimination	594	1.26**	.06	.14	.20

The relationship of the data to the Tables in this chapter is shown in Figure 6.1 overleaf.

6.4 Conclusions

There are associations between the diagnostic group and the dependency level of the patient. But whilst there is an association between diagnostic category and both the quality and outcome of care, the relationship nearly disappears when allowing for the ward.

It seems reasonable to argue that the culture of the ward is unlikely to be affected by the particular case-mix, which would suggest that it is not necessary to take diagnostic group into account. On the other hand, the ward variable could be acting as a proxy for variations in case-mix between wards. The ext to which it is necessary to allow for diagnostic group therefore depends upon the interpretation placed upon the ward variable.

Figure 6.1 Relationship Between Data Sets and the Numbers in Each Analysis

	Diagnostic Groups	Dependency	Outcome	Qualpacs
Workload Study	139	331	331	-
Skill Mix Study	488	708	708	290*
	627	1039	1039	290

* Diagnostic data were also available for this group.

1 Data from which Tables 6.2, 6.4, 6.6(a) and 6.8 are derived.

2 Data from which Tables 6.3 and 6.6 (b)(i) are derived.

3 Data from which Tables 6.5(a) and 6.5(b)(ii) are derived.

4 Data from which Table 6.6(b)(ii) are derived.

5 Data from which Table 6.5(b)(i) are derived.

CHAPTER 7

DISCUSSION

The primary objective of this investigation was to review the methodologies of a variety of NWM systems designed to measure workload using different approaches. In the course of this inquiry, major issues of validity and reliability of NWM systems were raised - to what extent did any of the measures chosen accurately reflect ward activity on a daily basis?

There is general agreement that efficient nursing resource utilisation is becoming increasingly urgent in the 'new' NHS; but it must be a cause for concern that there is a dearth of independent, impartial advice available for service planners. Whilst the reliability of NWM systems as a whole is being questioned in the USA (Brooten, 1988), in the UK criticisms of NWM systems tend to be confined to certain aspects of a particular system or approach rather than to workload measurement as a whole (for example Bagust, 1990).

The analyses have established that there are substantial differences in the workload estimates provided by different systems. These analyses were based on data collected retrospectively - either from patient records, nursing records, direct observation or discussions with ward staff, whilst short-term memories were clear and there were no (or very few) staff changes - in order to minimise the issue of reliability. Given that NWM systems are designed to forecast nursing workload estimates, the results presented here throw into sharp relief the difficulties arising, and the reliability of information obtained, when trying to forecast the number of patients who may be on the ward, their possible dependency levels, and the tasks that will need to be performed on them over the ensuing 24 hour period.

Furthermore, an accurate assessment of the parameters or assumptions integral to each of the NWM systems is also of crucial importance to the reliability of workload measures. The examples in Chapter 4 show that substantial differences occur (ranging from 10-23%) when one set of minutes, ratios and amount of time spent on direct nursing care is adopted in preference to another. The examples used to generate various workload estimates are not fictitious; they have been widely introduced in a number of hospitals in different RHAs.

Although Example 1 (differences in minutes allocated to patients in the least dependent group) uses Criteria for Care to illustrate the financial implications of choosing model ward timings or those generated by Hospital B, similar differences may be found using any of the systems reviewed here (and many others) since these systems all rely upon timed interventions of one sort or another. EXCELCARE's Units of Care and FIP's basic and technical items of care rely on minutes and SENS permits extra time to be added to the calculation for specified procedures. Ideally all of these timings should be established at the time of implementation but anecdotal evidence suggests that hospitals rarely undertake a full and comprehensive activity/work study analysis prior to implementation. Thus timings are 'borrowed' from other wards, or other institutions, or an alternative scenario is that timings generated from a comprehensive activity analysis across several sites may be adopted for wards which are atypical in terms of patient dependency, ward activities or case-mix.

The temptation to conclude therefore that there are 'gold standards' which could be applicable to all sites is however erroneous. It is crucial to establish timings which are ward-specific and where activity analyses can

be undertaken at regular intervals in order to identify staff or case-mix changes which may affect workload requirements.

The second and third examples demonstrated the financial implications of importing other parameters: viz the ratio of the number of minutes for each dependency level in the Criteria for Care system, and the percentage of time spent on direct nursing care in the wards. All three are examples of decisions which need to be taken at the senior managerial, service planning or project level prior to implementing the chosen workload system. In contrast, the fourth example, illustrating the cost implications relating to differing patient dependency level categories hinges upon decisions about allocating to patients to dependency levels which are taken daily (at least) by ward staff and whilst they have been trained to undertake this exercise, the actual classification will still ultimately rely upon their professional judgement.

Although the data presented in this latter example referred to the dependency levels of patients for one day during the six days of observation, differences were of a similar order for the remaining five days. A striking feature of these limited data was that there were no instances of Group A (ie ward staff) recording patients in dependency level I; this contrasts with the allocation of Group B (the research staff) who recorded 45 out of a total of 83 patients as dependency level I (54%). Where there was agreement between the two groups it was nearly always in the allocation of patients into the most highly dependent group (level IV). This tendency to maximise patient dependency clearly has repercussions for workload estimation and these findings are therefore a major cause for concern.

The discrepancy between classification into dependency groups by different groups reported here contrast with those reported by Waite (1986). Although his sample size was unclear, Waite suggested that most nurses were in agreement on how to classify patients into dependency groups and that subsequent workload measures generated produced similar results. (The two workload measures tested were the Brighton approach to the Telford Consultative Method and the workload index generated according to Barr's checklist).

These findings would therefore appear to lend support to measuring workload by other approaches. For example, Bagust (1990) argues that 'dependency systems do not offer a reliable basis for costing' and he states that 'nursing dependency is an artificial abstraction'. The TEAMWORK approach therefore bases its methodology on the recording of factual data on ward activity, such as bed occupancy, admissions, discharges and theatre cases and further refinements to this system concentrate on task allocation and standard setting. This approach clearly lends itself to application on wards where task allocation is the method of delivering nursing care but it would be most difficult to implement on wards/sister where primary nursing was the adopted philosophy for example.

Moreover, the different approaches to measuring workload were not reflected in the differences in workload estimation. In two of the three

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It should be noted that, for the inter-system differences in workload estimates, the timings used to calculate Criteria for Care requirements were those taken from Hospital B (75 minutes of nursing care over a 24-hour period) rather than the model ward timings advocated in the Criteria for Care manual. Had the latter timings been used to calculate workload, the differences between Criteria for Care and any of the other systems would have been greater.

wards, patient dependency-driven systems produced the highest and the lowest estimates of workload; Criteria for Care always resulting in the highest estimate and SENS the lowest estimate over two of the wards. Thus the different estimates from this limited exercise cannot be ascribed to the different approaches to measuring workload, patient dependency , task-orientation or the care-planning approach.

It may be tempting for a manager to conclude that the workload measure producing the lowest estimates should be the system of choice, but this may lead to imprudent decisions being taken. For example SENS, across two of the wards, produces the lowest estimates as already observed - but there is no quality assessment integral to this system. EXCELCARE and FIP however have standard setting in their programmes; EXCELCARE relating quality to workload and hence taking skill mix into account. Criteria for Care is often used in conjunction with Monitor, a quality of care measure.

The finding that NWM systems provide inconsistent and unreliable estimates begs a much larger question - what exactly are the systems measuring? To what extent is the activity of nursing actually reflected in the output of these (or any) NWM systems? And to what extent is it justifiable to sacrifice simplicity for flexibility? The 'newcomers' to the NWM system market are sophisticated to allow for flexibility, but such complexity may be reflected in difficulties in implementing and running such systems. Operational requirements need to be drawn up with much careful thought - whilst hardly an original observation, the results presented in this report serve to emphasise this point.

The final two chapters of the report are an attempt to explore this in

more detail. In Chapter 5, the estimates of over and under staffing according to the various NWM systems are compared with the actual shift hours worked and with average outcomes on the wards.

There were quite high correlations between the estimates of over/under staffing and per capita hours paid. One might have expected this to be due to variations in the type of ward not being sufficiently taken into account but further examination showed that these potentially 'confounding' factors made no difference. At the same time, there were also substantial correlations between the estimates of over/under staffing and the percentage of untrained hours. Given that the Skill Mix Study found that the proportion of trained staff had a significant impact on quality, this raises the issue of the extent to which these estimates are actually sensitive to the grade mix required to deliver good quality care.

In principle, of course, wards which are over staffed should be able to deliver better quality care. Yet there was no association of this kind in the data; only after controlling for the percentage of untrained hours did any pattern emerge. This provides further support for the view that these estimates do not make sufficient allowance for the skill mix of staff required to deliver good quality care.

Finally, this project is set within the framework of a discussion as to whether or not nursing workload estimates should take case mix into account. Whilst our CASPE colleagues are, of course, addressing this issue directly via an examination of data from several thousand ward-days, the opportunity arose, in this context, to examine the issue on a micro-level. Specifically, the data collected both for this study and for the Skill Mix Study could be used

to examine the hypothesis that the quality and outcome of care was independent of the diagnostic classification of a case.

The analyses reported in Chapter 6 show clearly that there is a substantial association between the quality and outcome of care and diagnostic group. But as in the Skill Mix study, the between ward variations are substantial: and the association between diagnostic group and quality and outcome of care nearly disappears after 'controlling for' ward. Thus, any between-ward analysis has to take a prior view on the causal model which is being tested.

7.1 Conclusions

1. The temptation to import parameters from other sites/hospitals/wards should be resisted. The consequences of succumbing to this temptation are illustrated in the section entitled 'Intra-System Differences'. This not only applies to borrowing timings from activity analyses undertaken elsewhere but also to decisions relating to percentages of time devoted to direct, indirect and associated care.

2. It follows that whichever NWM system is chosen or whether a homegrown system is developed, attention and resources must be made available to undertake a fully comprehensive activity analysis. Indeed, given the financial implications of over- and under-staffing situations calculated from the four NWM systems, it may be prudent to invest in 'activity analysis teams'. These teams, suitably trained and familiar to ward staff, could therefore be relied upon to undertake this exercise efficiently and in a way least likely to cause antagonism or the suspicion of ward staff. This investment should ensure a maximum chance

of reliably generating workload estimates which would be directly related to the activity patterns on the wards/sites where the chosen system is being implemented.

3. The reliability of any systematic recording of nursing activities and workload ultimately rests with the ward nursing staff. Failure to train, educate and explain the necessity for resource management results in failures to accept the importance of data collection. The often quoted "we do the dependencies when we have time" attitude obviously generated erroneous data for service planners. Again, this is not an original observation, but the evidence of failure to produce reliable results is reported here.

Further, the failure to find any substantial relationships between estimates of over-staffing and external criteria is worrying. It raises the question of whether these estimates of workload bear any relation to the process of nursing at all.

'First thoughts on an information strategy for the NHS' by the NHS Management Executive (1991) is predicting that 'most major acute hospitals will have computerised at least four of the following 'core' systems : radiology, pathology, pharmacy, nursing and theatre management by 1993'. Given the state of implementation of NWM systems in UK hospitals at the present time, and the patchy implementation of such systems in the RMI sites identified as long ago as 1986, such forecasts are indeed optimistic. In order to produce accurate and appropriate means of measuring the most costly resource in the NHS, the nursing profession has much to contribute, and must gain confidence in participating in the IT debate in order to play a major part in resource management in the 'new' NHS.

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APPENDIX A

Schedules

PT. NAME ..... WARD ..... HOSPITAL .....

PT. NUMBER: | | | | | DATE: | | | | |

Item 1 MOBILITY

1. Independent - Walks unaided with/without walking aids. Requires no nurse intervention.

2. One Nurse Assistance - Able to walk with one nurse assisting.

3. Mobile in Bed - Patient nursed in bed over 24 hours yet is able to move in bed. Requires a check of pressure areas rather than physical turning.

4. Two Nurses Assistance - Requires two or more nurses to assist with mobilisation.

5. Chairfast - Patient unable to mobilise but can be sat out in chair.

6. Immobile in Bed - Patient nursed in bed over 24 hours and needs continuous pressure area care.

F C S

Comments .....

Item 2 HYGIENE

1. Self Wash/Bath - Patient able to wash or bath self unaided.

2. One Nurse Assistance - Able to bath with assistance of one nurse.

4. Two Nurse Assistance - Required to carry out general bathing.

5. Blanket Bath - Two nurses required to carry out full blanket bath procedure.

Comments .....

Item 3 INCONTINENCE/CONTINENCE

O. Continent

U. Urinary - The patient is incontinent of urine only during both the day and night.

F. Faecal - The patient is incontinent of faeces.

N. Nightly - The patient is incontinent at night.

D. Doubly - The patient is doubly incontinent.

C. Catheter - The patient is incontinent but has a catheter inserted.

B. Both C&F - The patient is faecally incontinent and catheterised.

Comments .....

Item 4 NUTRITION

0. Nil by Mouth

1. Self Feed - No nurse intervention required apart from minimal observation to ensure adequate nourishment.

2. Nurse Required - A nurse is required either to observe and encourage the patient during meals to ensure adequate nourishment or if the patient is able to feed self but needs meal cut up by nurse.

3. Naso-Gastric Tube Feed - Frequent naso-gastric tube feed required to ensure adequate nourishment.

4. Hourly Restricted Fluids - Post operative patient who requires hourly restricted fluids over a 24 hour period.

5. Feed Patient - Patient unable to feed self, requires full nurse assistance.

F C S

Comments .....

Item 5 PSYCHOLOGICAL NEED

1. Needs Reassurance - Patient requires some reassurance.

2. Very Anxious - Patient requires much nursing support and/or counselling.

4. Close Surveillance - Aggressive, noisy or unpredictable at times, requiring nurse intervention.

5. Specialled - Patient requiring continuous 24 hour nursing attention.

Comments .....

Item 6 CLINICIAL INTERVENTION/NURSING ATTENTION

1. 4 hourly or less.

2. 2-4 hourly.

3. Hourly/constant.

4. More frequent observations, e.g. post-operatively.

Comments .....

Item 7 MAJOR INTERVENTIONS

e.g. for operation, special procedures, psycho-social support.

Item 8 SPECIALLING

	F	C	S
Item 7 MAJOR INTERVENTIONS	☐	☐	☐
Item 8 SPECIALLING	☐	☐	☐

CRITERIA FOR CARE DEPENDENCY SCORES:

Dependency 1	4 A scores
Dependency 2	A + B scores & not more than 1C
Dependency 3	2 or 3C scores, more C than A scores or equal numbers of C and A scores
Dependency 4	4 or more C scores
Dependency 5	Specialled constantly over 24 hours

☐ Personal Care

☐ Ability to feed

☐ Mobility

☐ Nursing Attention

☐ Involuntary Drainage

☐ Major Interventions

☐ Specialling

Criteria for Care Dependency ☐

SENS Dependency Category ☐

FIP Dependency Category ☐

GENERAL MEDICINE

FLUID/MONITOR

IV Fluid	[ ]
Unit of Blood	[ ]
IV Feeding	[ ]
IV Additives	[ ]
IV Plats/Ser	[ ]
IV Chemoth'py	[ ]
Insert CVP	[ ]
Read CVP	[ ]
Fluid Balance	[ ]
Cardiac Montr	[ ]

OBSERVATION

TPR	[ ]
BP	[ ] [ ]
Apex/Pulse	[ ]
Neuro Obs	[ ]
Peak Flow	[ ]
Calf/Girth	[ ]
Weight	[ ]

ELIMINATION

Stoma Care	[ ]
Suppositories	[ ]
Enema	[ ]
Man Evac Rect	[ ]

SPECIMENS

	ROU	DIA
Urinalysis	[ ]	[ ]
MSU/CSU	[ ]	
Stool/OBT	[ ]	
Sputum	[ ]	
BM/GM Stix	[ ]	
Swabs	[ ]	
24hr Urine	[ ]	

MEDICATION

	IM	O
Contr'd Med	[ ]	[ ]
	HEP	ANB
IV Injection	[ ]	[ ]
IM Injection	[ ]	
SC Injection	[ ]	
Syringe Pump	[ ]	
Nebulizer	[ ]	
Oxygen	[ ]	

SPECIALITY/OTHER

Education	[ ]
NG Tube Insert	[ ]
Venesection	[ ]
Barrier Nurse	[ ]
Prep Spec Bed	[ ]
Prep X-ray/Ultrasound	[ ]
Prep for BA Enema	[ ]
Fit Elas Stocks/Tubgr	[ ]
Chest Aspiration	[ ]
Chest Drain	[ ]
Bone Marrow Puncture	[ ]
Endoscopy	[ ]
Liver Biopsy	[ ]
Lumbar Puncture	[ ]
Myelography	[ ]
Applic of Cream	[ ]
Sigmoidoscopy	[ ]

ASEPTIC PROCEDURES

Minor Dressing	[ ]
Inter Dressing	[ ]
Major Dressing	[ ]
Catheterisation	[ ]
Bladder Washout	[ ]
Oro Trach Suct	[ ]
Trachie Dress	[ ]

GENERAL SURGERY

OBSERVATIONS

TPR	[ ]
BP	[ ]
Special Obs	[ ]
CVP Record	[ ]
Weight	[ ]

SPECIALTY/DRESSINGS

NG Tube Feed	[ ]
Chest Aspiration	[ ]
Chest Drains	[ ]
Abdo-Paracentesis	[ ]
Insert NG Tube	[ ]
Insert Gold Chain	[ ]
Prep Pt for X-ray	[ ]
Prep Pt U/Sound	[ ]
Prep Pt Isotopes	[ ]
Prep Pt CT. Scan	[ ]
Prep Pt R'thpy	[ ]
Counselling	[ ]
Minor Dressing	[ ]
Intermed Dressing	[ ]
Major Dressing	[ ]

SPECIMENS

MSU	[ ]
Sputum	[ ]
Stool	[ ]
Urinalysis	[ ]
Wound Swab	[ ]
Redivac Spec	[ ]
BM Stix	[ ]
Venepuncture	[ ]

ELIMINIATION

Sieve Urine	[ ]
Catheterisation	[ ]
Empty Urine Bag	[ ]
Suppositories	[ ]
Enema	[ ]
Bowel Prep	[ ]
W'out Procedure	[ ]
NG Aspiration	[ ]
Wound Drain Bag	[ ]
Stoma Care	[ ]
Roberts Pump	[ ]
Change Redivac	[ ]
Fluid Balance	[ ]

MEDICATION/IV FLUIDS

SC Injection	[ ]	[ ]	
IM Injection	[ ]	[ ]	
IV Injection	[ ]	[ ]	[ ]
IM Cont'd Inj	[ ]	[ ]	
Oral Contr'lld	[ ]	[ ]	
Syringe Pump	[ ]	[ ]	
Nebuliser	[ ]		
Supp Med	[ ]		
IV Fluid	[ ]		
IV Blood	[ ]		
CVP Line	[ ]	[ ]	
Cath Irrgtn	[ ]		
Metriset	[ ]		
Drip Counter	[ ]		

THEATRE PATIENTS

Time	Category	
Morning	Investigations	☐
..... am	Minor	☐
	Intermediate	☐
	Major	☐
Afternoon	Investigations	☐
..... pm	Minor	☐
	Intermediate	☐
	Major	☐

Comments

.....

.....

.....

EXCELCARE NURSING SYSTEM

UNITS OF CARE

DATE: HOSPITAL

WARD OBSERVER

Please tick the items of care relevant to each patient.

UOC	UNIT OF CARE DESCRIPTION	PATIENT NUMBER															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1005	ROUTINE ADMISSION																
1010	DISCHARGE OF PATIENT																
1015	WARD TRANSFER																
1020	TRANSFER TO ANOTHER CARING ENVIRONMENT																
1025	SELF-DISCHARGE																
2200	COMMUNICATION DIFFICULTIES/FACIAL SURGERY																
2300	DEAFNESS/HARD OF HEARING																
2350	BLIND PATIENT																
2400	DIFFICULTIES WITH SPEECH (CARE OF THE PATIENT WITH)																
2500	ADVICE ON DISCHARGE DEEP VEIN THROMBOSIS																
2531	PATIENT EDUCATION / DIABETES - DIET CONTROLLED																
2533	PATIENT EDUCATION / DIABETES - TABLET CONTROLLED																
2535	HEALTH EDUCATION - DIABETES - INSULIN DEPENDENT																
2540	WARFARIN - ADVICE ON DISCHARGE																
2545	STEROID THERAPY IN-PATIENT																
2600	HEALTH EDUCATION MASTECTOMY																
2700	ARTHRITIS - HEALTH EDUCATION																
2800	OSTOMY HEALTH EDUCATION OR DISCHARGE																
2975	OBESITY																
3100	SUTURED SURGICAL WOUND																
3200	WOUND CARE - OPEN WOUND																
3300	PYREXIA (ADULTS)																
3400	UNCONSCIOUS PATIENT																
3410	HEAD INJURY																
3450	PRE-OPERATIVE DIABETIC																
3475	POST-OPERATIVE DIABETIC																
3485	SEVERE HEADACHE - PHOTOPHOBIA (CARE OF PATIENT WITH)																
3500	STANDARD ISOLATION																
3520	PROTECTIVE ISOLATION																
3600	ADMINISTRATION OF DRUGS VIA SYRINGE PUMP																
3625	HYPOGLYCAEMIA																
3650	HYPERGLYCAEMIA																
3670	UNSTABLE BLOODSUGAR																
3690	FITTING PATIENT (CARE OF THE)																
3700	LIVER BIOPSY																
3702	LUMBAR PUNCTURE (ADULT)																
3704	RENAL BIOPSY																
3710	REMOVAL OF VACUUMED DRAIN																
3720	REMOVAL OF DRAINAGE TUBES																
3800	WOUND DEHISCENCE (BURST ABDOMEN)																
3802	WOUND SWAB																

EXCELCARE NURSING SYSTEM

UNITS OF CARE

DATE: _____ HOSPITAL _____

WARD _____ OBSERVER _____

Please tick the items of care relevant to each patient.

UOC	UNIT OF CARE DESCRIPTION	PATIENT NUMBER															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3850	MENTAL HANDICAP/ILLNESS																
3900	CONFUSED PATIENT																
3925	CARE OF PATIENT WHO HAS TAKEN OVERDOSE OF DRUGS																
3950	POST-OPERATIVE WIRED JAW																
3975	PATIENT WITH A TEMPERATURE BELOW 35 oC																
4025	POTENTIAL FOR CHEST INFECTION																
4050	CHRONIC BREATHING DIFFICULTIES																
4080	BREATHING DIFFICULTIES/FRACTURED RIBS																
4100	CHEST INFECTION																
4110	SPUTUM SPECIMEN																
4112	THROAT SWAB																
4113	NOSE SWAB																
4200	OXYGEN THERAPY - VIA MASK - ADMINISTRATION OF																
4425	UNDERWATER SEAL DRAIN (CARE OF PATIENT)																
4450	REMOVAL OF CHEST TUBE																
4452	BRONCHOSCOPY																
4453	CHEST ASPIRATION																
4500	BLOOD TRANSFUSION																
4510	BONE MARROW ASPIRATION																
4550	CARDIAC ARREST																
4600	DEEP VEIN THROMBOSIS																
4700	HYPERTENSION																
4750	GASTRO INTESTINAL HAEMORRHAGE (HAEMATEMESIS/MELAENA)																
4800	VASCULAR SURGERY																
4805	INSUFFICIENT PERIPHERAL CIRCULATION																
4900	CENTRAL LINE INSITU (CARE OF PATIENT WITH)																
5050	NASO-GASTRIC TUBE MAINTENANCE																
5100	NASO-GASTRIC FEEDING																
5150	INDIGESTION																
5160	TOTAL PARENTERAL NUTRITION - CARE OF PATIENT REQUIRING																
5200	LOSS OF APPETITE																
5225	DYSPHAGIA (DIFFICULTY IN SWALLOWING SOLIDS)																
5250	NUTRITION - INADEQUATE NUTRITIONAL STATUS																
5290	NUTRITION/FRACTURED JAW																
5350	DEHYDRATION																
5375	VENFLON IN SITU (PATIENT WITH A)																
5400	INTRAVENOUS INFUSION																
5500	GRADED INCREASE OF ORAL FLUIDS																
5600	NAUSEA AND VOMITING																
5625	INDWELLING CATHETER																
5650	URINARY TRACT INFECTION																

EXCELCARE NURSING SYSTEM

UNITS OF CARE

UOC	UNIT OF CARE DESCRIPTION	17	18	19	20	21	22	23	24	25	26	27	28	29	30
5660	INDWELLING CATHETER REMOVAL														
5670	24 HOUR URINE COLLECTION														
5671	C.S.U.														
5672	M.S.U.														
5675	ACUTE RENAL FAILURE (CARE OF THE PATIENT WITH)														
5677	CHRONIC RENAL FAILURE (CARE OF PATIENT WITH)														
5700	DIARRHOEA														
5710	CONSTIPATION														
5720	STOOL SPECIMEN														
5725	PREVENTION OF CLOT RETENTION														
5740	ANAL SURGERY														
5750	OSTOMY (PRE-OPERATIVE)														
5760	OSTOMY (POST-OPERATIVE)														
5800	INTERMITTENT SELF-CATHETERISATION														
5850	BOWEL PREPARATION - SIGMOIDOSCOPY														
5855	BARIUM ENEMA														
5900	PRE-OPERATIVE BOWEL PREPARATION														
6400	TREMOR (PATIENT WITH A)														
6510	SELF CARE														
8888	OTHER NOT LISTED (ENTER THE NUMBER OF MINUTES TAKEN)														
	ALL DATA ENTERED FOR THIS PATIENT														

DEPENDENCY FORM

Rater _____

Hospital _____ Ward _____

Date _____ Time _____

Bed	Dependency/ Operation Cat.	Admission/ Op. Return Time	Extra Time Admission	Extra Time Other
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
		Total		
		Day cases		
		Misc.		
		Total non dependency time		

Events

	Night	Day
Admissions		
Discharges		
Pre-op Prep		
Pre-med		
Transfers in		
Transfers cut		
Escort Hosp.		
Escort Away		

Total Dependency Hours

Category 1 = x 1
= hrs

Category 2 = x 2
= hrs

Category 3 = x 3
= hrs

Category 4 = x 4
= hrs

Total Dependency
Extra Time hrs

Total Dependency

Total Patients

Staff on Duty Date _____ Shift Times: Early =
Late =
Night =

	Grade	Early	Late	Night	Other	Sick Leave	Annual Leave	Study Leave	Comments
Sister	G								
Sister/Sen SN	F								
Staff Nurse	E								
Staff Nurse	D								
Enrolled Nurse	E								
Enrolled Nurse	D								
Enrolled Nurse	C								
EN Conversion									
3rd Year									
2nd Year									
1st Year									
1st Warder									
Auxiliary*									
Support Worker*									
Bank**									
Agency**									
Ward Clerk									

* State if not grade A ** State grade and type (eg, EN, RGN etc)

PT. NAME ..... WARD ..... HOSPITAL .....

PT. NUMBER: | | | | | DATE: | | | | |

AGE .....

SEX M F

DISCHARGE STATUS (IF KNOWN) .....

DISCHARGE DESTINATION (IF KNOWN) .....

DATE OF ADMISSION | | | | |

DATE OF DISCHARGE (IF KNOWN) | | | | |

DIAGNOSIS/REASON FOR ADMISSION .....

.....

.....

.....

.....

SURGICAL PROCEDURES (IF ANY) .....

.....

.....

.....

.....

DRG

MDC

Comments .....

OUTCOME MEASURES

HOSP:
WARD:

Date: Time of day: Rater:

Patient Dependency Level:

Scoring system: All criteria will be scored by direct observation.
Exceptions occur only where criteria is cued. #D. *I. *A.
In such cases, please indicate method of observation by circling appropriate cue.
E.g. (#D) (*I)

1. Patient Hygiene:

Desired Outcome: Patients receive appropriate assistance when illness prevents them from carrying out aspects of their personal hygiene.

Criteria	Yes	No	Not observ.	Not applic.
a. General care is given and assistance offered with bathing and washing	1	2	3	4
b. Mouth care is given or offered at least twice a day. #D. *I	1	2		4
c. Provision is made for patient to wash hands after using bed pan.	1	2		4
d. Bed linen is clean, and patient is provided with change of clothing if soiled.	1	2		4
e. Patient's general appearance indicates hygeine needs are met.	1	2		4
f. Nails, hands and feet and skin are clean and hair is tidy.	1	2		4
g. Bedside environment is neat and orderly.	1	2		4

2. Patient nutrition and hydration

Deiried Outcome: Patients whose nutritional and fluid balance is at risk will be assessed and appropriate care implemented.

Criteria	Yes	No	Not observ.	Not applic.
a. Patient's mouth and tongue are clean and moist.	1	2		4
b. Patient is provided with fluid (including N.G. feeding).	1	2		4
c. Patient is encouraged to drink fluids between scheduled meal/coffee/tea times.	1	2		4
d. Intake of food and drink is monitored and recorded accurately where ordered. #D. *I.	1	2		4
e. Assistance is given with food and drinks when help is needed.	1	2		4
f. Food tray is checked before it is removed from the patient for amount of food consumed.	1	2		4

3. Pressure Sores/Skin Integrity

Desired Outcome: Skin care of bed patients who are at risk of skin breakdown is appropriate and reflects good nursing practice.

Criteria	Yes	No	Not observ.	Not applic.
a. The patient is repositioned at least every 4 hours. #D. *I.	1	2		4
b. A special mattress, elbow and/or heel protectors, and/or other devices are used to protect bony prominences and other sensitive areas of the body. *I. #D.	1	2		4
c. The bony prominences and other sensitive areas are inspected daily for reddened areas. #D. *I.	1	2		4
d. Nurse ensures patient's skin is not in direct contact with plastic sheet.	1	2		4
e. The bed linen is clean, dry and free from wrinkles and crumbs.	1	2		4
f. The patient's skin is clean and dry.	1	2		4

4. Intra-Venous Therapy

Desired Outcomes: Patient receives prescribed intra-venous fluid at correct rate of flow for prescribed period of time.

Criteria	Yes	No	Not observ.	Not applic.
a. IV fluid is checked to ensure that it is the one prescribed. #D. *I.	1	2		4
b. The rate of flow of the infusion is checked at least hourly to ensure it is appropriate for the prescription.	1	2		4
c. The patient's fluid input and output are recorded accurately. #D. *I.	1	2		4
d. Patients receiving blood transfusion will have TPR recorded, and general condition noted, hourly. #D. *I.	1	2		4
e. Site of intra-venous infusion is checked for signs of inflammation of vein or swelling of surrounding tissue at least every 4 hours. #D. *I.	1	2	3	4

5. Planning for Patient Discharge

Desired Outcome: The patient and/or family is provided with information and the necessary arrangements are made to ensure that his physical, psychological and social needs are met following discharge from hospital.

Criteria	Yes	No	Not observ.	Not applic.
a. Patient and family are given adequate notification of discharge to allow for preparations to be made. *I. *A.	1	2		4
b. Patient's home circumstances – and support likely to be available – is assessed at the earliest possible stage. *I.	1	2		4
c. When necessary, appropriate support services are notified of patient's discharge (e.g. Community nursing services, social worker, occupational therapist). *I. #D. *A.	1	2		4
d. Patient and/or family receives either verbal or written instructions regarding the period of convalescence and procedures to follow if problems arise. #D. *I. *A.	1	2		4
e. Patient and/or family is provided with written details of follow-up appointment. #D. *A.	1	2		4
f. Patient and/or family is given written instrructions of his prescribed medication, along with an indication of their possible side effects. #D. *A.	1	2		4
g. Patient is given the opportunity to ask questions and express any anxieties about discharge. #D. *A.	1	2		4

6. Pain Control

Desired Outcome: Pain resulting from illness or surgery will be appropriately controlled or alleviated.

Criteria	Yes	No	Not observ.	Not applic.
a. Patient's need for analgesia is monitored. #D. *I.	1	2		4
b. Patient's reponse to analgesia is monitored. #D. *I.	1	2		4
c. Reassurance and support are offered to comfort patient and allay fear and anxiety. #D. *I.	1	2		4
d. Patient is assisted to change position.	1	2		4
e. Proper body alignment is maintained.	1	2		4
f. Therapies (other than drugs) are used if indicated – e.g. hot and cold applications, use of T.E.N.S., massage and relaxation techniques. #D. *I. (T.E.N.S. = transcutaneous electrical nerve stimulation)	1	2		4

7. Education/Rehabilitation

Desired Outcome: The patient will acquire sufficient knowledge to; (i) participate fully in his disease rehabilitation management while in hospital and; (ii) function as independently as possible when discharged from hospital.

Criteria	Yes	No	Not observ.	Not applic.
a. Patient's learning and educational needs are identified. This should include physical, psychological and social aspects of his care. *I. #D.	1	2	●	4
b. The teaching and rehabilitation programmes of the nurses are coordinated with those of other disciplines, when necessary, to ensure compatibility with procedures prescribed or treatments being given. #D. *I.	1	2	●	4
c. Patient and/or family indicate knowledge and understanding of his disease or operation performed. *I. *A.	1	2	●	4
d. Patient and/or family verbalizes the importance of taking prescribed medications or continuing with specific treatments whether in hospital or on discharge; e.g. (i) taking insulin (ii) hypertensive medications (iii) using inhalers (iv) changing ostomy bags. *A. *I.	1	2	●	4
e. The patient understands the rationale for rest, exercise or in the case of surgery, early ambulation. *I. *A.	1	2	●	4
f. The patient and/or family will recognise physical, psychological or social factors which may limit his lifestyle. *A. *I.	1	2	●	4

8. Elimination

Desired Outcome: The patient will achieve and maintain a pattern of elimination which ensures the adequate removal of waste products from the body.

Criteria	Yes	No	Not observ.	Not applic.
a. Bowel function is monitored and any problem identified acted upon (e.g. diarrhoea, constipation, or changes in stool appearance). #D. *I.	1	2		4
b. Bladder function is monitored and any problems identified are acted upon (e.g. incontinence, urinary retention or changes in urine appearance). #D. *I.	1	2		4
c. Feacal constipation is prevented through advice on diet, exercise and fluid intake and treated by the administration of laxatives, suppositories and enemata where prescibed. #D. *I.	1	2		4
d. Patient is given prompt assistance to use bedpan, commode or go to toilet when help is needed or requested.	1	2		4
e. The patient's privacy and dignity are maintained during elimination.	1	2		4
f. Patients with a colostomy, ileostomy, or ileal conduit are assisted and encouraged by nursing staff to care for the skin surrounding the stoma sites and to change stoma bags as necessary. Nursing staff carry out this care where the patient is not ready to perform it for himself. #D. *I.	1	2		4
g. Intake and output of fluids are measured and recorded where this is prescribed (e.g. N/G drainage, Foley catheter, wound drains, heamorrhage). *I.	1	2		4
h. All drainage tubes, bags, tubes and bottles are correctly positioned to ensure maximum drainage and avoid stasis (e.g. catheters, wound drains, nasogastic tubes).	1	2		4
i. Drainage tubes are checked for patency to ensure drainage is taking place. Bags are emptied when necessary. #D. *I.	1	2		4

9. Patient Anxiety, Orientation and Information

Desired Outcome: Anxiety resulting from unfamiliar surroundings and procedures will be alleviated through appropriate interventions.

Criteria		Yes	No	Not observ.	Not applic.
a.	patient is informed on admission about the call bell or the nurse ensures bell is placed within reach of patient at all times	1	2		4
b.	procedures are explained to patient before they are carried out	1	2		4
c.	patient is encouraged to speak about any worries and concerns	1	2		4
d.	nurses demonstrate a willingness to listen	1	2		4
e.	the patient is responded to in a caring manner	1	2		4
f.	questions from the patient are answered in a way which will be understood	1	2		4
g.	adequate privacy is provided during procedures	1	2		4

APPENDIX B

NWM Systems: Hours Required Over 6 Day Observation Period

Table B 1.1 NWM systems: Hours required over 6 day observation period

Ward A (Medical)

NWM	SENS	FIP	EXCELCARE	C for C
Day 1 (Sun)	55.78	55.48	46.46	98.87
Day 2 (Mon)	57.11	64.84	79.59	109.28
Day 3 (Tues)	68.14	62.24	58.22	126.01
Day 4 (Wed)	51.99	64.78	55.49	115.227
Day 5 (Thur)	50.94	68.06	78.04	98.87
Day 6 (Fri)	43.55	63.3	83.02	107.05
TOTAL	327.51	378.7	400.82	655.307

Table B 1.2 NWM systems: Hours required over 6 day observation period

Ward B (Medical)

NWM	SENS	FIP	EXCELCARE	C for C
Day 1 (Sun)	124.33	134.6	137.5	157.973
Day 2 (Mon)	115.22	112.18	125.40	154.26
Day 3 (Tues)	122.35	110.6	113.16	142.733
Day 4 (Wed)	114.08	117.54	113.21	147.565
Day 5 (Thur)	115.46	111.02	111.41	135.397
Day 6 (Fri)	108.97	108.48	106.2	141.618
TOTAL	700.41	694.42	706.88	879.546

Table B 1.3 NWM systems: Hours required over 6 day observation period

Ward C (Surgical)

NWM	SENS	FIP	EXCELCARE	C for C
Day 1 (Sun)	86.30	97.72	69.15	125.263
Day 2 (Mon)	85.84	109.66	86.17	133.44
Day 3 (Tues)	95.62	124.66	110.05	149.05
Day 4 (Wed)	97.54	105.48	125.54	131.21
Day 5 (Thur)	84.97	108.78	103.01	141.618
Day 6 (Fri)	92.47	103.12	92.05	110.023
TOTAL	542.74	649.42	585.97	790.604

APPENDIX C

I List of Main Diagnostic Categories (MDCs) and Titles

II List of DRGs with Cluster Number

List of Main Diagnostic Categories (MDCs) and Titles

MDC	Title
1	Diseases and disorders of the nervous system
2	Diseases and disorders of the eye
3	Diseases and disorders of the ear, nose and throat
4	Diseases and disorders of the respiratory system
5	Diseases and disorders of the circulatory system
6	Diseases and disorders of the digestive system
7	Diseases and disorders of the hepatobiliary system and the pancreas
8	Diseases and disorders of the musculoskeletal system and connective tissue
9	Diseases and disorders of the skin, subcutaneous tissue and breast
10	Endocrine, nutritional and metabolic diseases and disorders
11	Diseases and disorders of the kidney and urinary tract
12	Diseases and disorders of the male reproductive system
13	Diseases and disorders of the female reproductive system
14	Pregnancy, childbirth and the puerperium
15	Newborn and other neonates with conditions originating in the perinatal period
16	Diseases and disorders of the blood and blood-forming organs and immunological disorders
17	Myeloproliferative diseases and disorders and poorly differentiated neoplasms
18	Infectious and parasitic diseases (systemic or unspecified sites)
19	Mental diseases and disorders
20	Substance use and substance induced organic mental disorders
21	Injury, poisoning and toxic effects of drugs
22	Burns
23	Factors influencing health status and other contacts with health services.

II LIST OF DRGS WITH CLUSTER NUMBER

MDC	DRG	TYPE	DRG NAME	CLUSTER
1	1	P	Craniotomy Age >17 Except for Trauma	5
1	2	P	Craniotomy for Trauma Age >17	5
1	3	P	Craniotomy Age <18	5
1	4	P	Spinal Procedures	5
1	5	P	Extracranial Vascular Procedures	4
1	6	P	Carpal Tunnel Release	1
1	7	P	Periph & Cranial Nerve & Other Nerv Syst Proc Age >69 &/or CC	2
1	8	P	Periph & Cranial Nerve & Other Nerv Syst Proc Age <70 W/O CC	2
1	9	M	Spinal Disorders & Injuries	5
1	10	M	Nervous System Neoplasms Age >69 &/or CC	4
1	11	M	Nervous System Neoplasms Age <70 W/O CC	4
1	12	M	Degenerative Nervous System Disorders	4
1	13	M	Multiple Sclerosis & Cerebellar Ataxia	4
1	14	M	Specific Cerebrovascular Disorders Except Tia	4
1	15	M	Transient Ischemic Attack & Preoerebral Oclusions	3
1	16	M	Nonspecific Cerebrovascular Disorder W CC	5
1	17	M	Nonspecific Cerebrovascular Disorder W/O CC	4
1	18	M	Cranial & Peripheral Nerve Disorders Age >69 &/or CC	2
1	19	M	Cranial & Peripheral Nerve Disorders Age <70 W/O CC	1
1	20	M	Nervous System Infection Except Viral Meningitis	5
1	21	M	Viral Meningitis	3
1	22	M	Hypertensive Encephalopathy	3
1	23	M	Nontraumatic Stupor & Coma	5
1	24	M	Seizure & Headache Age >69 &/or CC	3
1	25	M	Seizure & Headache Age 18-69 W/O CC	2
1	26	M	Seizure & Headache Age 0-17	4
1	27	M	Traumatic Stupor & Coma, Coma >1 Hr	5
1	28	M	Traumatic Stupor & Coma, Coma <1 Hr Age >69 &/or CC	5
1	29	M	Traumatic Stupor & Coma, Coma <1 Hr Age 18-69 W/O CC	5
1	30	M	Traumatic Stupor & Coma, Coma <1 Hr Age 0-17	5
1	31	M	Concussion Age >69 &/or CC	3
1	32	M	Concussion Age 18-69 W/O CC	2
1	33	M	Concussion Age 0-17	3
1	34	M	Other Disorders of Nervous System Age >69 &/or CC	3
1	35	M	Other Disorders of Nervous System Age <70 W/O CC	3
2	36	P	Retinal Procedures	2
2	37	P	Orbital Procedures	3
2	38	P	Primary Iris Procedures	2
2	39	P	Lens Procedures With or Without Vitrectomy	1
2	40	P	Extraocular Procedures Except Orbit Age >17	2
2	41	P	Extraocular Procedures Except Orbit Age 0-17	2
2	42	P	Intraocular Procedures Except Retina, Iris & Lens	2
2	43	M	Hyphema	1
2	44	M	Acute Major Eye Infections	4
2	45	M	Neurological Eye Disorders	1
2	46	M	Other Disorders of the Eye Age >17 W CC	1
2	47	M	Other Disorders of the Eye Age >17 W/O CC	1
2	48	M	Other Disorders of the Eye Age 0-17	2
3	49	P	Major Head & Neck Procedures	5
3	50	P	Sialoadenectomy	1
3	51	P	Salivary Gland Procedures Except Sialoadenectomy	1

MDC	DRG	TYPE	DRG NAME	CLUSTER
3	52	P	Cleft Lip & Palate Repair	3
3	53	P	Sinus & Mastoid Procedures Age >17	2
3	54	P	Sinus & Mastoid Procedures Age 0-17	3
3	55	P	Miscellaneous Ear, Nose & Throat Procedures	2
3	56	P	Rhinoplasty	1
3	57	P	T&A Proc, Except Tonsillectomy &/or Adenoidectomy Only, Age >17	2
3	58	P	T&A Proc, Except Tonsillectomy &/or Adenoidectomy Only, Age 0-17	2
3	59	P	Tonsillectomy &/or Adenoidectomy Only, Age >17	2
3	60	P	Tonsillectomy &/or Adenoidectomy Only, Age 0-17	2
3	61	P	Myringotomy W Tube Insertion Age >17	1
3	62	P	Myringotomy W Tube Insertion Age 0-17	1
3	63	P	Other ear, nose & throat O.R. procedures	2
3	64	M	Ear, nose & throat malignancy	3
3	65	M	Dysequilibrium	1
3	66	M	Epistaxis	1
3	67	M	Epiglottitis	5
3	68	M	Otitis Media & Uri Age >69 &/or CC	1
3	69	M	Otitis Media & Uri Age 18-69 W/O CC	1
3	70	M	Otitis Media & Uri Age 0-17	2
3	71	M	Laryngotracheitis	4
3	72	M	Nasal Trauma & Deformity	1
3	73	M	Other Ear, Nose & Throat Diagnoses Age >17	1
3	74	M	Other Ear, Nose & Throat Diagnoses Age 0-17	1
4	75	P	Major Chest Procedures	5
4	76	P	Other Resp System O.R. Procedures W CC	5
4	77	P	Other Resp System O.R. Procedures W/O CC	4
4	78	M	Pulmonary Embolism	5
4	79	M	Respiratory Infections & Inflammations Age >69 &/or CC	3
4	80	M	Respiratory Infections & Inflammations Age 18-69 W/O CC	2
4	81	M	Respiratory Infections & INflammations Age 0-17	3
4	82	M	Respiratory Neoplasms	3
4	83	M	Major Chest Trauma Age >69 &/or CC	5
4	84	M	Major Chest Trauma Age <70 W/O CC	5
4	85	M	Pleural Effusion Age >69 &/or CC	2
4	86	M	Pleural Effusion Age <70 W/O CC	2
4	87	M	Pulmonary Edema & Respiratory Failure	5
4	88	M	Chronic Obstructive Pulmonary Disease	4
4	89	M	Simple Pneumonia & Pleurisy Age >69 &/or CC	4
4	90	M	Simple Pneumonia & Pleurisy Age 18-69 W/O CC	3
4	91	M	Simple Pneumonia & Pleurisy Age 0-17	4
4	92	M	Interstitial Lung Disease Age >69 &/or CC	3
4	93	M	Interstitial Lung Disease Age <70 W/O CC	2
4	94	M	Pneumothorax Age >69 &/or CC	5
4	95	M	Pneumothorax Age <70 W/O CC	4
4	96	M	Bronchitis & Asthma Age >69 &/or CC	4
4	97	M	Bronchitis & Asthma Age 18-69 W/O CC	3
4	98	M	Bronchitis & Asthma Age 0-17	4
4	99	M	Respiratory Signs & Symptoms Age >69 &/or CG	2
4	100	M	Respiratory Signs & Symptoms Age	2
4	101	M	Other Respiratory System Diagnoses Age >69 &/or CC	3
5	105	P	Cardiac Valve Procedure W Pump & W/O Cardiac Cath	5
5	106	P	Coronary Bypass W Cardiac Cath	5
5	107	P	Coronary Bypass W/O Cardiac Cath	5

MDC	DRG	TYPE	DRG NAME	CLUSTER
5	108	P	Other Cardiovascular or Thoracic Proc, W Pump	5
5	109	P	Cardiothoracic Procedures W/O Pump	5
5	110	P	Major Reconstructive Vascular Proc W/O Pump Age >69 &/or CC	5
5	111	P	Major Reconstructive Vascular Proc W/O Pump Age <70 W/O CC	5
5	112	P	Vascular Procedures Except Major Reconstruction W/O Pump	5
5	113	P	Amputation For Circ System Disorders Except Upper Limb & Toe	5
5	114	P	Upper Limb & Toe Amputation for Circ System Disorders	4
5	115	P	Perm Cardiac Pacemaker Implant W AMI, Heart Failure or Shock	5
5	116	P	Perm Cardiac Pacemaker Implant W/O AMI, Heart Failure or Shock	3
5	117	P	Cardiac Pacemaker Replace & Revis Except Pulse Gen Repl Only	2
5	118	P	Cardiac Pacemaker Pulse Generator Replacement Only	2
5	119	P	Vein Ligation & Stripping	2
5	120	P	Other Circulatory System O.R. Procedures	4
5	121	M	Circulatory Disorders W AMI & C.V. Comp Disch Alive	5
5	122	M	Circulatory Disroders W AMI W/O C.V. Comp Disch Alive	4
5	123	M	Circulatory Disroders W AMI, Expired	5
5	124	M	Circulatory Disorders Except AMI, W Card Cath & Complex Diag	5
5	125	M	Circulatory Disorders Except AMI, W Card Cath W/O Complex Diag	4
5	126	M	Acute & Subacute Endocarditis	4
5	127	M	Heart Failure & Shock	5
5	128	M	Deep Vein Thrombophlebitis	4
5	129	M	Cardiac Arrest, Unexplained	5
5	130	M	Peripheral Vascular Disorders Age >69 &/or CC	2
5	131	M	Peripheral Vascular Disorders Age <70 W/O CC	2
5	132	M	Atherosclerosis Age >69 &/or CC	3
5	133	M	Atherosclerosis Age <70 W/O CC	2
5	134	M	Hypertension	2
5	135	M	Cardiac Congenital & Valvular Disorders Age >69 &/or CC	4
5	136	M	Cardiac Congenital & Valvular Disorders Age 18-69 W/O CC	4
5	137	M	Cardiac Congenital & Valvular Disorders Age 0-17	5
5	138	M	Cardiac Arrhythmia & Conduction Disorders Age >69 &/or CC	5
5	139	M	Cardiac Arrhythmia & Conduction Disorders Age <70 W/O CC	4
5	140	M	Angina Pectoris	3
5	141	M	Syncope & Collapse Age > 69 &/or CC	5
5	142	M	Syncope & Collapse Age <70 W/O CC	4
5	143	M	Chest Pain	2
5	144	M	Other Circulatory System Diagnoses W CC	5
5	145	M	Other Circulatory System Diagnoses W/O CC	3
6	146	P	Rectal Resection Age >69 &/or CC	5
6	147	P	Rectal Resection Age <70 W/O CC	4
6	148	P	Major Small & Large Bowel Procedures Age >69 &/or CC	5
6	149	P	Major Small & Large Bowel Procedures Age <70 W/O CC	4
6	150	P	Peritoneal Adhesiolysis Age >69 &/or CC	4
6	151	P	Peritoneal Adhesiolysis Age <70 W/O CC	3
6	152	P	Minor Small & Large Bowel Procedures Age >69 &/or CC	4
6	153	P	Minor Small & Large Bowel Procedures Age <70 W/O CC	3
6	154	P	Stomach, Esophageal & Duodenal Procedures Age >69 &/or CC	5
6	155	P	Stomach, Esophageal & Duodenal Procedures Age 18-69 W/O CC	4
6	156	P	Stomach, Esophageal & Duodenal Procedures Age 0-17	5

MDC	DRG	TYPE	DRG NAME	CLUSTER
6	157	P	Anal & Stomal Procedures Age >69 &/or CC	3
6	158	P	Anal & Stomal Procedures Age <70 W/O CC	2
6	159	P	Hernia Procedures Except Inguinal & Femoral Age >69 &/or CC	4
6	160	P	Hernia Procedures Except Inguinal & Femoral Age 18-69 W/O CC	3
6	161	P	Inguinal & Femoral Hernia Procedures Age >69 &/or CC	3
6	162	P	Inguinal & Femoral Hernia Procedures Age 18-69 W/O CC	2
6	163	P	Hernia Procedures Age 0-17	3
6	164	P	Appendectomy W Complicated Principal Diag Age >69 &/or CC	4
6	165	P	Appendectomy W Complicated Principal Diag Age <70 W/O CC 3	3
6	166	P	Appendectomy W/O Complicated Principal Diag Age >69 &/or CC	3
6	167	P	Appendectomy W/O Complicated Principal Diag Age <70 W/O CC	2
6	168	P	Mouth Procedures Age >69 &/or CC	3
6	169	P	Mouth Procedures Age <70 W/O CC	2
6	170	P	Other Digestive System O.R. Procedures Age >69 &/or CC	5
6	171	P	Other Digestive System O.R. Procedures Age <70 W/O CC	4
6	172	M	Digestive Malignancy Age >69 &/or CC	3
6	173	M	Digestive Malignancy Age <70 W/O CC	3
6	174	M	G.I. Hemorrhage Age >69 &/or CC	5
6	175	M	G.I. Hemorrhage Age <70 W/O CC	4
6	176	M	Complicated Peptic Ulcer	5
6	177	M	Uncomplicated Peptic Ulcer Age >69 &/or CC	2
6	178	M	Uncomplicated Peptic Ulcer Age <70 W/O CC	1
6	179	M	Inflammatory Bowel Disease	2
6	180	M	G.I. Obstruction Age >69 &/or CC	5
6	181	M	G.I. Obstruction Age < 70 W/O CC	3
6	182	M	Esophagitis, Gastroent & Misc Digest Disorders Age >69 &/or CC	3
6	183	M	Esophagitis, Gastroent & Misc Digest Disorders Age 18-69 W/O CC	2
6	184	M	Esophagitis, Gastroent & Misc Digest Disorders Age 0-17	3
6	185	M	Dental & Oral Dis Except Extractions & Restorations, Age >17	2
6	186	M	Dental & Oral Dis Except Extractions & Restorations, Age 0-17	3
6	187	M	Dental Extractions & Restorations	2
6	188	M	Other Digestive System Diagnoses Age >69 &/or CC	2
6	189	M	Other Digestive System Diagnoses Age 18-69 W/O CC	2
6	190	M	Other Digestive System Diagnoses Age 0-17	2
6	191	P	Major Pancreas, Liver & Shunt Procedures	5
6	192	P	Minor Pancreas, Liver & Shunt Procedures	4
7	193	P	Biliary Tract Proc Except Tot Cholecystectomy Age >69 &/or CC	5
7	194	P	Biliary Tract Proc Except Tot Cholecystectomy Age <70 W/O CC	4
7	195	P	Total Cholecystectomy W C.D.E. Age >69 &/or CC	5
7	196	P	Total Cholecystectomy W C.D.E. Age <70 W/O CC	4
7	197	P	Total Cholecystectomy W/O C.D.E. Age >69 &/or CC	5
7	198	P	Total Cholecystectomy W/O C.D.E. Age <70 W/O CC	4
7	199	P	Hepatobiliary Diagnostic Procedure for Malignancy	2
7	200	P	Hepatobiliary Diagnostic Procedure for Non-Malignancy	2
7	201	P	Other Hepatobiliary or Pancreas O.R. Procedures	4
7	202	M	Cirrhosis & Alcohol Hepatitis	2
7	203	M	Malignancy of Hepatobiliary System or Pancreas	4
7	204	M	Disorders of Pancreas Except Malignancy	3
7	205	M	Disorders of Liver Except Malig, Cirr, Alc Hepa Age >69 &/or CC	3
7	206	M	Disorders of Liver Except Malig, Cirr, Alc Hepa Age <70 W/O CC	3

MDC	DRG	TYPE	DRG NAME	CLUSTER
8	209	P	Major Joint & Limb Reattachment Procedures	5
8	210	P	Hip & Femur Procedures Except Major Joint Age >69 &/or CC	5
8	211	P	Hip & Femur Procedures Except Major Joint Age 18-69 W/O CC	5
8	212	P	Hip & Femur Procedures Except Major Joint Age 0-17	5
8	213	P	Amputation for Musculoskeletal System & Conn Tissue Disorders	5
8	214	P	Back & Neck Procedures Age >69 &/or CC	5
8	215	P	Back & Neck Procedures Age <70 W/O CC	5
8	216	P	Biopsies of Musculoskeletal System & Connective Tissue	1
8	217	P	WND Debrid & Skin Grft Except Hand, for Muscskelet & Conn Tiss Dis	4
8	218	P	Lower Extrem & Humer Proc Except Hip, Foot, Femur Age >69 &/or CC	5
8	219	P	Lower Extrem & Humer Proc Except Hip, Foot, Femur Age 18-69 W/O CC	4
8	220	P	Lower Extrem & Humer Proc Except Hip, Foot, Femur Age 0-17	5
8	221	P	Knee Procedures Age >69 &/or CC	4
8	222	P	Knee Procedures Age <70 W/O CC	3
8	223	P	Upper Extremity Proc Except Humerus & Hand Age >69 &/or CC	4
8	224	P	Upper Extremity Proc Excpet Humerus & Hand Age <70 W/O CC	3
8	225	P	Foot Procedures	2
8	226	P	Soft Tissue Procedures Age >69 &/or CC	3
8	227	P	Soft Tissue Procedures Age <70 W/O CC	2
8	228	P	Ganglion (Hand) Procedures	1
8	229	P	Hand Procedures Except Ganglion	2
8	230	P	Local Excision & Removal of Int Fix Devices of Hip & Femur	3
8	231	P	Local Excision & Removal of Int Fix Devices Except Hip & Femur	3
8	232	P	Arthroscopy	1
8	233	P	Other Musculoskelet Sys & Conn Tiss O.R. Proc Age >69 &/or CC	2
8	234	P	Other Musculoskelet Sys & Conn Tiss O.R. Proc Age <70 W/O CC	2
8	235	M	Fractures of Femur	4
8	236	M	Fractures of Hip & Pelvis	5
8	237	M	Sprains, Strains & Dislocations of HIP, Pelvis & Thigh	3
8	238	M	Osteomyelitis	2
8	239	M	Pathological Fractures & Musculoskeletal & Conn Tiss Malignancy	5
8	240	M	Connective Tissue Disorders Age >69 &/or CC	2
8	241	M	Connective Tissue Disorders Age <70 W/O CC	1
8	242	M	Septic Arthritis	4
8	243	M	Medical Back Problems	3
8	244	M	Bone Diseases & Specific Arthropathies Age >69 &/or CC	2
8	245	M	Bone Diseases & Specific Arthropathies Age <70 W/O CC	1
8	246	M	Non-Specific Arthropathies	2
8	247	M	Signs & Symptoms of Musculoskeletal System & Conn Tissue	1
8	248	M	Tendonitis, Myositis & Bursitis	1
8	249	M	Aftercare, Musculoskeletal System & Connective Tissue	1
8	250	M	FX, SPRN, STRN & DISL of Forearm, Hand, Foot Age > 69 &/or CC	3
8	251	M	FX, SPRN, STRN & DISL of Forearm, Hand, Foot Age 18-69 W/O CC	2
8	252	M	FX, SPRN, STRN & DISL of Forearm, Hand, Foot Age 0-17	3
8	253	M	FX, SPRN, STRN & DISL of Uparm, Lowleg Ex Foot Age >69 &/or CC	3
8	254	M	FX, SPRN, STRN & DISL of Uparm, Lowleg Ex Foot Age 18-69 W/O CC	2
8	255	M	FX, SPRN, STRN & DISL of Uparm, Lowleg Ex Foot Age 0-17	3
8	256	M	Other Musculoskeletal System & Connective Tissue Diagnoses	1
9	257	P	Total Mastectomy for Malignancy Age >69 &/or CC	4
9	258	P	Total Mastectomy for Malignancy Age <70 W/O CC	4
9	259	P	Subtotal Mastectomy for Malignancy Age >69 &/or CC	3
9	260	P	Subtotal Mastectomy for Malignancy Age <70 W/O CC	3

MDC	DRG	TYPE	DRG NAME	CLUSTER
9	261	P	Breast Proc for Non-Malignancy Except Biopsy & Local Excision	3
9	262	P	Breast Biopsy & Local Excision for Non-Malignancy	1
9	263	P	Skin Graft &/or Debrid for Skin Ulcer of Cellulitis Age >69 &/or CC	4
9	264	P	Skin Graft &/or Debrid for Skin Ulcer of Cellulitis Age <70 W/O CC	4
9	265	P	Skin Graft &/or Debrid Except for Skin Ulcer or Cellulitis W CC	4
9	266	P	Skin Graft &/or Debrid Except for Skin Ulcer of Cellulitis W/O CC	4
9	267	P	Perianal & Pilonidal Procedures	3
9	268	P	Skin, Subcutaneous Tissue & Breast Plastic Procedures	2
9	269	P	Other Skin, Subcut Tiss & Breast O.R. Proc Age >69 &/or CC	3
9	270	P	Other Skin, Subcut Tiss & Breast O.R. Proc Age <70 W/O CC	2
9	271	M	Skin Ulcers	4
9	272	M	Major Skin Disorders Age >69 &/or CC	3
9	273	M	Major Skin Disorders Age <70 W/O CC	3
9	274	M	Malignant Breast Disorders Age >69 &/or CC	3
9	275	M	Malignant Breast Disorders Age <70 W/O CC	3
9	276	M	Non-malignant Breast Disorders	1
9	277	M	Cellulitis Age >69 &/or CC	3
9	278	M	Cellulitis Age 18-69 W/O CC	3
9	279	M	Cellulitis Age 0-17	3
9	280	M	Trauma to the Skin, Subcut Tiss & Breast Age >69 &/or CC	3
9	281	M	Trauma to the Skin, Subcut Tiss & Breast Age 18-69 W/O CC	2
9	282	M	Trauma to the Skin, Subcut Tiss & Breast Age 0-17	3
9	283	M	Minor Skin Disorders Age >69 &/or CC	1
9	284	M	Minor Skin Disorders Age <70 W/O CC	1
10	285	P	Amputat of Lower Limb for Endocrine, Nutrit & Metabol Disorders	5
10	286	P	Adrenal & Pituitary Procedures	5
10	287	P	Skin Grafts & Wound Debrid for Endoc, Nutrt & Metab Disorders	4
10	288	P	O.R. Procedures For Obseity	5
10	289	P	Parathyroid Procedures	5
10	290	P	Thyroid Procedures	5
10	291	P	Thyroglossal Procedures	3
10	292	P	Other Endocrine, Nutrit & Metab O.R. Proc Age >69 &/or CC	5
10	293	P	Other Endocrine, Nutrit & Metab O.R. Proc Age <70 W/O CC	4
10	294	M	Diabetes Age >35	5
10	295	M	Diabetes Age 0-35	5
10	296	M	Nutritional & Misc Metabolic Disorders Age >69 &/or CC	4
10	297	M	Nutritional & Misc Metabolic Disorders Age 18-69 W/O CC	4
10	298	M	Nutritional & Misc Metabolic Disorders Age 0-17	5
10	299	M	Inborn Errors of Metabolism	3
10	300	M	Endocrine Disorders Age >69 &/or CC	5
10	301	M	Endocrine Disorders Age <70 W/O CC	4
11	302	P	Kidney Transplant	5
11	303	P	Kidney, Ureter & Major Bladder Procedures for Neoplasm	5
11	304	P	Kidney, Ureter & Major Bladder Proc for Non-Neopl Age >69 &/or CC	5
11	305	P	Kidney, Ureter & Major Bladder Proc for Non-Neopl Age <70 W/O CC	4
11	306	P	Prostatectomy Age >69 &/or CC	4
11	307	P	Prostatectomy Age <70 W/O CC	3
11	308	P	Minor Bladder Procedures Age >69 &/or CC	2
11	309	P	Minor Bladder Procedures Age <70 W/O CC	2
11	310	P	Transurethral Procedures Age >69 W/O CC	2
11	311	P	Transurethral Procedures Age <70 W/O CC	2

MDC	DRG	TYPE	DRG NAME	CLUSTER
11	313	P	Urethral Procedures, Age 18-69 W/O CC	2
11	314	P	Urethral Procedures, Age 0-17	2
11	315	P	Other Kidney & Urinary Tract O.R. Procedures	3
11	316	M	Renal Failure	5
11	317	M	Admit for Renal Dialysis	3
11	318	M	Kidney & Urinary Tract Neoplasms Age >69 &/or CC	3
11	319	M	Kidney & Urinary Tract Neoplasms Age <70 W/O CC	3
11	320	M	Kidney & Urinary Tract Infections Age >69 &/or CC	3
11	321	M	Kidney & Urinary Tract Infections Age 18-69 W/O CC	1
11	322	M	Kidney & Urinary Tract Infections Age 0-17	2
11	323	M	Urinary Stones Age >69 &/or CC	4
11	324	M	Urinary Stones Age <70 W/O CC	4
11	325	M	Kidney & Urinary Tract Signs & Symptoms Age >69 &/or CC	2
11	326	M	Kidney & Urinary Tract Signs & Symptoms Age 18-69 W/O CC	1
11	327	M	Kidney & Urinary Tract Signs & Symptoms Age 0-17	2
11	328	M	Urethral Stricture Age >69 &/or CC	2
11	329	M	Urethral Stricture Age 18-69 W/O CC	1
11	330	M	Urethral Stricture Age 0-17	2
11	331	M	Other Kidney & Urinary Tract Diagnoses Age >69 &/or CC	3
11	332	M	Other Kidney & Urinary Tract Diagnoses Age 18-69 W/O CC	1
11	333	M	Other Kidney & Urinary Tract Diagnoses Age 0-17	2
12	334	P	Major Male Pelvic Procedures W CC	5
12	335	P	Major Male Pelvic Procedures W/O CC	5
12	336	P	Transurethral Prostatectomy Age >69 &/or CC	4
12	337	P	Transurethral Prostatectomy Age <70 W/O CC	3
12	338	P	Testes Procedures, For Malignancy	2
12	339	P	Testes Procedures, Non-Malignancy Age >17	2
12	340	P	Testes Procedures, Non-Malignancy Age 0-17	2
12	341	P	Penis Procedures	2
12	342	P	Circumcision Age >17	1
12	343	P	Circumcision Age 0-17	1
12	344	P	Other Male Reproductive System O.R. Procedures for Malignancy	3
12	345	P	Other Male Reproductive System O.R. Proc Except for Malignancy	3
12	346	M	Malignancy, Male Reproductive System, Age >69 &/or CC	3
12	347	M	Malignancy, Male Reproductive System, Age <70 W/O CC	3
12	348	M	Benign Prostatic Hypertrophy Age >69 &/or CC	2
12	349	M	Benign Prostatic Hypertrophy Age <70 W/O CC	1
12	350	M	Inflammation of the Male Reproductive System	1
12	351	M	Sterilization, Male	1
12	352	M	Other Male Reproductive System Diagnoses	1
13	353	P	Pelvic Evisceration, Radical Hysteretomy & Volvectomy	5
13	354	P	Non-Radical Hysterectomy Age >69 &/or CC	5
13	355	P	Non-Radical Hysterectomy Age <70 W/O CC	4
13	356	P	Female Reproductive System Reconstructive Procedures	2
13	357	P	Uterus & Adenexa Procedures for Malignancy	3
13	358	P	Uterus & Adenexa Proc for Non-Malignancy Except Tubal Interrupt	3
13	359	P	Incisional Tubal Interruption for Non-Malignancy	1
13	360	P	Vagina, Cervix & Vulva Procedures	3
13	361	P	Laparoscopy & Endoscopy (Female) Except Tubal Interruption	1
13	362	P	Laparoscopic Tubal Interrpution	1
13	363	P	D&C, Conization & Radio-Implant, for Malignancy	2
13	364	P	D&C, Conization Except for Malignancy	1

MDC	DRG	TYPE	DRG NAME	CLUSTER
13	365	P	Other Female Reproductive System O.R. Procedures	3
13	366	M	Malignancy Female Reproductive System Age >69 &/or CC	3
13	367	M	Malignancy Female Reproductive System Age <70 W/O CC	3
13	368	M	Infections, Female Reproductive System	2
13	369	M	Menstrual & Other Female Reproductive System Disorders	1
14	370	P	Cesarean Section W CC	4
14	371	P	Cesarean Section W/O CC	3
14	372	M	Vaginal Delivery W Complicating Diagnoses	4
14	373	M	Vaginal Delivery W/O Complicating Diagnoses	2
14	374	P	Vaginal Delivery W Sterilization &/or D&C	2
14	375	P	Vaginal Delivery W O.R. Proc Except Steril &/or D&C	2
14	376	M	Postpartum & Post Abortion Diagnoses W/O O.R. Procedure	1
14	377	P	Postpartum & Post Abortion Diangoses W O.R. Procedure	2
14	378	M	Ectopic Pregnancy	4
14	379	M	Threatened Abortion	1
14	380	M	Abortion W/O D&C	1
14	381	P	Abortion W D&C, Aspiration Curettage or Hysterectomy	1
14	382	M	False Labour	1
14	383	M	Other Antepartum Diagnoses W Medical Complications	1
14	384	M	Other Antepartum Diagnoses W/O Medical Complications	1
15	385		Neonates, Died or Transferred	5
15	386		Extreme Immaturity or Respiratory Distress Syndrome, Neonate	5
15	387		Prematurity W Major Problems	4
15	388		Prematurity W/O Major Problems	4
15	389		Full Term Neonate W Major Problems	5
15	390		Neonate W Other Significant Problems	5
15	391		Normal Newborn	2
16	392	P	Splenectomy Age >17	4
16	393	P	Splenectomy Age 0-17	4
16	394	P	Other Blood & Blood Forming Organs O.R. Procedures	3
16	395	M	Red Blood Cell Disorders Age >17	3
16	396	M	Red Blood Cell Disorders 0-17	4
16	397	M	Coagulation Disorders	4
16	398	M	Reticuloendothelial & Immunity Disorders Age >69 &/or CC	4
16	399	M	Reticuloendothelial & Immunity Disorders Age <70 W/O CC	5
17	400	P	Lymphoma or Leukemia W Major O.R. Procedure	5
17	401	P	Lymphoma or Leukemia W Other O.R. Proc Age >69 &/or CC	5
17	402	P	Lymphoma or Leukemia W Other O.R. Proc Age <70 W/O CC	4
17	403	M	Lymphoma or Leukemia Age >69 &/or CC	3
17	404	M	Lymphoma or Leukemia Age 18-69 W/O CC	3
17	405	M	Lymphoma or Leukemia Age 0-17	3
17	406	P	Myeloprolif Discord or Poorly Diff Neopl W Maj O.R. Proc & CC	5
17	407	P	Myeloprolif Discord or Poorly Diff Neopl W Maj O.R. Proc W/O CC	5
17	408	P	Myeloprolif Discord or Poorly Diff Neopl W Other O.R. Proc	5
17	409	M	Radiotherapy	1
17	410	M	Chemotherapy	2
17	411	M	History of Malignancy W/O Endoscopy	1
17	412	M	History of Malignancy W Endoscopy	1
17	413	M	Other Myeloprolif Dis or Poorly Diff Neopl Diag Age >69 &/or CC	3
17	414	M	Other Myeloprolif Dis or Poorly Diff Neopl Diag Age <70 W/O CC	3
17	415	P	O.R. Procedure for Infectious & Parasitic Diseases	3
17	416	M	Sceptecemia Age >17	4

MDC	DRG	TYPE	DRG NAME	CLUSTER
18	417	M	Sceptecemia Age 0-17	4
18	418	M	Postoperative & Post-Traumatic Infections	4
18	419	M	Fever of Unknown Origin Age >69 &/or CC	2
18	420	M	Fever of Unknown Origin Age 18-69 W/O CC	2
18	421	M	Viral Illness Age >17	1
18	422	M	Viral Illness & Fever of Unknown Origin Age 0-17	3
18	423	M	Other Infectious & Parasitic Diseases Diagnoses	1
19	424	P	O.R. Procedure W Principal Diagnoses of Mental Illness	4
19	425	M	Acute Adjust React & Disturbances of Psychosocial Dysfunction	2
19	426	M	Depressive Neuroses	4
19	427	M	Neuroses Except Depresive	3
19	428	M	Disorders of Personality & Impulse Control	3
19	429	M	Organic Disturbances & Mental Retardation	5
19	430	M	Psychoses	4
19	431	M	Childhood Mental Disorders	5
19	432	M	Other Mental Disorder Diagnoses	2
20	433		Substance Use & Induced Organic Mental Disorders, Left AMA	3
20	434		Subst Abuse, Intox, Induce Mental Syn Exc Depend &/or Oth Sympt Tre	1
20	435		Substance Dependence, Detox &/or Other Symptomatic Treatment	1
20	436		Substance Dependence W Rehabilitation Therapy	2
20	437		Substance Dependence, Combined Rehab & Detox Therapy	4
20	438		No Longer Valid	
21	439	P	Skin Grafts for Injuries	4
21	440	P	Wound Debridements for Injuries	4
21	441	P	Hand Procedures for Injuries	4
21	442	P	Other O.R. Procedures for Injuries Age >69 &/or CC	4
21	443	P	Other O.R. Procedures for Injuries Age <70 W/O CC	3
21	444	M	Multiple Trauma Age >69 &/or CC	5
21	445	M	Multiple Trauma Age 18-69 W/O CC	4
21	446	M	Multiple Trauma Age 0-17	5
21	447	M	Allergic Reactions Age >17	1
21	448	M	Allergic Reactions Age 0-17	2
21	449	M	Poisoning & Toxic Effects of Drugs Age >69 &/or CC	3
21	450	M	Poisoning & Toxic Effects of Drugs Age 18-69	3
21	451	M	Poisoning & Toxic Effects of Drug Age 0-17	4
21	452	M	Complications of Treatment Age >69 &/or CC	3
21	453	M	Complications of Treatment Age <70 W/O CC	3
21	454	M	Other Injury, Poisoning & Toxic Eff Diag Age >69 &/or CC	3
21	455	M	Other Injury, Poisoning & Toxic Eff Diag Age <70 W/O CC	3
21	456		Burns Transferred to Another Acute Care Facility	6
22	457		Extensive Burns	6
23	458	P	Non-Extensive Burns W Skin Graft	5
22	459	P	Non-Extensive Burns W Wound Debridement & Other O.R. Proc	5
22	460	M	Non-Extensive Burns W/O O.R. Procedure	5
23	461	P	O.R. Proc W Diagnoses of Other Contact W Health Services	3
23	462	M	Rehabilitation	1
23	463	M	Signs & Symptoms W CC	1
23	464	M	Signs & Symptoms W/O CC	1
23	465	M	Aftercare W History of Malignancy as Secondary Diagnosis	1
23	466	M	Aftercare W/O History of Malignancy as Secondary Diagnosis	1
23	467	M	Other Factors Influencing Health Status	1
24	468		Unrelated Operating Room Procedures	3
24	469		Principal Diagnosis Invalid as Discharge Diagnosis	.
24	470		Ungroupable	.
8	471	P	Bilateral or Multiple Major Joint Procs of Lower Extremity	5

Table 6.1 Quality of Care by Grade

(a) Clinical Grades, number of ratings and Quality of Care

	N	%	Av. Quality	Qualpac Sections 1	2	3	4	5
F & G	4192	9.7	2.96	3.04	2.78	2.87	3.07	3.05
E	6903	16.0	2.83	2.90	2.69	2.79	2.89	2.86
D	8881	20.5	2.86	2.95	2.74	2.77	2.86	2.80
C	5072	11.7	2.73	2.77	2.62	2.70	2.74	2.82
A & B	5108	11.8	2.68	2.74	2.60	2.66	2.42	2.56
Learners	8426	19.5	2.74	2.78	2.61	2.76	2.63	2.85
Ward clerks	85	.2	2.21	2.23	1.84	2.67	-	2.33
Conversions not spec.	4573	10.1						
	43242	Overall av.	2.80	2.86	2.66	2.73	2.76	2.80

(b) Excess of Good over Poor Care

	N good	N bad	N total	$\frac{(N\ good - N\ bad) * 100}{N\ total}$
F & G	765	727	4181	.91
E	885	1679	6898	-11.5
D	1102	1970	8867	-9.8
C	338	1415	5061	-21.3
A & B	341	1563	5100	-24.0
Learners	531	2041	8418	-17.9

Table 6.1 continued

Predominance (> .5)	Overall qual		Overall qual. QP Psychosoc. 1	Phys. 2	Gen. 3	Comm. 4	N	Prof. dev. 5	
Average	2.81	(358)	2.86	2.69	2.80	2.83	256	2.81	305
No predom.	2.77	146	2.83	2.66	2.78	2.80	108	2.74	130
F+G	2.98	16	3.09	2.89	2.79	3.09	13	2.85	14
E	2.87	38	2.91	2.73	2.91	3.02	24	2.73	26
D	2.88	52	2.94	2.77	2.92	2.88	37	3.01	47
C	2.71	18	2.74	2.61	2.57	2.66	9	2.58	12
A+B	2.76	59	2.83	2.62	2.78	2.76	42	2.84	52

When these grades predom. (> .5)		Quality delivered by these grades: F+G	E	D	C	A+B	L
	None	3.01	2.79	2.83	2.72	2.58	2.69
	F+G	3.09	3.00	2.67	2.51	2.99	2.60
	E	3.25	2.86	2.82	2.74	2.83	2.93
	D	3.04	3.10	2.89	2.86	2.76	2.77
	C	2.88	2.98	2.66	2.85	2.72	2.64
	A+B	2.90	2.88	2.86	2.68	2.72	2.51
	L	2.72	2.84	2.96	2.73	2.57	2.75
	Av.	2.99	2.86	2.84	2.74	2.66	2.73

Appendix Rating of Outcome Measures

A simple regression of each of the outcome measures using the dummy variables for the raters suggests a high degree of inter-rater variability on these measures. Table X, the proportion of variance in each outcome measure accounted for by dummy variables for the raters is displayed. The first main observation is that these outcome measures are not yet in a marketable form as there is substantial variation between rates.

	OUTCOMES							
Influence of Raters	1	2	3	4	5	6	7	8
Variance accounted for	31	40	52	33	56	45	52	38
Significant ($p<0.1$) Raters	R14 R12 R62	R14 R12 R43 R11 R6	R75 R74 R61 R33 R21 R12 R43 R64 R11 R62 R6 R51	R14 R1 R6	R75 R61 R33 R5 R51	R75 R74 R21 R41 R14 R43 R5 R64 R6 R57	R75 R61 R33 R58 R31 R23 R51	R5 R64 R1 R11 R6 R53