The Impact of Patient Transfers and Bedspace Moves on Nurse Workload

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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'This life is a hospital in which each patient is obsessed with the desire to change beds'

Charles Baudelaire (1821-1867)[1]

[1] Baudelaire, C. (1867). 'Anywhere Out of the World', *Little Poems in Prose*; Spleen, Paris.

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Abstract

This multiple methods study explores the impact of moving patients between and within wards on nursing workload. While patient transfers (between clinical units) and bedspace moves (between beds on the same ward) are a routine part of nursing practice in acute hospitals, the rate of transfers has increased in recent times, due primarily to a shortage of hospital beds and an increasing demand for health services. The organisation and preparation of the patient prior, during and post transfer or bedspace move and the related communication processes forms a component of nursing work that has not been comprehensively explored. As a consequence, the impact of patient moves on nursing workload has not been fully realised nor captured in staffing models.

A three-stage, sequential approach was used in this study. Stage 1 retrospectively examined 2008-2009 financial and patient administrative data to explore the incidence and destination of patient moves in one Australian metropolitan hospital over a financial year. Results identified that the majority of patient movements involved medical-surgical wards (n=12) and were therefore suitable contexts for more in-depth investigation.

Stage 2 consisted of a direct observational-timing study conducted over a seven week period. Based on Stage 1 results, one medical and one surgical ward with a high rate of patient moves were selected for observation. A purpose-designed data collection tool was used to record and time nursing activities associated with observed patient moves (n=75). From these observational records and field notes, two case studies were developed in Stage 3 to demonstrate in detail the sequence of nursing activities, the

role of the nurse and the factors that can impact on the time taken to transfer a patient to another ward.

The results of Stage 1 identified that at the selected hospital, 10,733 patients who remained in hospital for 48 hours or more experienced 34,715 transfers and bedspace moves in the selected year. The largest single group (48.6%, n=16,861) of these moves involved medical-surgical wards. The results from Stage 2 indicated that the average patient transfer took 65.8 minutes and bedspace moves 29.2 minutes to complete. Of this time, over 40 minutes of nurses' time was spent on patient transfers and 11 minutes on bedspace moves. This means that for medical-surgical wards alone, 3.9 FTE nurses are necessary for all the moves that occur each month.

The impact of patient transfers and bedspace moves on nurses' workload is considerable. Time spent moving patients means that less time is available for other patients and their care needs. In addition, many transfer activities could be performed by other members of the team. Given the impact on nurses' workload, it is timely for hospitals to consider strategies to minimise the frequency and improve the efficiency of patient transfers.

Author Publications Associated with this Thesis

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Blay, N., Duffield, C., Gallagher, R. & Roche, M. 2014, 'A Systematic Review of Time Studies to Assess the Impact of Patient Transfers on Nurse Workload', *International Journal of Nursing Practice*, vol. 20, no. 6, pp. 662-73.

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Chapter 1. Background

Nurses are in short supply in most countries and Australia is no different, with projections that the nursing shortage is likely to increase to 123,000 (38%) by 2030 (Health Workforce Australia 2014). At the same time there is an increasing demand for hospital services from an ageing population with increasing levels of chronic disease. The number of available hospital beds has declined, with the effect that hospitals are experiencing unprecedented occupancy rates and bed shortages. These increased demands for care in a climate of nursing shortages and a shrinking bed base negatively impact nurses' workload. Nurse managers are therefore under constant pressure to use resources to their best effect to maintain quality patient care. Two areas of significant challenge are the appropriate and effective utilisation of bed resources and the management of nursing workload.

In response, hospitals have instigated a variety of bed management strategies in an attempt to increase patient flow or the progression of patients through the hospital system (Blay, Duffield & Gallagher 2012; McD Taylor, Bennett & Cameron 2004). However, these strategies have likely increased the frequency with which patients are transferred between clinical units and/or wards as demonstrated by the increasing trend for patients to spend time on at least two different clinical units during their hospital stay (Duffield et al. 2007; Kanak et al. 2008). It is also likely that patients are also being moved more often within a ward or unit. The need to accommodate one patient can result in the need to move other patients from one bedspace to another within that ward or unit (called a bedspace move in this thesis) to ensure that each patient is positioned in a suitable position for their clinical care needs (Blay et al. 2014b). As nurses are likely to be involved with the coordination of patient transfers (Abraham & Reddy 2008; Abraham & Reddy 2013) and the preparation of the patient in readiness to be transferred (Abraham & Reddy 2013; Hendrich & Lee 2005; Kibler & Lee 2011), the rate of patient transfers and bedspace moves may impact on nurses' workload.

The literature points to a global increase in the frequency with which patients are being transferred (Blay, Duffield & Gallagher 2012). However, previous research has been limited by the capacity of hospital information systems to capture and/or report intra-hospital transfers (Firth, Mellor & Francis 2008; West 2010b) while bedspace moves have not previously been examined in the published literature (Blay et al. 2014b). A lack of definitive evidence on the rate of patient transfer rates and bedspace moves in the inpatient population means that the impact of moving patients within and between wards on nurses' workload is only speculative. This study aims to address this gap in nursing knowledge. The overall purpose of this multiple methods, sequential study was to quantify the frequency of intra-hospital transfers and bedspace moves and determine their impact on nursing time.

For contextual purposes, a synopsis of the structure of this thesis is presented here. To better understand the pressures on nurses and their workload, an overview of the current context of the Australian healthcare system, the nursing workforce and a brief introduction to the bed management strategies designed to increase patient flow is provided in this Chapter. Bed management strategies that have likely contributed to the increasing trend for patients to be moved between and within wards and clinical units during their hospital stay will be discussed. In Chapter 3, the published literature will be examined to determine what is known about the impact of transferring a patient on nursing workload. The literature review found that patient transfers were frequently listed as a nursing activity in nursing workload studies (Blay et al. 2014b) but the varied research techniques employed limited comparisons between studies. Few studies timed the nurse when attending to activities associated with the transferring patient (Blay et al. 2014b) meaning that any future research needed to encompass the observation and timing of nursing activities. To determine the most appropriate observational research method to record and time activities undertaken by nurses when moving a patient, the time and motion technique and associated variants of the time and motion technique, are critiqued in Chapter 4.

In Chapter 5, the research objectives, research design and the research methods employed in this study are described. The research was divided into three stages using a sequential approach. The purpose of the first Stage of the research was to retrospectively examine the rate of patient transfers between wards or units over a one year period within the acute hospital setting. Results from Stage 1, were used to inform Stage 2 of this project. The second Stage utilised a prospective, observational-timing approach to examine the impact of patient transfers and bedspace moves on nursing workload. The third Stage used case studies to examine the patient transfer process in greater detail and to further knowledge on the impact of patient transfers on nursing workload. Results from the three stages are described in Chapters 6, 7, and 8 respectively. Finally, the discussion and conclusion are addressed in Chapter 9.

1.1 The Australian Healthcare System

Australia is made up of six States and two Territories and is governed by a Federal system whereby power is divided between the Australian Commonwealth

Government and separately elected State and Territory Governments. The Commonwealth Government has legal responsibility for the nation and for social welfare, defence and sovereign matters, whereas the States and Territories are responsible for transport and housing. A third tier of government, local councils, are responsible for local infrastructure and maintenance of locally based public health (Australian Government n.d.).

Many of the State, Territory and Commonwealth Governments' responsibilities overlap. Healthcare is one example (Australian Government 2014a; Parliament of Australia n.d.) and this overlap has led to a complex healthcare system and subsequent issues in regard to shifting costs and/or responsibilities across jurisdictions (Arendts & Howard 2010; Dow & McDonald 2007; Dwyer 2014). The Commonwealth Government manages and funds Medicare, Australia's universal public health insurance scheme, funds primary health care, rehabilitation and aged care services (Dwyer & Eagar 2008) and contributes 45% towards the funding of public hospitals (AIHW 2014a; Parliament of Australia 2014). The States/Territory Governments are the major funders (54%) and have regulatory responsibility for the management of the public hospital system and for healthcare workers. Local governments under the jurisdiction of the States/Territory Governments manage and contribute towards the funding of locally based public health services, for example immunisation services (AIHW 2014a, 2014c; Australian Government 2014b).

The complexity of the healthcare system becomes evident when funding arrangements are examined. The majority (46%) of the Australian Commonwealth Government health expenditure is for Medicare, the universal health insurance system, while an almost equal proportion (45%) is provided to the States and

Territories for public hospitals (AIHW 2014a; Australian Taxation Office 2014; Parliament of Australia 2014). This funding is targeted for special purpose projects and/or linked to performance based activities (ABS 2012b; AIHW 2014a) such as the National Emergency Access Target (NEAT) that aimed to promote a hospital wide approach to access to public hospital services and enhance patient safety (Emergency Care Institute NSW & Agency for Clinical Innovation 2014; Geelhoed & de Klerk 2012; NSW Department of Health 2012b). In addition to public funding, sources include individuals' out of pocket contributions for medical services (17%), health insurance contributions (8%), and miscellaneous sources such as third party motor vehicle and workers' compensation insurers (5%) (ABS 2012b; AIHW 2014a; Australian Law Reform Commission 2014). Public hospitals, the sector where the current study was conducted, are primarily funded and remain the responsibility of the relevant States and Territories (AIHW 2014c).

The complexity described above provides opportunity for cost shifting across funders. For privately insured patients, the decision to be treated as a public (free at the point of service) or private patient (fee paying depending on insurance level) in the public hospital system primarily lies with the individual (AIHW 2014a). However, public hospitals actively encourage patients to utilise their private health insurance as medical fees are billed directly to the Commonwealth Government (King 2013), thereby shifting some of the cost from the States/Territories and (indirectly) contributing to the increased demand for hospital services.

Overall, healthcare expenditure has substantially increased over the past decade. Part of the increase in Commonwealth and State/Territory funding (ABS 2012b; AIHW 2014a) can be explained by a continuing demand for healthcare services. For example, presentations to Emergency Departments (ED) and hospital separations[2] have increased by 2.4% and 3.1% respectively per annum since 2008-2009 (AIHW 2013a, 2014b).

An increase in ED presentations usually translates into an increase in hospital admissions. However, with 19,000 public hospital beds (AIHW 2014b) for an estimated resident population of 7.4 million in NSW and an ageing population (ABS 2014), access to a hospital bed for ED patients requiring admission has become more difficult. The ageing of the population is a pervasive influence on health demand and resources. For example, individuals aged 65 years or more represent 14.2% of Australia's population and 40% of all hospital separations (ABS 2012a; AIHW 2013c, 2014b).

Despite the increased demands for hospital care successive Australian governments have gradually reduced inpatient hospital beds, while the number of beds or chairs for same-day treatments has increased. Furthermore, some of the 'counted' beds include specialist chairs for chemotherapy and/or hospital-in-the home beds (Alexander 2014; Allen 2014a) which means that the number of beds available for inpatient services is fewer than that reported. Private hospital beds have increased slightly but as the majority of separations from private hospitals are for same-day procedures (AIHW 2014b) the impact of the private sector on the demand for public hospital beds is probably minimal. The net effect of all these changes is that the

[2] A separation is defined in Australia as the completion of a hospital episode or a portion of a hospital episode following a change of care type by either discharge, transfer to another facility or death (AIHW 2010 p.13).

number of available public hospital beds has declined per head of the population from 2.66 to 2.57 from 2008-2009 over a four year period (AIHW 2014a).

One way in which hospitals have endeavoured to manage this situation is to reduce the length of hospital stay, and overall this has been effective. In 2007-2008 patients remaining overnight in public acute hospitals could expect to remain in hospital 6.2 days (AIHW 2013c) whereas in 2013-2014 the average length of stay (ALOS) for overnight stay patients was 5.5 days (AIHW 2015a). Technological advances and less invasive surgical procedures have also contributed to a shortening of patient recovery times, further reducing length of hospital stay. However, the net effect of reductions in ALOS and increased patient turnover are high hospital occupancies. Many Australian hospitals operate at full capacity with occupancy levels of 90%, which many argue are inefficient, unsafe for patients and increase staff workload (Kaier, Mutters & Frank 2012; Keegan 2010; Weissman et al. 2007). Occupancy rates of 85% have been called for (AMA 2008, 2013). It is important and timely to consider the impact of continued demand for hospital care and patient throughput on nursing workload.

1.2 Nursing Workforce

Australia, as are many other countries, is facing a shortage of healthcare workers that is only predicted to worsen. The estimates of growth in demand for health services ranges from 24% to 130% (Jones et al. 2008; Schofield & Earnest 2006). As a consequence, the need for an increased supply of healthcare workers, particularly nurses, will grow substantially. Australia, like many other countries, is facing a shortage of healthcare workers that is only predicted to worsen. The most significant workforce shortage is that of nurses, with the projected shortfall estimated to be approximately 31,000 nurses by 2062 (Holland, Allen & Cooper 2012). These may be conservative estimates however, as calculations often do not take into consideration the hours worked and as many nurses work part-time hours (Health Workforce Australia 2012, 2013) a greater number of nurses is needed to staff a service.

One of the most significant factors which is projected to increase workforce shortages is the fact that nurses, like other healthcare workers, are ageing (Graham & Duffield 2010; Holland, Allen & Cooper 2012; Oulton 2006; Schofield et al. 2006). In 2010, 20% of nurses and midwives were aged 55 years and over (AIHW 2013b) while 2013 figures indicated that almost 40% of employed nurses are aged 50 or more years (AIHW 2014d). This means that within 15 years, over 50% of the nursing workforce may be contemplating retirement or will have retired from the workforce (Australian Nursing and Midwifery Federation 2014; Graham et al. 2014). The loss of such a large percentage of experienced nurses to retirement will have severe implications for the nursing workforce in a system that is already facing nursing shortages.

Some have argued that despite increases in the number of nursing students (ABS 2013; Health Workforce Australia 2013) the number of new recruits may not compensate for the predicted number of retirees (Buerhaus et al. 2013; Duckett 2000). Attrition and the duration of time taken for nursing students to complete their education compounds the gap between the supply of graduate nurses entering the profession, the projected number of nursing retirees and the projected need for nurses (Duckett 2000; Gaynor et al. 2007-2008; Health Workforce Australia 2012). For the older nurse remaining in the healthcare system, the physical nature of nursing work can have a negative impact on age-related health issues that can lead to a loss of productivity, increased work demands and reductions in working hours (Letvak, Ruhm & Gupta 2013; Stichler 2013). The health status of the nurse can also influence the decision to leave the nursing workforce (Duffield et al. 2015a).

Another factor contributing to nursing workforce shortages is that the majority (89.6%) of nurses are female (AIHW 2014d). Females are more likely to take career breaks for child rearing, are more likely to work part-time or on a casual basis in order to balance family commitments (ABS 2006, 2009a) and retire earlier from the workforce compared to males (Australian Government Productivity Commission 2005; Australian Medical Workforce Advisory Commitee (AMWAC) 2000). For example, almost 40% of nurses (and/or midwives) work on a part-time basis (AIHW 2013d) or an average 34.3 hours per week (AIHW 2014d) and an increasing number are thought to be working on a casual basis (Batch, Barnard & Windsor 2009; Batch & Windsor 2015; Creegan, Duffield & Forrester 2003). In Australia, 21-25% of employees work on a casual basis (ABS 2009a, 2009b) with around 20% being employed in the 'Health Care and Social Assistance' industry (The Australia Institute & Richardson 2012). The percentage of nurses who work on a casual basis may well be greater if it is considered that hospitals employ casual and agency nursing staff to make up for the shortfall in the number of nurses relative to the demand for services (Hurst & Smith 2011); that nurses undertake casual work to gain experience particularly when studying (Becker, McCutcheon & Hegney 2010; FitzGerald, McMillan & Maguire 2007; Tailby 2005); and because casual employment allows for greater flexibility with working hours and family or personal commitments (ABS 2009a; Becker, McCutcheon & Hegney 2010; FitzGerald, McMillan & Maguire 2007; Lumley, Stanton & Bartram 2004; Tailby 2005). Furthermore, an emerging trend is for hospitals to employ casual staff on a pseudo-permanent basis and/or for less hours as an economic and human resource strategy (Baumann, Hunsberger & Crea-Arsenio 2013; Becker, McCutcheon & Hegney 2010; Simpson, Barkby & Lockhart 2010). As a consequence, of the large percentage of nurses working less than full-time hours, more nurses overall are needed to fill positions in a service (Shacklock & Brunetto 2012).

A further disadvantage of having a high casual and agency nursing labour force is that it increases the workload and responsibility of permanent staff on the ward. Casual nursing staff may be unfamiliar with ward routines (Creegan, Duffield & Forrester 2003; Tailby 2005), their scope of practice can be limited by hospital policies (Batch & Windsor 2015; Manias et al. 2003; Peerson et al. 2002), and/or their level of expertise and qualifications (Massey, Esain & Wallis 2009) and for some individuals, opportunities for continuing education are limited (Batch & Windsor 2015; Manias et al. 2003; Peerson et al. 2002). Moreover, knowledge and productivity are lost from the ward environment when experienced nurses change from permanent employment to casual work (Redpath, Hurst & Devine 2008). Such practices increase the workload of ward nursing staff who will need to care for additional patients until the time that the casual nurse arrives on the ward.

1.2.1 Bed Management Strategies

In response to the increasing demand for hospital services amidst a declining bed-base, hospitals have instigated a variety of bed management strategies in an attempt to increase patient flow or the progression of patients through the hospital system (Blay, Duffield & Gallagher 2012; McD Taylor, Bennett & Cameron 2004). Most of these strategies are designed to fast-track patients through the hospital system and free-up inpatient beds. However, these strategies have potentially increased the movement of patients from one unit to another. As a consequence, patients are remaining in one clinical area for shorter periods of time and there is less time available for nurses to coordinate and attend to patients' care needs (Duffield et al. 2009a; Duffield et al. 2007). This has implications for nursing workload and patient safety (Aiken et al. 2012; Twigg, Duffield & Evans 2013). More importantly, nurses are attending to a greater number of patients being admitted, transferred and discharged from each unit on a daily basis. Such high patient throughput has been shown to have an impact on nurse workload (Cheung 2013; Cho et al. 2014; Duffield et al. 2009b; Hughes et al. 2015; Jennings, Sandelowski & Higgins 2013; Unruh & Fottler 2006), which in turn, has been shown to link to an increased likelihood of nurses resigning from their workplace or the profession (Duvall & Andrews 2010; Hewko et al. 2014; Tourangeau et al. 2010). However, as the number of patients transferring between and within wards from one bedspace to another (bedspace move) has not been definitively realised, the time spent by the nurse attending to the transferring patient is not known (Baernholdt, Cox & Scully 2010; Blay et al. 2014b; Hughes et al. 2015; Simon et al. 2011). It is timely to undertake research to determine the impact of increased patient movements between and within wards on nurses' workload.

In summary, the healthcare system in Australia is facing an unprecedented demand for services due to population aging and increased rates of chronic disease. Successive Commonwealth and State Governments have reduced hospital bed numbers, adding to the strain on hospital services and leading to policies and processes being introduced to promote patient flow. These changes have increased the movement of patients between clinical units and have led to patients spending shorter periods of time in each area, leaving less time available for nurses to attend to patients' needs (Duffield et al. 2009a; Duffield et al. 2007).

Relative to the increasing demand for healthcare services, Australia has a severe shortage of nurses that is predicted to worsen. Population ageing, a high nursing turnover and the desire to work fewer hours are a few of the factors that have contributed to nursing workforce shortages. These factors coupled with high hospital occupancies and an increased patient turnover has negatively impacted on the workload of nurses remaining in the healthcare system.

Management strategies designed to increase patient flow have likely increased the number of transfers between and within wards (bedspace move). However, the rate of patient transfers and bedspace moves and the time spent by nurses attending to activities associated with patient transfers and bedspace moves has not been comprehensively researched (Blay et al. 2014b; Hughes et al. 2015). This research study aims to determine the rate of patient transfers and bedspace moves in an inpatient population in a hospital in the State of NSW and nurses' time in attending to patient transfers and bedspace moves.

1.3 Terminologies and Definitions used in this Thesis

In this thesis the term 'episode of care' has been used interchangeably with the term hospital admission to refer to all inpatient episodes. In Australia, an episode of care is defined as a 'period of healthcare with a defined start and end' (Department of Health and Ageing 2009) and can include periods of outpatient healthcare. For the purposes of this thesis, an episode of care refers to inpatient hospital episodes only.

The term readmission has been used to refer to repeat episodes of care for the same individual during the study period. This definition was selected as a national standard definition for a readmission does not exist in Australia (AIHW 2009) and the NSW definition of an 'unplanned admission within 28 days of separation' (NSW Department of Health 2012a) was not considered appropriate.

As a general rule in Australia, the term 'ward' is used to denote a division or floor within a hospital for patients who need similar care (Collins World English Dictionary 2009). The term 'unit' is generally given to smaller or more specialised areas e.g. Intensive care unit, short-stay unit while larger specialised areas are referred to as departments e.g. Emergency Department (ED). The terms ward, unit and clinical unit have been used interchangeably in this thesis.

The terms patient transfer and bedspace move have been used throughout this study. A patient transfer has been defined as any transfer or movement between clinical units, wards or departments during an episode of care. Temporary transfers, whereby the patient is transferred to another department for the provision of a service (Webster et al. 2011) such as to the radiology department before returning to the same bed in the same clinical unit, were not considered to be a patient transfer for the purposes of this research. Bedspace moves were defined as a patient move from one bedspace to another within the same clinical unit or ward. A comprehensive list of definitions used in this thesis is shown in Table 1.

Table 1: Definitions used in this thesis

Term	Definition
Episode of care	Inpatient episode of care ending at separation.
Separation	Completion of an episode of care by discharge, transfer to another

	facility, or death.
Subacute	Level of care that is not acute. Includes rehabilitation and aged care.
Typeset	Financial code referring to care level e.g. acute or subacute.
Ward	A designated area used to accommodate and treat patients.
Unit	Small, specialised area used to segregate and treat patients e.g. Emergency Medical Unit.
Department	Large specialised area used to treat patients e.g. Emergency Department.
Clinical unit	Any clinical area accommodating patients.
Patient transfer	Inpatient transfer from one clinical unit, ward or department to another.
Bedspace move	Patient move from one bedspace to another within the same ward or clinical unit.

1.4 Study Purpose

The purpose of this research study is to determine the rate of patient transfers and bedspace moves in the overnight inpatient population in a metropolitan hospital in Sydney, NSW and nurses' time used in attending to patient transfers and bedspace moves.

1.5 Research Questions

1. What is the rate of patient transfers and bedspace moves in adult inpatients hospitalised for greater than 48 hours?

2. Which clinical units have the highest rates of transfers and bedspace moves?

3. How much time is spent by nurses working on activities associated with patient transfers and bedspace moves and what effect does this time have on nurses' workload?

4. What is the designation of the nurse(s) involved with moving patients and the role of the nurse(s) in the transfer and bedspace moves process?

5. What is the sequence of activities performed when nurses are transferring a patient?

Chapter 2. Patient Flow

There is little doubt that hospitals are busier now than in the past. As described in Chapter 1, the decline in the number of available hospital beds combined with an increased demand for hospital services associated with an ageing population, and increased levels of chronic disease have contributed to high hospital occupancy levels. At the same time, the number of patients being treated on a day-only basis has increased and overnight stay patients are remaining in hospital for shorter periods of time. In response to increased levels of throughput, hospitals have introduced a range of bed management strategies designed to improve patient flow. A consequence of such practices is that they have contributed to increased ‘patient churn’ (Duffield et al. 2009a) or the ‘the inflow and outflow of patient admissions, discharges and transfers’ (Hughes et al. 2015, p. 1) at unit level. The implications of bed management strategies for nursing workload are discussed in this Chapter.

2.1 Strategies to Improve Patient Flow

2.1.1 Short-stay Units

A common strategy designed to increase patient flow is to establish a short-stay area such as a medical assessment unit or mental health unit, to assess and fast track patients through the hospital system (McNeill et al. 2011). The aim is to segregate, treat and discharge selected patients within 48-72 hours (Brand et al. 2010; Downing, Scott & Kelly 2008; Eijsvoogel et al. 2014; Ong et al. 2012; Yong et al. 2011).

When used appropriately, short-stay units avoid the need to transfer patients to other wards in the hospital (Downing, Scott & Kelly 2008; Eijsvoogel et al. 2014) because these units are designed to have a complement of medical and ancillary staff within the one area (Ong et al. 2012). The disadvantage of short-stay units is that unless patients are comprehensively assessed and selected for admission to the unit (Basic & Khoo 2009; Downing, Scott & Kelly 2008), vacant short-stay beds may be viewed as 'general bed stock' (Brand et al. 2010 p.335) limiting any intended effect on bed capacity (Russell, Hakendorf & Thompson 2014). The end result is that patients who are expected to remain in hospital for a longer period can be admitted to a short-stay unit, and will later need to be transferred to a general ward (Allen 2014a; Corbally, Macri & Hawkshaw 2014; Hartley et al. 2010). Such practices increase the number of transfers experienced by the individual patient (Blay, Duffield & Gallagher 2012) and the workload of the nurses who are faced with the additional tasks associated with transferring the patient from the unit to the ward.

2.1.2 The Transit Lounge

In line with the short-stay unit is the transit lounge, a holding area for patients being admitted or discharged from hospital. This is another resource implemented to segregate patients, increase throughput and free up hospital beds (Cameron, Joseph & McCarthy 2009; Cameron & Campbell 2003). The transit lounge can act as an admission-holding area (Gilligan et al. 2009; Ruffin & Hooper 2003; Wardell & Lovell 2013), a short-stay unit for patients recovering from minor surgery (McD Taylor, Bennett & Cameron 2004), an area for pre-discharge patients (Chetter 2009), or a place where discharged patients can wait collection from family members (Hernandez, John & Mitchell 2014; Morris, Winfield & Young 2012; National Audit Office 2000; Scott et al. 2011). Transferring patients to a transit lounge adds another move for patients and increases the workload of nursing staff (Blay, Duffield & Gallagher 2012). Nurses may need to prepare the patient for the transfer and/or discharge and if the patient needs to be escorted to the transit lounge by a nurse, the nurses remaining on the ward will be required to care for additional patients until the escort nurse returns.

To expedite the transfer of patients from the ED to a ward bed, hospital policies often require patients to be transferred to the transit lounge by mid-morning (SESIAHS 2009). In addition to preparing the patient for transfer and/or discharge, the nurse will need to ensure that the bed has been cleaned in order to receive a new patient (National Audit Office 2000). The pressure to transfer and receive patients in this way may explain why the transit lounge is unpopular with nursing staff, patients and families (Hernandez, John & Mitchell 2014; Maumill et al. 2013; Morris, Winfield & Young 2012; National Audit Office 2000) and why they are poorly utilised (Chetter 2009; Hernandez, John & Mitchell 2014; Morris, Winfield & Young 2012; National Audit Office 2000). At other times, new or transferring patients may need to wait in a chair until a bed becomes available (Fyfe 2013).

2.1.3 National Emergency Access Target

The pressure to transfer patients to the transit lounge or admit patients to any available bed could, in part, be attributed to the National Emergency Access Target (NEAT). The NEAT also known as the 'Four Hour Rule' (Council of Australian Governments 2011; Schuh 2012) follows on from the 4-Hour Target introduced in the United Kingdom (U.K.) in 2004 (Mason et al. 2009; Mortimore & Cooper 2007) and Western Australia's pilot Four Hour Rule Program in 2009 (Hughes 2010; Stokes 2011; Vezyridis & Timmons 2014). Introduced by the Commonwealth Government in 2012 as a strategy to promote Emergency Department flow and increase patient safety (Council of Australia Governments Reform Council 2013; Emergency Care Institute NSW & Agency for Clinical Innovation 2014; NSW

Department of Health 2012b), the NEAT restricts the time that patients are permitted to remain in the ED to four hours. Within four hours of presentation to an ED in a public hospital, it is expected that the majority of patients will have been admitted and transferred to a ward, discharged or transferred to another facility (NSW Department of Health 2012b).

The 4-Hour Target has had a positive effect on patient flow in the ED, as demonstrated by reductions in the number of patients 'boarding' or waiting in ED corridors (Mortimore & Cooper 2007; Weber et al. 2011) and reductions in ED waiting times (Mason et al. 2009). However, a reported negative effect of the 4-hour target is that patients are being transferred to wards which are inappropriate for their clinical condition (Lipley & Parish 2008; Perera et al. 2015). Hospitals are often forced to admit patients into any available bed within the hospital to achieve the target time, or transfer a patient residing in a ward to another area to make way for an ED patient waiting admission. Later, when a more appropriate bed becomes available the outlier patient (a patient whose clinical condition does not relate to that particular unit) will be transferred to a new clinical location (Goulding et al. 2012; National Audit Office 2000; Thompson et al. 2009).

In this way, patients may be transferred to ward(s) for a short period(s) of time (Hendrich & Lee 2005; Smith 1976) which can result in patients experiencing up to eight moves during their hospital stay (Boutilier 2007). At other times, patients may need to be moved from one bed to another on the same ward (bedspace move) to enable a new or transferring patient to be closer to the nurses' station, or to ensure that patients of the same gender are accommodated together in one multi-bedded room. The increased demand for beds means that patient transfers and bedspace moves have increased substantially. In some clinical units the increased movement and patient throughput can contribute to increased ward complexity and a more diverse casemix (Duffield et al. 2009b; Duffield et al. 2015b).

The reduction in the time allowed for patients to remain in the ED has increased the pressure on ED nurses with a resulting increase in their workload (Lipley & Parish 2008; Mason et al. 2009; Mortimore & Cooper 2007; Weber et al. 2011). What has not been recognised in the published literature, is the potential increase in the workload of nurses working in the wards because of the escalating number of internal transfers and a push for inpatient discharges in an attempt to vacate beds.

2.1.4 'Winter' Beds

Commonly used during periods of high demand, hospitals often 'open' additional beds to new admissions on a temporary basis. Referred to as winter beds as it usually occurs in the winter when high rates of admissions occur (Department of Health Victoria 2010; Worth 2015), this temporary measure can increase bed capacity by up to 20% (Department of Health Victoria 2010; Garfield et al. 2001; Iemma & NSW Health 2004; Silvester et al. 2014; Skinner & NSW Government 2012). Nurse staffing levels are calculated on existing bed numbers and occupied bed-days[3] (Government of Western Australia n.d.; NSW Nurses and Midwives Association 2014a) which means that additional staff may be needed to care for patients. Hospitals attempt to address the staffing shortfall by employing nurses on a

[3] Bed-days are the number of days occupied by admitted patients as counted at midnight (NSW Health 2011).

temporary (fixed term), casual or agency contractual basis (Massey, Esain & Wallis 2009; May, Bazzoli & Gerland 2006). However, the less popular nursing shifts and wards can be difficult to fill with casual and/or agency staff (FitzGerald, McMillan & Maguire 2007; Tailby 2005). Some wards will therefore remain short-staffed, with the result that the nurses may need to care for additional patients, again increasing their workload (Schilling et al. 2010).

2.1.5 Other Patient Flow Strategies

One consequence of bed shortages and high occupancy rates is 'hot-bedding' (Bodden 2009) a derivative of the naval term 'hot-bunking' referring to the sharing of bunks in submarines (Health and Safety Executive 2008; Kelly & Radio National 2004). In the hospital context hot-bedding refers to the frequent turnover of patients per bedspace per day. Admitting or transferring patients into available beds within a short period of the previous patient being transferred or discharged gives rise to '... the appearance of double occupancy' (Wheeler & Grice 2000 p30) and is a mechanism used by hospitals to augment patient flow when faced with bed shortages and increased health service demand. It could also be argued that the NEAT as discussed in Section 2.1.3, along with bed shortages, has increased the need for the rapid turnover of patients in each bed. A consequence of such practices is that on some wards, patient turnover can be as much as 50% of the patients in one day (Beglinger 2006; Cookson & McGovern 2014). For nurses, this means having to transfer or discharge one patient and receive another into the same bed within a short period of time.

Critical care units are associated with high costs and longer length of stay (Armony, Chan & Zhu 2014). To promote efficient use of the healthcare dollar patients are frequently transferred to a lower dependency area as soon as is clinically appropriate, often within 24 hours (Garland & Connors 2013). A strategy designed to free-up critical care beds is to transfer critical and coronary care patients to step-down units as an intermediate stage prior to transferring the patient to the ward environment (Armony, Chan & Zhu 2014; Edmonds & Kelly 1997; Tulloch et al. 2007). This strategy has been described as a ‘conveyor belt approach’ to medical and nursing care (Kwan 2011, p. 73). The resultant high turnover of patients to acute care areas adds another transfer process for the patient (Blay, Duffield & Gallagher 2012; Gallant & Lanning 2001), can increase readmissions to critical care units (Baker et al. 2009), increase patient acuity (Graf et al. 2003) and increase the workload of nurses on the ward (James, Quirke & McBride-Henry 2013; Needleman et al. 2011).

Less frequently discussed as strategies to free-up hospital beds are patient transfers from the acute care sector to the continuing care sector, for example rehabilitation and aged care. As noted in Chapter 1, the significant increase in older patients, those with chronic disease and shorter lengths of stay have all impacted on the need for rehabilitation services (Cowper et al. 2006; Graham & Cameron 2008; Landry et al. 2008; Pryor 2010; Wilson et al. 2007). Transfers between the acute and continuing care sectors are on the rise (Bakes 2014; Cowper et al. 2006) as evidenced by a 6% per annum increase in the number of rehabilitation separations from public hospitals from 2007-2008 to 20011-20012 (AIHW 2013c). However, it is also argued that the pressure for acute beds has led to an inappropriate use of rehabilitation beds with patients being transferred to one much sooner than would have been expected following major surgery (Bakes 2014; Poulos et al. 2011). In effect the rehabilitation specialty is being transformed into a secondary recovery phase that can have a negative impact on continuing care nurses’ workload (Bakes 2014).

However one strategy that has reduced the number of patient transfers and decreased nursing workload is the acuity-adaptable room. Also referred to as a flexi-unit or universal room, the acuity-adaptable room is designed to accommodate patients in the one location from the acute through to the subacute stages of their hospital stay (Besserman et al. 1999; Bonuel & Cesario 2013a; Gallant & Lanning 2001; Hendrich, Fay & Sorrells 2004). The use of acuity-adaptable rooms eliminates the need to transfer critical care patients to the ward as the patient remains in the one location throughout all care levels. Not only do these rooms substantially reduce the number of patient transfers (Bonuel & Cesario 2013a; Hendrich, Fay & Sorrells 2004; Winter, Tjiong & Houston 2011), but they also have a positive effect on patient flow by reducing length of stay (Bonuel & Cesario 2013a; Emaminia et al. 2012; Winter, Tjiong & Houston 2011). Above all, the stream-lined model of care used for nursing patients in this system (Hendrich, Fay & Sorrells 2004) reduced nursing workload, had a positive effect on patient and nurse satisfaction and subsequently improved nurse retention (Bonuel & Cesario 2013a; Bonuel, Degracia & Cesario 2013; Clark, Roberts & Traylor 2004; Winter, Tjiong & Houston 2011).

The Admission, Discharge, Transfer (ADT) nurse role is designed to promote patient flow by having a dedicated nurse (or team of nurses) to facilitate patient admissions, discharges and transfers (Giangiulio et al. 2008; Joyce et al. 2005; Kirkbride et al. 2012; Lane et al. 2009; Norton-Westwood, Robertson-Malt & Anderson 2010; Siehoff, Gancarz & Wise 2009). Conceptualised by Joyce and colleagues (2005) in Ohio, the ADT nurse role was introduced in 2003 for a trial period, following the recognition that patient admissions were time intensive and interrupted nursing workflow (Joyce et al. 2005). The ADT nurse role was found to have a positive influence on patient flow by reducing Emergency Department ‘re-routes’ or diversions (Joyce et al. 2005) and has improved nurse and patient satisfaction (Joyce et al. 2005; Siehoff, Gancarz & Wise 2009; Spiva & Johnson 2012). Furthermore, the role positively affected clinical nurses' workload and enabled more time to be spent with patients (Giangiulio et al. 2008; Lane et al. 2009).

In summary, the strategies that have been implemented to accommodate patients in a hospital bed and enhance patient flow include the introduction of short-stay and other units, the NEAT and the ADT nurse to name a few. Some of these strategies implemented by hospitals in an attempt to accommodate patients needing hospital admission, have resulted in unintentional consequences for patients including the likelihood of being transferred far more frequently during their hospitalisation. The resultant increase in patient turnover has implications on nursing workload. The following sections will explore patient transfers in greater detail.

2.2 Patient Transfers

Patient transfers and bedspace moves are explored in the following sections in terms of current definitions, incidence and patterns. The literature is also examined to determine the impact of patient transfers and bedspace moves on staff time.

2.2.1 Definitions of Patient Transfers

Definitions of patient transfers are limited (Victorian Quality Council 2009), but in broad terms transfers can be external or internal to the hospital system. This means that patients can be transferred between hospitals and/or facilities (inter-hospital) or between wards and departments within hospitals (intra-hospital). No formal published definitions have been found for intra-hospital transfers or for transfers within a ward as occurs when a patient is moved from one bedspace to another.

Possibly because of this lack of definition, multiple terms are in use. In Australia, nurses tend to use the three terms - admission, transfer and discharge. To avoid confusion, in this thesis, transfers between wards, units and other departments have been referred to as intra-hospital or patient transfers, and transfers within the same clinical area have been defined as a bedspace move (refer to Table 1).

2.2.2 Incidence of Patient Transfers

As noted earlier, intra-hospital transfers are increasing in frequency within Australia and elsewhere. Decades ago 6% of patients were transferred during a single episode of care (Smith 1976), but by the turn of the century the intra-hospital transfer rate had risen to 15% (Eveillard et al. 2001). Later in the U.S., 69% of elderly patients were found to have been nursed in two or more units during an average length of stay of ten days (Kanak et al. 2008), meaning that patients were not remaining in one ward for very long. However, the need to transfer patients is not isolated to individual hospitals. In, the U.K., between 9% and 88% of patients across 42 hospital trusts were transferred each month. Around 15% of these transfers had no clinical basis (West 2010b, 2010c) and likely stemmed from the need to transfer patients from the ED into a vacant bed as a result of the Four Hour Rule (Lipley & Parish 2008). Analyses of secondary data during the course of an infectious outbreak in The Netherlands found that the average number of patient transfers rose from 0.37 to 0.70 per patient over a ten year period (Leverstein-van Hall et al. 2006). In Australia, the average number of wards per episode of care increased from 2.10 to 2.26 wards over a five year period for acute overnight stay patients with an average length of stay of 6.5 days (Duffield et al. 2007). Patients who remain in hospital for a longer period are likely to have more complex care needs and hence the impact of transferring such a patient on nursing time cannot be under-estimated.

These studies have indicated that the increasing trend to transfer patients during their hospital stay is not only an Australian phenomenon. If decreases in length of stay are also considered, the time a patient spends in one clinical area is shortened. This is particularly concerning as the minimal duration spent within each area limits comprehensive nursing assessment and the provision of safe care, increasing pressure on nursing time.

2.2.3 Patterns of Patient Transfers

Transfers tend to follow the pattern of admissions and discharges reflecting the pattern of bed availability. Hospital discharges are fewer on Mondays and on the weekends, but from thereon discharges increase throughout the working week rising to a peak on Fridays (Ou et al. 2009; Rae, Busby & Millard 2007; Varnava et al. 2002). The higher discharge rate on a Friday means that more beds are available for admissions that day and, as a consequence, patients admitted to hospital on this day are less likely to be transferred to a ward unrelated to their specialty. Conversely, patients admitted to hospital on Mondays and during the weekends have the highest number of transfers because of limited bed availability (Blay, Donoghue & Mitten-Lewis 2002). The patterns of admissions, transfers and discharges are important in terms of nurse workload and staffing levels. Fewer nursing staff may be rostered on the weekends (Kc & Terwiesch 2009; Schilling et al. 2010; Van den Heede et al. 2008) as weekends are frequently quieter in terms of nursing workload (Debergh et al. 2012). If the workload associated with patient transfers is taken into account, this may no longer be the case.

In the 1990s, the majority of transfers took place between 0800 to 2000 hours (McGinty & Ghiz 1993). However, recent studies have shown that the rate of patient transfers after-hours has increased. Between 30-50% of intensive care unit (ICU) patients and 36% of ward patients were admitted or transferred during the evening shift (Baernholdt, Cox & Scully 2010; Dawson & Runk 2000) and up to 10% of ICU and ward patients were relocated during the night (Baernholdt, Cox & Scully 2010; Jennings, Sandelowski & Higgins 2013). The high percentage of transfers after-hours is a concern as fewer staff may be rostered to work at this time. Receiving and nursing a patient, particularly those transferred from the ICU, decreases the time available to attend to other patients, particularly when fewer human resources are available (Elliott et al. 2011; Haggstrom, Asplund & Kristiansen 2009; Häggström, Asplund & Kristiansen 2012; Lin et al. 2013; Whittaker & Ball 2000).

The common practice of physician rounds commencing in ICU, followed by the step-down units and lastly the wards, is considered to be a contributory factor to the rise in after-hour transfers (Dawson & Runk 2000). Beds need to be vacated on the ward in order for patients to be transferred from the critical care areas. Any delays with discharging patients will likely result in patients being transferred from the critical care and step-down areas to be later in the day (Lin et al. 2013).

2.3 Bedspace Moves

Movements of patients may also occur within a ward or unit, defined as a bedspace move in this thesis, or the transfer of a patient from one bedspace to another within the same clinical area. These moves may be conducted in response to changes in an individual's clinical condition or to accommodate new or other patients in the ward. For example, some patients are relocated within the ward either closer to (or further from) the nurse's station as a result of greater or lesser need for nurse observation. Bedspace moves to single rooms from shared wards are frequently performed to maintain segregation from other inpatients in response to an individual's infectious status, mental state or clinical needs. Bedspace moves can also be undertaken due to specific technological or space requirements. Telemetry or continuous piped oxygen maybe restricted to specific beds in some areas, while space limitations may on occasion, make it essential for the patient to move beds in order to accommodate certain medical apparatus.

2.3.1 Incidence of Bedspace Moves

The rate of bedspace moves within the hospital sector has not previously been explored in the published literature and therefore the incidence is unknown. In a small study the number of neonatal bedspace (crib) moves experienced by six neonates in the neonatal unit were examined as part of an investigation into an infection outbreak (McGrath et al. 2011). Over the three month study period, the six neonates experienced 24 bedspace moves, with one individual neonate experiencing six bedspace moves. Because the seriousness of the infectious outbreak was not initially recognised, the infants were moved in response to space and nursing staff limitations (McGrath et al. 2011). The study highlights that the principles behind bedspace moves are similar on neonatal units to adult wards even though neonatal units maybe structurally different.

2.3.2 Mixed Gender Patient Rooms

In response to bed shortages, many NSW hospitals introduced mixed-gender patient rooms where patients of either gender can be simultaneously accommodated and nursed in the same room. For example, if the only available bed is in a four bedded room with three males, then a female may be admitted to that bed.

The mixed-gender room policy has been criticised by many because of a loss of patient dignity and privacy, and insensitivity towards some religious beliefs (Baillie 2008, 2009; Bryant & Adams 2009; Royal Society of Medicine 2009). An Australian report examining acute hospital services in NSW strongly condemned the practice (Garling 2008, Recommendation 124). This condemnation led to a policy directive stating that all overnight stay patients would be placed in a gender-specific room within 24 hours of admission by 2011 (NSW Health 2010). A similar directive in the U.K. has met with limited success. In that country hospitals have been financially penalised for continued mixed-gender ward practices (BBC News 2011) as they have struggled to cope with the policy amongst increased patient admissions and limited bed resources (Baillie 2009; Bryant & Adams 2009; Hurst 2008). The consequence of these policies is that nurses are likely to be moving patients between bedspaces or even wards on a more frequent basis in order to accommodate patients in a room with others of the same gender. Such moves will increase the workload of nursing staff with further interruption to workflow.

Following the 'Same Gender Accommodation' policy directive (NSW Health 2010), extra funding was allocated in recognition of the impact of the policy on the number of patient movements and ancillary staff workload. This funding was to be used to employ additional ward-persons (also known as an orderly) and clerical staff to assist with service re-organisation and patient transportation associated with gender-specific rooms (NSW Health 2010). The potential impact on nursing workload was not recognised and extra funding was not provided for additional nurses. While data related to the incidence of patient moves associated with gender-specific rooms in Australia and elsewhere are scant, it is likely that nurses will find they are responsible for coordinating and moving patients to another ward or gender-appropriate bedspace, often after-hours.

2.4 The Impact of Patient Transfers and Bedspace Moves on Staff Time

The transfer process has been described as unsatisfactory and inefficient (Dammand et al. 2014; Field, Prinjha & Rowan 2008; Häggström, Asplund & Kristiansen 2014; Hendrich & Lee 2005) which can negatively impact on staff time and can lead to the transfer being delayed (Hanne, Melo & Nickel 2009; Kibler & Lee 2011; Silich et al. 2012; Williams & Leslie 2004; Williams et al. 2010), adding to the pressure on hospital beds. Whilst the published literature frequently refers to transfer delays, the meaning and definition of this term has not been well documented when referring to intra-hospital transfers and, as a consequence, the period constituting a delay is somewhat subjective. This is evidenced by different expectations between hospitals and researchers of how long a transfer should take. Some hospital policies expect transfers to take place within 15-60 minutes from the time that a bed was assigned (Glasson et al. 2011; Jennings, Sandelowski & Higgins 2013; Priesmeyer & Murray 2012; University of Kentucky & UK HealthCare 2008) while other hospitals include the time required to find and allocate a bed (Derby Hospitals NHS Foundation Trust 2011). Depending on the clinical areas involved and the point at which timing commenced, transfers can be considered to be delayed from 20 minutes to eight or more hours (Cowie & Corcoran 2012; Johnson et al. 2013; O'Callaghan et al. 2012; Silich et al. 2012; Williams & Leslie 2004; Williams et al. 2010; Wood, Coster & Norman 2014). The time of arrival or departure from the ward can have consequences for nurse staffing and workload. A late arrival may coincide with a period of reduced staffing (e.g. after-hours) and other critical patient care activities, lessening the time available for nurses to attend to the transferred patient's care needs (Allen 2014b; Lin et al. 2013).

Inevitably, admission to high dependency areas involves an increase in the use of technology and diagnostic procedures. Beglinger (2006) found in her study of medical and surgical intensive care units, that multiple transfers to the medical imaging department for diagnostic tests occurred each day. The average number of transfers to medical imaging, diagnostic and ancillary departments for patients is not currently known. Considering that one Australian study found transfers to radiology from general wards averaged 80 per day for a 440 bedded hospital (Ong & Coiera 2011), it can be assumed that the rate of patient transfers to other departments is also not insignificant.

As early as 1987, research determined that patient transfers took approximately 45 minutes (Deines & Stevens 1987). Nurses today can anticipate that the transfer process may take anything up to 12 hours (Kibler & Lee 2011; Williams & Leslie 2004; Williams et al. 2010) with transfers from ICU taking an average of seven or more hours from the time of bed request to patient transfer (Chaudhury, Mahmood & Valente 2005; Kibler & Lee 2011). Not all of this time is nursing time. Using a time and motion (TM) technique Hendrich and Lee (2005) determined that preparing for a patient transfer took an average of 22 minutes and post transfer activities took a further 31 minutes. Actual transfer (movement) of the patient took between 7-10 minutes. However, it is not clear from their study whether these times were limited to ward level patients, and reflected the time spent on the transfer process by nurses and/or other healthcare professionals.

More recently, an ethnographical study used observational data, participant interviews and inpatient records to examine the factors that contribute to 'turbulence' or disruption(s) to nurses' work (Jennings, Sandelowski & Higgins 2013). The researchers spent nine months in one medical and one surgical unit observing nursing care processes, including 48 'patient turnover events' such as admissions, transfers and discharges. Seven (53.9%) nurses were observed attending to newly admitted or transferred patients during this time. Attending to a patient from the Emergency Department took nurses from 9 minutes to almost three hours (n=7), attending to a patient from the Post Anaesthetic Care Unit (PACU) from 6 to 25 minutes (n=12), and 13-49 minutes for patients transferred from other units (n=7). The time spent by nurses attending to transferred patients depended not only on the individual patient's clinical status, but also, the type of nursing tasks which had been performed (or left undone) prior to transfer (Jennings, Sandelowski & Higgins 2013). A limitation of previous studies is that non-nursing health professionals have been included (Hendrich & Lee 2005) and a second is that few transfers have been observed (Jennings, Sandelowski & Higgins 2013). As the evidence points to a rising incidence of patient transfers, further research into the time that nurses spend attending to patient transfers is necessary.

It is quite likely that moving a patient between bedspaces will impact upon nursing workload but no published literature has been found. Aside from the physical relocation of the bed, medical equipment and personal belongings, the patient's family will also require notification of the change. While patients may be remaining in the same clinical unit, for the purposes of patient safety and continuity of care, reorganisation of patient services is essential, adding to nurse workload. For example, to ensure the patient receives the diet appropriate for their clinical condition, the dietetics department will need to be notified. Other notifications could include pharmacy and allied health professionals. Depending on the ward or unit layout, some bedspaces can be more suited for higher or lower acuity patients. To ensure that any new patient admissions are appropriate for the bedspace, the coordinating bed management centre needs to be informed. The implications of bedspace moves on nursing workload has not yet been fully realised (Blay et al. 2014b).

2.4.1 Summary

In summary, patients may be transferred between departments, wards and bedspaces for clinical and non-clinical reasons. The factors contributing to patients being transferred include the use of step-down areas, gender specific rooms and shortened lengths of hospital stays. Clinical units introduced by hospitals to aid patient flow are not always used as originally intended and can be seen as a potential area to accommodate additional patients. Hospital bed shortages have led to a bed management practice whereby patients are admitted to a vacant bed on a ward and transferred to a more appropriate location at a later time. The need to move other patients to more appropriate areas then arises.

Increasing numbers of planned and unplanned transfers and bedspace moves potentially impact negatively on staff workload. Recognition is increasingly being given to the nurses' role in patient transfers by manner of inclusion in workload studies, but the impact of bedspace moves on workload has not been addressed. The next chapter will examine nursing workload measurements systems and published nursing workload research to discuss more fully how patient transfers have affected nursing workload.

Chapter 3. Literature Review

The impact of moving patients and patient turnover on nursing workload is important because nurses are in short supply and as discussed in Section 1.2, an increased workload is a contributory factor in nursing turnover. Patient transfers are a contributory factor to patient turnover which impacts nursing workload (Duffield et al. 2011; Duffield et al. 2009b; Myny et al. 2012; Unruh & Fottler 2006), but to date the impact of patient transfers on nursing workload has received little attention (Blay, Duffield & Gallagher 2012). Early indications are that up to 88% of patients are transferred at some point during their hospitalisation (Kanak et al. 2007; Leverstein-van Hall et al. 2006; West 2010c). Considering that the rate of bedspace moves (moving a patient from one bedspace to another) has not previously been measured, the impact of moving patients on nursing workload has not yet been accurately determined (Blay et al. 2014b; Hughes et al. 2015). Attending to a transferring patient is an integral part of nursing work but does interrupt nursing workflow (Lane et al. 2009) and can limit the time available for other patient care activities. With a potentially high number of patients moving between and within clinical units the impact on nurses' time could be considerable.

Some nursing workload measures have attempted to take into account the impact of patient turnover on nursing workload and staffing needs. However, many of these measures rely on the midnight census which counts the number of patients in any one clinical unit at that time and therefore cannot include more than one transfer per patient within the day (Baernholdt, Cox & Scully 2010; Beswick, Hill & Anderson 2010; Hughes et al. 2015; Simon et al. 2011). Patients who are transferred into and out of a ward during the one day or relocated within the ward (bedspace move) may not be captured in these metrics (Blay, Duffield & Gallagher 2012; Hughes et al. 2015). For example, the practice of hot-bedding as discussed in the previous Chapter, has led to an average of 1.25 patients rotating through each hospital bed on a daily basis (Duffield et al. 2007). The rate of transfers and bedspace moves in the inpatient population can therefore only be estimated, meaning that the impact of moving a patient on nursing workload and staffing needs remains largely unknown (Blay et al. 2014b; Blay, Duffield & Gallagher 2012). However, there is general agreement that the high turnover of patients in an era of nursing workforce shortages has added to nurses' existing workload pressures (Duffield et al. 2011; Duffield et al. 2009b; Unruh & Fottler 2006).

Researchers have recognised this gap in nursing knowledge and have begun to incorporate patient transfers into nursing workload measures (Hughes et al. 2015; Twigg & Duffield 2009). However, because the precise time spent by nurses attending to patient transfers has not been determined, the accuracy of such metrics cannot be assured (Hughes et al. 2015). Moreover, none have included bedspace moves as a factor of patient turnover on nurses' workload. Considering that the healthcare system is facing nursing staff shortages relative to service demand and that nursing workload is frequently cited as a reason for nursing staff turnover (Duvall & Andrews 2010; Tourangeau et al. 2010) the impact of patient transfers and bedspace moves on nursing workload must be considered.

3.1 Nursing Workload

The concept of measuring nursing workload is not new and there are many workload measurement systems available (Beswick, Hill & Anderson 2010; Duffield, Roche & Merrick 2006; Hurst 2010; Park et al. 2015). In Australia, the State/Territory parliamentary Acts that govern nursing workforce employment conditions vary across the country (Gerdtz & Nelson 2007). As a consequence, various nursing workload management systems are in place in hospitals throughout Australia (Duffield, Roche & Merrick 2006). These are described below.

The majority (n=5) of State/Territory nursing industrial bodies responsible for the public sector have endorsed the Nursing Hours Per Patient Day (NHPPD) model (Australian Nursing Federation & Director General of Health 2005; Department of the Premier and Cabinet & Public Sector Workforce Relations 2013; Minister Administering the State Service Act, Australian Nursing Federation Tasmanian Branch & Health Services Union Tasmania No 1 Branch 2013; Northern Territory Government ; NSW Department of Health 2011). Defined by the Californian Department of Public Health (2011) as the '..actual nursing hours performed by direct caregivers per patient day' excluding non-productive time such as that spent on breaks and leave (Spetz et al. 2008). The available or rostered nursing hours are then divided by the number of patients or the number of occupied beds in a set period (Duffield, Roche & Merrick 2006; NSW Department of Health 2011). Once NHPPD have been determined for a patient population or ward type (often through industrial arbitration) this can be converted to the number of nursing staff required.

A major criticism of the NHPPD (and of many other nursing workload measurement systems) is their reliance on historical patient and administrative data (Duffield, Roche & Merrick 2006) meaning that the many factors that influence nursing workload on a daily basis, such as changing patient acuity, nursing skill mix and patient turnover are not considered (Buchan 2005; Duffield, Roche & Merrick 2006; Gabbay & Michael 2009; Twigg & Duffield 2009). In order to address some of these issues, a modified form of NHPPD was developed for use in Western Australia (WA) (Twigg & Duffield 2009). This model has subsequently been adopted by the Northern Territory and Tasmania (Minister Administering the State Service Act, Australian Nursing Federation Tasmanian Branch & Health Services Union Tasmania No 1 Branch 2013; Northern Territory Government 2014). One of the definitive features of the WA model is that wards are categorised into seven different groupings based on specific characteristics, including patient complexity, the presence of high dependency beds and patient turnover. Six of the seven ward groupings contain a descriptor for patient turnover (low <35%, medium >35%, or high >50%) based on the percentage of admissions, transfers and discharges per bed. National benchmarking data used to inform the NHPPD component were assigned to each ward grouping (Twigg & Duffield 2009; Twigg et al. 2011).

The WA model is the first to attempt to include patient transfers in a nursing workload measurement system. However, as the model utilises historical data, most likely the midnight census (that records the number of patients present in a ward at midnight), and because hospital information systems are only able to record transfers to specific locations (Stevenson et al. 2011), it is likely that some patient transfers are not captured. Bedspace moves are not factored into the model. Furthermore, as the nursing time required to transfer patients between and within wards is not definitively known (Blay et al. 2014b), and is likely to vary depending on the transfer location(s), the nursing time allowed for this activity can at best be described as an estimate. As a result, the true reflection of patient turnover and specifically patient transfers and bedspace moves on nurses' workload, has not been realised (Blay, Duffield & Gallagher 2012; Hughes et al. 2015).

The second nursing workload measure used within Australia is nurse to patient ratios. Nurse ratios are a way to measure nursing hours and ensure safe workloads by mandating the minimum number of patients to be cared for by a nurse (NSW Nurses and Midwives Association 2014c). Victoria was the first Australian State to enact nurse ratios (ANMF 2014; Gerdtz & Nelson 2007). A decade later in 2011, the New South Wales Department of Health implemented NHPPD which are then translated to minimum nurse ratios (NSW Department of Health 2011; NSW Nurses and Midwives Association 2014c). Meanwhile, nursing unions in Queensland are actively pursuing the concept of nurse ratios, again using the NHPPD (Berry 2014) with legislation currently being enacted.

Subtle differences exist between the NSW and Victorian models. The Victorian model requires that public hospitals in metropolitan areas of Victoria roster one nurse to every four patients (or occupied beds) on day shifts and one nurse to eight patients on the night shift in medical-surgical wards (ANMF 2014). A degree of flexibility is permitted on the day shift to allow for patient acuity. Nursing Unit Managers (NUMs) are able to vary the number of patients allocated to each nurse as long as the ratio of 5 nurses to 20 patients is maintained at unit level (Gerdtz & Nelson 2007). The NSW model is based on calculations of NHPPD over a one week period, multiplied by the average number of patients per bed at midnight. The model allows the NUM to distribute staffing over the nursing shifts, as long as the NHPPD are maintained over the week (NSW Nurses and Midwives Association 2014c).

Minimum nurse to patient ratios have received strong support from the nursing community (NSW Nurses and Midwives Association 2014b) and have been credited for improving nurse recruitment in Victoria and elsewhere (Buchan 2005; Gerdtz &

Nelson 2007; Spetz et al. 2008). The system does however, have its drawbacks. A major criticism of nurse ratios is that patient acuity, nursing skill mix and patient turnover are not taken into account in the calculations (Buchan 2005; Hurst 2010; Lang et al. 2004; Unruh & Fottler 2006) which can lead to the projected number of nurses being underestimated (Unruh & Fottler 2006). Considering the increased demand for health services and increased patient throughput, it is quite possible that this is the case in NSW.

It could also be argued that basing nurse to patient ratios on bed numbers does not consider other venues where patients may be found, such as in a chair on the ward, ward corridors and treatment rooms where they reside until a bed becomes available (Allen 2014a; Lim et al. 2015). Calculating NHPPD on occupied beds could mean that these over-census patients are not considered, that insufficient staff are provided and nurses are caring for a greater number of patients than the ratios determine. Furthermore, as discussed previously, nursing workload associated with the high turnover of patients (admissions, transfers, discharges) is not taken into account. Considering that patient turnover in some wards and/or units can be up to 65% of patients per day (Baernholdt, Cox & Scully 2010; Cookson & McGovern 2014; Jennings, Sandelowski & Higgins 2013), a substantial amount of nursing time in this activity is not being captured.

3.1.1 Nursing Workload and Patient Turnover

Transferring a patient forms a routine component of nursing (Griffiths 2011; Sadler-Moore 2009), clerical (Derby Hospitals NHS Foundation Trust 2011; Portsmouth Hospitals NHS Trust 2012; SESLHD 2013) and ancillary staff roles (Derby Hospitals NHS Foundation Trust 2011; Jensen et al. 2012; Odegaard et al. 2007a;

Portsmouth Hospitals NHS Trust 2012; WA Health n.d.). However, the frequency that patients are transferred will affect staff workload. As indicated earlier, the amount of time nurses spend on this activity is unknown and so the impact on their workload cannot be determined. Baernholdt, Cox and Scully (2010) examined 405,000 episodes of care from one hospital over 14 years, to calculate the ratio of time nurses spent on admissions, discharges and transfers (ADT) in 13 medical-surgical units and three intensive care units (ICUs). The authors compared data from the midnight census and the Unit Activity Index (UAI) which reflects the percentage of patients on the ward plus admissions, discharges and transfers (ADT). Results indicated that the midnight census under represented the number of patients, and as a consequence, nursing workload associated with ADT in each unit. The UAI ranged from 30% to 59% across medical-surgical wards and 35% to 60% across ICUs. Results determined that more nurse time was spent attending to admissions, transfers and discharges on high-turnover units, than to patients already in the unit (Baernholdt, Cox & Scully 2010) although as patient turnover (ADT) were considered as one entity, the percentage of time given to transferring a patient into or out of the unit could not be determined.

Myny et al. (2012) have also found that patient turnover can impact on nurses' workload. A survey of 864 nurses working in 70 Belgian hospitals demonstrated that second to a high number of work interruptions, high patient turnover had a major influence on nursing workload (Myny et al. 2012). This is interesting as the arrival of patients can be a source of work interruptions (Jennings, Sandelowski & Higgins 2013). Perhaps nurses distinguish interruptions from those that can be anticipated such as the (expected) arrival or departure of a patient, from interruptions that are not anticipated. The former possibly allows for greater planning of workflow.

It is also interesting to note that the influential Institute of Medicine (1999) in their landmark report “To err is human”, recognised the impact of patient turnover (which includes patient transfers) on workload and human error. One of their many recommendations was that staffing levels allow for ‘variations in patient volume’ and that units should be closed to admissions and transfers as determined by staffing levels and workload (*cited in* Page 2004, p. 254). Considering the pressure for beds described in the earlier chapters, it is unlikely that units are closed during periods of high demand. Indeed, the nursing of patients in alternative wards and/or rooms designed for other purposes is an all too frequent scenario (McMurdo & Witham 2013; West 2010a). This practice is so common that nurses have described the frequent admission, discharge and transfer of patients as a ‘revolving door’ (Giangiulio et al. 2008, p. 62) and critical care nurses have expressed concern that patients are sometimes transferred to the ward early as a result of bed limitations (Haggstrom, Asplund & Kristiansen 2009).

3.2 Nursing Workload Studies and Patient Transfers

Patient transfers have been included as a nursing activity in many nursing workload studies conducted in Australia (Abbey, Chaboyer & Mitchell 2012; Ampt et al. 2007; Chaboyer et al. 2008; Duffield & Wise 2003; Gardner et al. 2010a; Webster et al. 2011; Westbrook et al. 2011); the United States of America (Capuano et al. 2004; Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Cornell et al. 2011; Douglas et al. 2013; Hendrich et al. 2008; Hendrich & Lee 2005; Hoffman et al. 2003; Storfjell et al. 2009; Storfjell, Omoike & Ohlson 2008; Wong et al. 2003); Canada (Ballermann et al. 2011); the United Kingdom (Farquharson et al. 2013; Harrison & Nixon 2002; Williams, Harris & Turner-Stokes 2009); in rural and metropolitan regions, and in organisations with diverse populations and casemix (Blay et al. 2014b). The vast majority (n= 20, 87%) of these studies used direct observational techniques such as time and motion and work sampling, to record and sometimes time activities performed during the course of a shift, working day or 24 hour period to inform the ways in which nurses' spend their working time.

Despite such an extensive body of research, the impact of transferring a patient on nurses' time remains largely speculative. As with the studies examining workload and patient turnover, nursing activities associated with patient transfers are often grouped with admissions and/or discharges meaning that the impact of transferring a patient on nursing workload cannot be differentiated. For example in several studies examining nursing workflow and the cost of nurses' time, transfers were variously included as admission-transfer (Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010); admission, transfer, discharge (Storfjell et al. 2009); and discharge and transfer (Cornell et al. 2011). Perhaps in these instances further distinction was unnecessary. However it could be argued that admissions, transfers and discharges should be examined independently as nursing activities may well differ between each process.

In many studies the number of observed transfers were few or not reported (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Douglas et al. 2013; Wong et al. 2003; Yen et al. 2009), or the scope of nursing activities associated with the transfer process was limited as patient transfers were not the focus of the workload studies, but one activity amongst many, that nurses (and other healthcare workers) at times perform. Transporting a patient was the most frequently included nursing activity associated with patient transfers (Abbey, Chaboyer & Mitchell 2012; Capuano et al. 2004; Chaboyer et al. 2008; Douglas et al. 2013; Duffield et al. 2005; Duffield & Wise 2003; Hendrich et al. 2008; Yen et al. 2009), but as the transfer process can be complex (Abraham & Reddy 2013) it is likely that the nurse is also involved with other transfer related tasks. Therefore the full extent of the amount of time it takes to transfer a patient and the impact on nursing workload has not been determined.

In light of the multiple research methodologies, terminologies and definitions used to describe transfer activities, comparisons between nurse workload studies are difficult (Blay et al. 2014a, 2014b). Despite these differences, study results provide some indication of the role that patient transfers have on nursing workload and are therefore discussed more fully in the following sections.

3.2.1 Patient Transfers and Nursing Work

Transfers form a component of nursing work for most nursing roles working in various clinical specialities. The work sampling technique was used to examine the workload and roles of Nurse Practitioners (NPs) (Gardner et al. 2010a) and clinical nurses (Capuano et al. 2004; Chaboyer et al. 2008; Duffield & Wise 2003; Harrison & Nixon 2002; Westbrook et al. 2011; Williams, Harris & Turner-Stokes 2009) working across multiple specialties in rural and/or metropolitan areas. The time and motion and related timing techniques were utilised to examine the work of critical care (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Wong et al. 2003); medical-surgical (Cornell, Riordan & Herrin-Griffith 2010; Storfjell et al. 2009; Storfjell, Omoike & Ohlson 2008; Webster et al. 2011); maternity, oncology (Webster et al. 2011); and paediatric (Cornell et al. 2011) nurses.

Work sampling conducted by Gardner et al. in 2008-2009, found that some Australian NPs initiated patient transfers and/or discharges as part of their daily work (Gardner et al. 2010a). At that time, NPs spent 36% of their time on direct care, defined as activities spent in the presence of a patient, family member or caregiver (Gardner et al. 2010b) and a small proportion (1.3%) of direct care time was spent initiating transfers and/or discharges. Abraham and Reddy's (2008; 2010, 2013) research helped to identify that communication between the nurse, bed management and the receiving department is an essential component of the nurses' role and the pre-transfer process. As the researchers utilised a qualitative-observational design the time required for these arrangements was not determined.

Several authors specified the destination criteria for transfers to be included in workload studies. For instance, Harrison and Nixon (2002) included transfers to wards, the operating theatre, for scans and to other hospitals. Hendrich and colleagues specified transfers 'between departments' (Hendrich et al. 2008, p. 27) and 'between nursing units' (Hendrich & Lee 2005, p. 158) but did not define these further. Finally Ong and Coiera (2010) examined transfers to radiology from the ward environment, demonstrating that nurses working in diverse environments will almost certainly need to attend to the transferring patient at some point in their working day. The transfer destination was not specified in the majority of studies, possibly because the authors did not consider the destination relevant. However, it could be argued that transfer associated tasks and the impact on nursing workload, could vary according to the transfer destination. For example, moving patients from one bedspace to another (bedspace move) and temporary transfers for diagnostics or procedural purposes may not require the same level of service re-organisation as would a permanent transfer to another location.

Finally, as patient transfers are a multidisciplinary process (Hendrich & Lee 2005; National Audit Office 2000) and much coordination and service reorganisation is necessary to maintain continuity of care between transferring departments, some researchers focussed on healthcare professionals working across many specialties and departments with whom the nurse interacted (Abraham & Reddy 2010; Hendrich & Lee 2005; Odegaard et al. 2007a; Ong & Coiera 2010). These studies emphasise the complexity of the transfer process (Kibler & Lee 2011) and serve to highlight the fact that nurses' interaction(s) with the multidisciplinary team is essential for the smooth and timely transfer of the patient (Abraham & Reddy 2008; Abraham & Reddy 2010).

Thus far, this Chapter has demonstrated that increasingly nursing researchers have recognised that transferring a patient within the hospital environment forms a component of nursing work and potentially a substantial amount of nurses' time. As the rate of patient transfers increases, so does the overall time spent by nurses attending to the transferring patient.

Considered equivalent to an admission (Joyce et al. 2005), the nurse may spend less than 30 minutes attending to patients whose nursing needs are limited, to several hours attending to patients with complex needs (Chaudhury, Mahmood & Valente 2005; Jennings, Sandelowski & Higgins 2013; Joyce et al. 2005). During this time the nurse may not be available to attend to other patients' needs. In order to determine the impact of transferring a patient on nursing workload, activities included in nursing workload studies that could be considered to form a component of the transfer or bedspace move process are discussed in more detail in the following sections.

3.2.2 Transfer Activities and Nurse Workload

The majority of authors included a component of the transfer process in their workload studies. For example, initiating and coordinating transfers, staffing and/or beds (Abraham & Reddy 2010; Gardner et al. 2010a; Harrison & Nixon 2002; Westbrook et al. 2011); gathering or reviewing information and documentation (Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Cornell et al. 2011); escorting and transporting (moving) patients (Abbey, Chaboyer & Mitchell 2012; Capuano et al. 2004; Chaboyer et al. 2008; Douglas et al. 2013; Duffield & Wise 2003; Harrison & Nixon 2002; Hendrich et al. 2008; Neatherlin & Prater 2003; Williams, Harris & Turner-Stokes 2009; Wong et al. 2003); preparing the bed or bedspace for a transferred patient (Harrison & Nixon 2002; Webster et al. 2011); orienting the patient to the unit (Cornell et al. 2010; Hendrich & Lee 2005); and transfer handover (Storfjell, Omoike & Ohlson 2008). In some instances the time spent on an activity has been reported. For these activities, the time taken by nurses will be explored further to provide insight into the time spent by nurses attending to patient transfers.

Indication of the time spent coordinating a transfer can be gained from Harrison and Nixon's (2002) early study of intensive care nurses. At that time, 6-7% of nurses' time was spent on 'time-out patient focussed' activities, described as those related to direct patient care that are not necessarily 'hands-on', and included the activity 'arranging a transfer'. There were different workloads according to time of shift. Nurses working in the afternoon shift attended to more time-out patient focussed activities (9%) compared to nurses working morning (6%) and night shifts (4%). However as arranging a transfer was one of seven activities included in the time-out category, the precise time spent by intensive care nurses coordinating a transfer is not known.

A similar activity was included in a longitudinal study by Westbrook et al. (2011). To determine how nurses organised their time, and whether work patterns changed over time, the Work Observation Method by Activity Timing (WOMBAT) was employed to observe 57 medical-surgical nurses working in an Australian hospital. The WOMBAT method is based on the principles of time and motion but also shares features with work sampling by categorising observed tasks into 10 pre-determined categories. One of the categories used by Westbrook and colleagues (2011) was the ward related 'coordinating beds and staffing'. Nurses spent an average of 144 seconds coordinating beds and staffing in year one, and 80 seconds in year three. However the frequency that nurses performed the task virtually doubled from 72 in year 1, to143 two years later, with the result that nurses spent more time on this activity overall. At the beginning of the study 2.6% of nurses' time was spent on ward related activities increasing to 3.9% two years later. The results certainly demonstrate that nurses are spending a greater proportion of their time coordinating beds and staffing, but to what extent this time related to patient turnover is unknown.

Transporting or escorting patients is one activity that regularly features in studies examining nursing roles and functions or nursing workload (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Capuano et al. 2004; Chaboyer et al. 2008; Duffield & Wise 2003; Harrison & Nixon 2002; Hendrich et al. 2008; Hendrich & Lee 2005; Hurst 2008; Neatherlin & Prater 2003; Shimizu et al. 2011; Wong et al. 2003; Yen et al. 2009). Possibly because of the large number of publications, little consistency can be seen between study methodologies and terminologies making comparisons between studies difficult. The act of transferring a patient was variously labelled as transfer or transport (Hendrich & Lee 2005; Shimizu et al. 2011; Wong et al. 2003); transferring (Harrison & Nixon 2002); transporting (Abbey, Chaboyer & Mitchell 2012; Capuano et al. 2004; Chaboyer et al. 2008; Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Duffield & Wise 2003; Hendrich et al. 2008; Hoffman et al. 2003; O'Neill et al. 2011; Yen et al. 2009); moving (Hurst 2008); or escorting a patient (Ballermann et al. 2011; Williams, Harris & Turner-Stokes 2009). Notwithstanding differences between terminologies, study locations and settings, results demonstrated that healthcare workers' spent less than 3% of their time transporting or escorting a patient (Chaboyer et al. 2008; Duffield & Wise 2003; Williams, Harris & Turner-Stokes 2009).

However, the majority of these studies utilised the work sampling technique, whereby the proportion or percentage of time attributed to an activity is based on the frequency that the activity was observed to be performed (Chaboyer et al. 2008; Urden & Roode 1997). If the number of observed nurse escorts was few compared to other nursing activities, the proportion of time calculated to have been spent on this task may not be accurately reflected (Blay et al. 2014a). Therefore the duration of time spent by nurses away from the ward environment escorting patients is not realised.

Studies that employed a time and motion or similar timing technique reported the duration of time taken by nurses to transfer (escort) a patient (Abbey, Chaboyer & Mitchell 2012; Cornell, Riordan & Herrin-Griffith 2010; Hendrich & Lee 2005; Webster et al. 2011). Escorting a patient from one clinical department to another took 4-19 minutes with critical care patients taking longer than medical-surgical patients

(Blay et al. 2014b). For the nurse physically accompanying the transferring patient, he or she is taken away from the clinical environment and other patients under the nurse's care. This leaves the rest of the ward staff to care for additional patients for a period of time, increasing their workload and responsibility (Selph 2014). In turn, the nurse escorting the patient may find on their return, that they need to 'catch-up' some activities that were unable to be performed or were delayed during their absence` (Pope 2003). Possibly because of the time spent away from the ward and the subsequent impact on workload, nurses did not perceive escorting patients between departments to be an important part of their role. Up to 70% of registered nurses working in hospitals across Egypt, Europe and the U.K. believed that accompanying or transporting a patient between departments were unimportant tasks that could be delegated to others (Bruyneel et al. 2013; Gabr & Mohamed 2012). Nurses in Australia may have a similar opinion.

Nursing handover associated with patient transfers and bedspace moves is essential for continuity of care. It is therefore somewhat surprising that transfer handover was found to be a non-value added (or non-productive) activity (Storfjell et al. 2009; Storfjell, Omoike & Ohlson 2008). A multiple methods study focussing on value and non-value added nursing time identified that almost one third of the RNs time was spent coordinating care, including shift and transfer handovers. Much of this time (47%) was considered to be non-value adding. Depending on shift length, between 12-20% (1-1.5 hours) of nurse time was spent on shift handover. Although time spent on transfer handovers was not differentiated from handovers that occurred at other times, Storfjell et al. (2008) advise that non-value added nursing time could be lessened if the number of transfers and other activities, such as general discussion during handover, were reduced. These comments confirm the need to determine the frequency with which patients are transferred to provide greater insight into the time spent by nurses on transfer handover.

Communication with patients and family is an important aspect of the transfer process. Several studies mentioned the need to orientate the patient and family members to the ward (Cornell et al. 2010; Hendrich & Lee 2005); to communicate with patients and/or families (Webster et al. 2011); and with other health professionals (Cornell, Riordan & Herrin-Griffith 2010; Webster et al. 2011). The time spent orientating the patient or communicating with family members ranged from less than one minute to five minutes (Cornell, Riordan & Herrin-Griffith 2010; Hendrich & Lee 2005; Webster et al. 2011). Communications with other nurses and health professionals were also short-lasting taking less than four minutes on average (Cornell, Riordan & Herrin-Griffith 2010; Webster et al. 2011). It must be recognised that with the exception of Hendrich and Lee’s (2005) study, some of these conversations may have been associated with admissions or discharges rather than with patient transfers.

Since early work sampling studies found that nurses spent a substantial proportion of their time on indirect care activities including documentation (Chaboyer et al. 2008; Duffield & Wise 2003), interest has grown in the time spent on this important nursing activity. Recent studies support the earlier works and have indicated that between 7-21% of nurses’ time is spent on documentation (Farquharson et al. 2013; Furaker 2009; Westbrook et al. 2011; White et al. 2015) some of which may have related to a transferring patient. Transfer documentation takes many forms including transfer checklists to accurately reflect patient care (Harrison & Nixon 2002; Hindmarsh & Lees 2012; Nakayama et al. 2012; Wang, Hailey & Yu 2011), the time of arrival and the mode of transport (Campos 2009; Monarch 2007; Pennsylvania Patient Safety Authority 2005). Moreover, many hospitals now require nurses to indicate whether the transfer is a result of clinical or non-clinical reasons (see Section 2.2.2) (Derby Hospitals NHS Foundation Trust 2011; East Cheshire NHS Trust 2012).

Despite the importance and extent of documentation associated with the transfer process, the impact on nurse workload has not been well studied. At best it is known that bedside charting following the transfer of a patient averaged 13 minutes (Hendrich & Lee 2005) but as a multidisciplinary study, some of the time accorded to charting may have been performed by other clinicians. Nursing documentation associated with the bed that is temporarily unoccupied, such as occurs when a patient is transferred to a department for the provision of a service (Webster et al. 2011), were infrequent and short-lived. Webster et al.'s (2011) time and motion study identified 517 instances when beds were temporarily unoccupied during which time nurses were observed to be documenting 47 (9%) times, taking an average of 2.6 minutes. The reason for the documentation (pre-admission, temporary transfer or post-discharge) was not indicated. This calls for further exploration as medical records and associated documentation generally accompany the transferring patient (Ong & Coiera 2010). The time spent by the nurse on documentation was therefore more likely to be associated with a pending admission or following a patient discharge.

Only two published articles examined the transfer process in full, from the time that a transfer need was determined to the patient being settled in the new location (Hendrich & Lee 2005; Ong & Coiera 2010). The aims and methods of these two studies were substantially different. Hendrich and Lee (2005) sought to document and time the transfer process in order to calculate labour and personnel costs, and identify any inefficient processes associated with transferring a patient. A pilot observation of 21 random transfers helped to identify the steps (process) involved in transferring a patient. As a result a 21 item data collection tool called the Hendrich Transfer Log was developed in Microsoft Access to record and store observational data. Research assistants observed over 200 randomly selected transfers over a five month period, encompassing 'various' shifts and days of the week (Hendrich & Lee 2005, p. 159). Although timing methods were not described, start and finish times were entered into the Transfer Log for some of the identified transfer steps. These times allowed the researchers to calculate the duration of the transfer process, identify inefficiencies and calculate labour costs. Results demonstrated that overall pre-transfer preparation took an average of 22 minutes, a further 7–10 minutes for the actual transfer and post-transfer activities took 31 minutes. Nurses' time in the transfer process was calculated to average 27 minutes (Hendrich & Lee 2005). However as this study also included personnel such as the respiratory therapist, it is unclear whether some of the timed activities such as the taking of the patient's vital signs and/or bedside charting were undertaken by other clinicians. Further research is warranted to clarify the time taken by the nurse when transferring patients.

As indicated previously, Webster et al. (2011) examined nurse workload associated with the unoccupied bed. In a time and motion study, two research nurses observed and timed any activity associated with the unoccupied bed in four wards. For practical reasons, a representative sample of 277 transfers, 138 discharges and 102 admissions associated with the unoccupied bed were observed over nine weeks between the hours of 0700 and 1900hrs. Activities associated with the unoccupied bed were identified by informal discussion with nursing and clerical staff in the respective medical, surgical, oncology and maternity wards (Collins et al. 2010). Results showed that temporary transfers to an unoccupied bed were associated with an average of 1.5 nursing activities taking on average 8.7 minutes. As would be expected, clinical nurses, both registered and Enrolled Nurses (ENs) (equivalent to a Licensed Practical Nurse in the U.S.) spent more time (8.3 minutes) managing the bed in preparation for a transferred patient than did the NUM or shift coordinator (4.4 minutes). Surprisingly, clinical nurses spent less time managing the unoccupied bed in readiness for an admission (5.7 minutes) than a temporary transfer (Webster et al. 2011). The reasons for these differences are not understood. However, as the study focussed on temporary transfers following the provision of a healthcare service whereby the patient returns to the same bed, further research is warranted to determine the impact on transfers from other wards on nurses' time.

3.2.3 Summary

Patient turnover has been shown to impact upon nurses' time. Recognition has been given to the need to include patient transfers in nursing workload measures but differences in study designs, research locations, nurse designations and nursing activities has meant that comparisons between studies are limited. A major feature of many of these studies is that transfers were included with patient admissions and/or discharges meaning that the time spent transferring a patient could not be determined.

The majority of the nursing workload studies that have included patient transfers as a component of nursing work have utilised the work sampling technique and as a consequence, the precise time to transfer a patient or the time taken to perform a transfer activity is not realised. A few studies have utilised the time and motion and other timing techniques to examine the transfer process. However in many cases, few transfers were observed or the results from timing transfer related activities were not reported (Blay et al. 2014b).

Nursing workload studies that have included patient transfers as a nursing activity, have for the most part, focussed on a specific aspect of the transfer process, primarily the transportation of the patient. Considering that relocating the patient forms only one part of the transfer process, further research is needed to determine how much time is spent by the nurse on the entire transfer process. Nursing workload associated with bedspace moves is yet to be examined. This research project aims to address these gaps in nursing knowledge by observing and timing nurses when moving patients within or between clinical units.

Chapter 4. Observational Research Study Methods

As has been discussed in the previous chapters, patient transfers are a frequent occurrence in the hospital setting. The time taken by nurses to transfer a patient is not definitively known but emerging data suggest that each transfer can take at least 30 minutes of nurses' time (Blay et al. 2014b). In light of a high patient turnover, this could be considered to be workload intensive. In recognition of the potential impact on nursing workload, activities associated with patient transfers are frequently included as a nursing activity in observational research studies especially those that use the work sampling technique as discussed in the previous Chapter. As patient transfers are not the focus of these studies, the full extent of transferring patients on nursing workload remains unknown. The second Stage of this study aims to explore nursing activities associated with patient transfers and bedspace moves using the observational time and motion (TM) research technique. To assess the suitability of the TM technique to collect data on nursing activities related to patient transfers and bedspace moves, the technique will be examined in detail.

4.1 Time and Motion

Time and motion is a well-established observational research method that was selected as the basis for this research study. Time and motion has been used extensively in the healthcare environment, therefore the published literature was comprehensively reviewed to assess and compare the study designs and TM technique. Time and motion is favoured for use in studies that examine workload and workflow (Abbey, Chaboyer & Mitchell 2012; Tang et al. 2007; Tipping et al. 2010b; Yeung et al. 2012), to assess the impact of new technologies on healthcare workload (Hollingworth et al. 2007) and for studies that focus on a healthcare process (Azzopardi et al. 2011; Hendrich & Lee 2005; Webster et al. 2011), specific activity(ies) or tasks (Dwibedi et al. 2011; Elganzouri, Standish & Androwich 2009).

Work sampling, another well respected observational technique used in nursing workload studies, was not considered to be a suitable research method in this instance. This is because sampling (or the recording of observations) is performed at predetermined or fixed time intervals or on a random interval basis (Tipping et al. 2010a; Urden & Roode 1997) and relies on observers recording the principle activity being performed at the time of observation (Duffield & Wise 2003; Pelletier & Duffield 2003). Therefore, some transfer activities may not be observed and/or recorded (Blay et al. 2014b). Furthermore, activities are not timed in work sampling. The time spent on each activity is based on the frequency with which each activity was observed and calculated as a proportion of the total number of observed activities (Finkler et al. 1993; Gardner et al. 2010a; Pelletier & Duffield 2003; Urden & Roode 1997). Work sampling is therefore unable to provide the precise time taken to perform a task (Blay et al. 2014b; Finkler et al. 1993; Keohane et al. 2008; Tucker & Spear 2006; Williams, Harris & Turner-Stokes 2009) and may not be applicable for studies focusing on one dimension of work life, for example patient transfers, or for subjects whose work is repetitive (Blay et al. 2014b; Myny et al. 2010). However, it is a robust method for studies that aim to determine how multiple workers performing a variety of activities, such as nurses, spend their overall time (Chaboyer et al. 2008; Urden & Roode 1997).

4.1.1 Background

Time and Motion (TM) techniques for data collection of work activities and processes were developed by Frank and Lillian Gillbreth around 1914. The Gilbreths combined the principles of Frederick Taylor's classic Time Studies from the 1880's (Helander 1997; Tipping et al. 2010a; Wilson 1935) with their own motion studies developed in 1909 (Price 1989; Zheng, Guo & Hanauer 2011) and this became the basis for TM studies. The major principle of TM is the continuous and independent observation of workers, an activity or process to calculate time spent on various activities or tasks (Burke et al. 2000; Finkler et al. 1993; Hollingworth et al. 2007; Keohane et al. 2008; Lo et al. 2007; Lopetegui et al. 2014; Tipping et al. 2010a; Wirth, Kahn & Perkoff 1977; Zheng, Guo & Hanauer 2011). The continuous nature of TM means that observer(s) follow an individual, activity, task or process from commencement to completion (Doherty-King et al. 2014; Finkler et al. 1993; Keohane et al. 2008; Lo et al. 2007; Qian et al. 2014; Tipping et al. 2010a) recording the activity being performed, the time the activity commenced and the duration of time taken by the subject to perform such an activity (Zheng et al. 2010). Because it is continuous observation, TM is considered to be the 'gold standard' for data collection compared to some other observational methods (Finkler et al. 1993; Hollingworth et al. 2007; Zheng, Guo & Hanauer 2011; Zheng et al. 2010) and depending on research design, is ranked second to randomised controlled trials (Poissant et al. 2005; Silverman 2009).

Time and motion has been used to collect data across many disciplines and for many purposes. It is a technique favoured by sports scientists to measure sports performance (Hill-Haas et al. 2009; King, Jenkinsa & Gabbett 2009), by industrial engineers to improve workplace efficiency (AHRQ 2011) and by Information Technology (IT) and health researchers to appraise the effects of IT systems amongst other measures. Specifically, TM has been used to determine how healthcare workers spend their time (Abbey, Chaboyer & Mitchell 2012; Hendrich et al. 2008; Mallidou et al. 2013; Milosavljevic et al. 2011; Neatherlin & Prater 2003; O'Leary, Liebovitz & Baker 2006; Tipping et al. 2010b; Yen et al. 2009); to provide information on workload and workflow (Elganzouri, Standish & Androwich 2009; Hendrich 2009; Hollingworth et al. 2007; Keohane et al. 2008; Tang et al. 2007; Tipping et al. 2010b); to calculate the cost of workers' time (Hendrich & Lee 2005; Schiller et al. 2008; Webster et al. 2011); to calculate the time taken to perform specific activities, including medication administration and nursing documentation (Cheevakasemsook et al. 2006; Gartemann et al. 2012; Keohane et al. 2008; Schiller et al. 2008; Thomson et al. 2009); and to explore health service processes such as patient waiting times (Azzopardi et al. 2011); work time associated with unoccupied beds (Webster et al. 2011); and patient transfers (Hendrich & Lee 2005).

4.1.2 Time and Motion Technique

The processes involved in TM, entails an independent observer(s) following a subject(s) and continuously recording the duration of time taken to perform various activities carried out by the subject(s). TM techniques vary according to the individual study focus and design, meaning that there are some variations to the classic TM study. When the study aims to determine how workers spend their time over a predetermined period, individual(s) may be timed performing multiple distinct activities over a shift, a day, one week or possibly longer (Mallidou et al. 2013; Milosavljevic et al. 2011; Pizziferri et al. 2005; Tang et al. 2007; Tipping et al. 2010b). When the study focuses on a specific activity, only that activity and associated tasks will be timed. In nursing, researchers have used TM to study the actions or tasks that contribute to medication administration (Elganzouri, Standish & Androwich 2009; Keohane et al. 2008; Thomson et al. 2009) and blood glucose monitoring (Gartemann et al. 2012). As these actions or tasks are timed as individual entities, the duration per task and the overall time per activity are provided.

Sometimes TM is used to time a process or course of action, such as Emergency Department (ED) waiting times (Azzopardi et al. 2011) or patient transfers (Hendrich & Lee 2005; Webster et al. 2011). Timing a process will inform the duration of time taken to complete the process and help highlight any inefficiencies or causes of delays. This is a useful exercise in the hospital setting as many healthcare processes are complex, requiring much coordination between different healthcare professionals and multiple departments. The difference between timing a process compared to a specific activity is that the multiple activities that contribute to the process need to be timed, but the individual tasks that make up each activity may not. To this end, information is gleaned on how long the entire process takes to perform.

Prior to timing, whether it be to explore workload, workflow, a process or a distinct activity, it is crucial that all activities be identified beforehand. Identification of activities enables researchers to develop an appropriate data collection tool and ensures consistency in description of such activities between observers. Following identification of activities, many researchers organise similar activities or tasks into broad categories as is done in work sampling. One reason for categorisation is that it will ease the recording (and timing) of activities by observers (Douglas et al. 2013) as similar activities are grouped together on the data collection tool. Depending on the study design and aim, results may be more meaningful when reported by category instead of by individual activity.

Categorising similar activities into groups is an especially useful process for studies examining workload or workflow (Hendrich et al. 2008; O'Leary, Liebovitz & Baker

2006; Pizziferri et al. 2005; Tipping et al. 2010b) but is not always appropriate for TM studies focussing on one activity or process. The number of activities contributing to a process, are likely to be fewer and less diverse compared to studies examining workflow, whereby all activities performed by subjects during the course of the study need to be identified. In which case, categories such as patient related or unit related as used in work sampling may not be useful. Studies focussing on a process often use categories to describe the stages within the process, such as Pre-Transport, Transport Patient and Post-Transport Events as used by Hendrich and Lee (2005) or the location where the process took part (Azzopardi et al. 2011). The various methods used to identify and categorise activities in TM studies will be discussed more fully in a later section.

4.1.3 Timing a Process

When using TM to time a process such as patient transfers, the technique will differ slightly. In many respects, multiple activities often performed by different individuals, contribute to the process or course of action. Timing of processes will therefore involve timing of such actions rather than timing of individual tasks. This can be demonstrated by a study examining waiting times by adult patients presenting to the ED of Malta's largest hospital (Azzopardi et al. 2011). Using an observational TM approach, data were collected over 24 hours for seven consecutive days. Eleven medical students stationed in various areas of the ED on a rotational basis, observed and recorded patient and staff movements. Observers recorded the time that patients were seen by nurses and other health professionals and the time patients and staff entered and departed pre-determined areas. Included within the timings were the duration taken for medical imaging and electrocardiograms (ECG). Clinical activities such as taking an ECG, were not broken down into component tasks for timing but timed as a complete activity, because the study objective was to find out which processes contributed to ED delays and not how long each individual task or action took. In this way, the timing data helped isolate the areas where delays occurred, the potential contributors to waiting times, and the time of day that these were most likely to happen (Azzopardi et al. 2011).

As described in Section 3.2.2, Hendrich and Lee (2005) used TM to examine the patient transfer process in a large U.S. hospital, in order to calculate the cost of healthcare workers' time and identify inefficiencies with the transfer process. Over the five months of data collection more than 200 patient transfers were observed and 21 previously determined activities were 'tracked' by nurse-observers (Hendrich & Lee 2005, p. 159). Precise details as to how activities were observed and timings were performed were not provided by the authors. However the study does provide some indication of the activities performed by healthcare workers that are necessary for a patient to be transferred.

Observational TM was also used by Webster et al. (2011) to cost nurses' time. The subject of focus in this study was not the healthcare worker, a process or an activity, but an inanimate object – the unoccupied bed. In this study, unoccupied beds were considered to be associated with pre-admission, post-discharge or temporary transfers for the provision of a health service. Previously identified nursing activities (Collins et al. 2010) were recorded on a purposefully designed data collection tool and timed using a stopwatch. Two nurse-observers working independently on different wards recorded 916 activities associated with 517 unoccupied beds (Webster et al. 2011). A limitation of the study is that the point at which the timing of activities was commenced and completed, was not defined. It is therefore not known if a continuous timing method was used, and whether timing commenced from the point when a bed became empty, continuing until a patient was admitted or transferred into the unoccupied bed.

4.1.4 Identifying Activities

Prior to the recording and timing of activities, tasks or processes, the researcher needs to have identified the majority of activities likely to be observed, so that these activities can be included on the data collection tool. Activities can be identified during the pilot phase of the study by either observation (Elganzouri, Standish & Androwich 2009; Hendrich & Lee 2005; Keohane et al. 2008; Pizziferri et al. 2005; Thomson et al. 2009), focus groups, discussions and interviews (Cheevakasemsook et al. 2006; Collins et al. 2010; Qian et al. 2012; Storfjell et al. 2009; Storfjell, Omoike & Ohlson 2008; Thomson et al. 2009) or by the use of standard protocols (Gartemann et al. 2012; Thomson et al. 2009).

Focus groups and discussions involve gathering a small group of workers together to discuss their work (Barbour 2005; Boddy 2005). In this manner, focus groups and discussions are an efficient and less time-consuming method compared to direct observation if a study is to be conducted over several sites. As the observational Stage of the current study examining patient transfers was to be conducted in two wards at one site, focus groups were not considered necessary. Instead of extending an invitation to attend a focus group, senior clinical nurses were asked to validate the list of activities previously identified from the published and grey literature.

An alternative method of determining activities is to use or develop standard protocols (Gartemann et al. 2012; Thomson et al. 2009). Thomson et al. (2009) defined a seven step protocol for medication administration prior to timing medication administration within the residential aged care setting. Developed following discussions with facility staff and direct observation in the clinical setting, the seven steps detailed nurse actions for the timing of medication administration to elderly residents. Following pilot TM testing, further refinements were made to the protocol. In a similar fashion, Gartemann and colleagues (2012) used standardised protocols to identify four workflow domains and subtasks for a study examining the impact of blood glucose monitoring on nursing workload. This method is ideal for studies wishing to determine nursing activities associated with clinical procedures that are performed by individual nurses in a specific order. The transfer process is less structured as it relies on the many individuals situated in many departments (Hendrich & Lee 2005; Kibler & Lee 2011) and as such activities may not be undertaken in a linear fashion. However, pre-existing hospital transfer policies and protocols were found to be valuable resources for the identification of activities for the development of the data collection tool (see Appendix D1 and D2). The final and probably the most renowned method used to identify activities is pilot observation. Pilot observation was the chosen method for this study and will be discussed more fully.

4.1.5 Pilot Observation

The observation of activities during the pilot phase of a study is particularly useful for those studies examining workload and workflow. It can be anticipated that workers will perform a multitude of different activities each day and that some of these activities may not be realised by other means. Pizziferri et al. (2005) used pilot observation with great effect to determine whether activities previously identified in an earlier study (Overhage et al. 2001) were relevant for primary care physicians working in a variety of settings. Pilot observation enabled amendment of the pre-existing data collection tool, by adding some previously unknown tasks and removal of others (Pizziferri et al. 2005).

Pilot observation has also been used to identify activities associated with a process such as medication administration (Elganzouri, Standish & Androwich 2009; Keohane et al. 2008; Thomson et al. 2009); ED waiting times (Azzopardi et al. 2011); and patient transfers (Hendrich & Lee 2005). For instance, Hendrich and Lee (2005) set out to investigate the activities and costs of the patient transfer processes in a large hospital in Missouri, U.S.A. The researchers used pilot observation to identify activities performed by 12 designations of healthcare workers, including porters, ancillary staff, nurses, a secretary and director, all of whom contributed to the coordination or implementation of transfers in some way. During the pilot, 21 random patient transfers were observed and 21 transfer associated activities were identified. These activities formed the basis of a computer database that was subsequently used for data collection (Hendrich & Lee 2005).

Finally, pilot observation has been used to highlight process inefficiencies not previously considered and to validate data collection tools. Two individual studies focussing on medication administration used pilot observation to great effect (Elganzouri, Standish & Androwich 2009; Keohane et al. 2008). Elganzouri, Standish and Androwich (2009) conducted a pilot observation in one of the three hospitals selected for their study. The pilot revealed some inefficient practices (not specified) that had not been considered by the researchers at the planning stage. This led to redevelopment of the data collection tool and some modifications to the method of data collection (not specified). The pilot also confirmed the need to conduct the study in all three sites (Elganzouri, Standish & Androwich 2009) although the reason why this was necessary was not explained. In the second study examining the time spent by nurses on medication administration, Keohane et al. (2008) used pilot observation to test validity of the data collection tool. Nurse Educators drew up a list of tasks associated with medication administration, which were subsequently verified by ten observations on differing clinical units. Notes written by the observers during the pilot observation phase helped develop the final list of tasks (Keohane et al. 2008).

For the current study, pilot observation was used to test the validity of the data collection tool, and served to provide practice with the observation and timing of patient transfers and bedspace moves in the clinical setting. The pilot study is described more fully in Stage 2 Procedure (see Section 5.6.4.).

4.1.6 Categorising Activities

One feature of observational research is the categorisation of identified activities. Organising activities into like categories aids the recording, timing, analysis and reporting of TM data. Categorisation is particularly advantageous for studies with a large number of activities, enabling observers to locate the relevant category and henceforth the activity in a logical fashion on the data collection tool (Douglas et al. 2013) and explains why some researchers recommend that activities are classified into major (Finkler et al. 1993) and/or minor categories which act as headings for like activities or tasks (Pizziferri et al. 2005).

Major categories used in TM are sometimes based on those developed for use in work sampling such as direct (patient) care, indirect (patient) care or unit-related activities (Duffield & Wise 2003; Urden & Roode 1997). More frequently TM researchers have devised categories more fitting for the project aim(s) whereby the category title reflects the overall function of a group of similar activities. Minor categories when used, are variously labelled domains (Gartemann et al. 2012); themes (Zheng et al. 2010); sub-categories (Hendrich et al. 2008; Hoffman et al. 2003; O'Leary, Liebovitz & Baker 2006; Tipping et al. 2010b; Yen et al. 2009); or subtasks (Westbrook et al. 2008). As with major categories, minor categories are generally made up of observed activities, tasks and procedures (Finkler et al. 1993; Gartemann et al. 2012; Hollingworth et al. 2007; O'Leary, Liebovitz & Baker 2006; Pizziferri et al. 2005; Tang et al. 2007; Yen et al. 2009) and can also be used to identify the individual(s) performing the activity (for example healthcare professional, patient) as occurs during consultations and with communication (Finkler et al. 1993; Pizziferri et al. 2005).

However, as there is no universal method of categorising activities for TM (Tipping et al. 2010a) much variation exists between studies. For instance, both Lo et al. (2007) and Pizziferri et al. (2005) used an extensive categorisation system based on earlier work by Overhage et al. (2001) that divided tasks into 75 major and minor categories. Following pilot observation for their TM study examining the work of 16 primary care physicians, Pizziferri et al. (2005) added ten more categories. Major categories identified the medium and main task used by the physicians e.g. Computer-read, Computer-writing, Computer-looking for, Paper-read, Paper-writing etc. while the minor categories provided specificity by identifying the person and task in hand e.g. (*Computer-looking for)* Consultant, Lab result, Forms and so forth (Pizziferri et al. 2005). While this system of categorising activities may appear complicated, it was probably necessary for the primary care setting. If detail related to computer based tasks were not provided, the primary care physician’s role may have appeared to be very limited.

In contrast to the vast quantity of categories used by Overhage et al. (2001), Lo et al. (2007) and Pizziferri et al. (2005), the majority of TM studies organised activities into a more manageable number of major categories with a varying number of sub-categories (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Elganzouri, Standish & Androwich 2009; Finkler et al. 1993; Keohane et al. 2008; Tang et al. 2007; Tipping et al. 2010b; Yen et al. 2009). These ranged from three categories (Direct Patient Care, Indirect Patient Care and Other) with 17 sub-categories as defined by Yen et al. (2009), six main categories (Direct Care, Indirect Care, Professional Development, Travel, Personal and Wait) 32 secondary categories and 53 tertiary categories (Tipping et al. 2010b), to 12 categories with 112 activities (Keohane et al. 2008).

Within nursing, Abbey, Chaboyer and Mitchell (2012) used four categories and 25 minor categories based on work sampling methodology, to describe the work activities of intensive care nurses. Westbrook and colleagues (2008; 2009) used ten mutually exclusive categories and 14 subtasks to describe the workload and tasks of nursing and medical staff working in a large Australian metropolitan hospital. Maintaining the minimal approach to categorisation, Hendrich et al. (2008) used two different sets of categories with less than 12 different headings in a multiple methods study examining work activities, activity location and physiological responses of nurses. The extensive study conducted in 36 medical-surgical units in 17 healthcare organisations consisted of four distinct protocols; Protocol A (TM) , Protocol B (work sampling), Protocol C (timing studies) and Protocol D (physiological response monitoring). Consenting nurses were randomised to either Protocol A or Protocol B, all nurses participated in Protocol C, whereas participation in Protocol D was voluntary. The study was interesting, in that both protocols A and B used nurse self-reporting but a different set of categories were used for Protocol A compared to Protocol B. This was probably because the aims of each protocol differed slightly. The aim of Protocol A was to obtain a baseline of documentation related activities prior to implementation of the Electronic Health Record, whereas Protocol B aimed at finding out how nurses spent their time. For the TM component (Protocol A) the authors had eight categories (Admission paperwork, Assessment, Transcribe orders, Writing care plan, Medications paperwork, Teaching, Discharge paperwork and Other) and no sub-categories, while Protocol B (work sampling) had four broad categories (Waste, Unit-related functions, Nursing practice and Nonclinical) and 12 sub-categories.

At the lower end of the spectrum Hendrich and Lee's (2005) study focussing on patient transfers used three categories (Pre-transport, Transport patient and Post-transport events). Each category contained the various identified activities associated with that stage of the transfer process. For a large study observing 200 transfers, using three category headings to describe the transfer process was very efficient. This method would no doubt have aided observation and the reporting of results. Using a similar method to Hendrich and Lee's (2005), Collins et al. (2010) organised nursing activities according to the three identified reasons for the unoccupied bed. Following discussions with staff they found that recurrent themes emerged, namely Patient expected, Temporary transfer or Patient discharged which became the basis for their study. The major difference between Collins et al.'s (2010).method of categorising activities to more conventional methods, is that activities were not unique to each category. Some activities, for example documentation, were repeated in more than one category.

Some researchers choose not to categorise activities prior to observation. Instead, observed activities can be categorised at the analysis stage. Fieldston et al. (2012) conducted an observational study to evaluate the utilisation of the Paediatric Intensive Care Unit (PICU) bed on patient flow. Although not strictly considered to be a TM study as continuous timing was not used, the researchers used three observers to record the most visible activity or event associated with 24 PICU beds at the time of the hourly observations. Following the five week non-contiguous observation period, the 47 activities identified during the pilot phase of the project were categorised as being either a Critical Care Service or non-Critical Care Service. As the project focussed on bed utilisation, these two categories helped to identify when a PICU bed was not being used appropriately.

As has been discussed, the number of activities in TM studies can be numerous and methods of categorising activities are variable. Once activities have been identified and categorised (if applicable) the data collection tool may need to be refined or possibly developed. Pilot observation at this stage will help validate the tool, categories and activities.

4.1.7 Observers, Training & Inter-rater Reliability

Further to identifying activities, pilot observation has two other functions. It allows for observer training, practice and when multiple observers are used, provides opportunity to verify inter-rater reliability. To observe and time activities, tasks and/or processes accurately, observer(s) must be able to recognise and correctly record performed actions. To this end, observer training and practice is required as it assists observers to become familiar with activities, the TM technique and data collection tools. However, systematic reviews of timing studies found that methods of training and inter-rater reliability measures are often not reported (Blay et al. 2014b; Zheng, Guo & Hanauer 2011) and/or that multiple methods are in use (Blay et al. 2014b). Simultaneous observation is a recommended method that is used for training, practice and to check inter-rater reliability (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Chaboyer et al. 2008; Milosavljevic et al. 2011; Ong & Coiera 2010; Pizziferri et al. 2005; Tipping et al. 2010b; Westbrook et al. 2011; Williams, Harris & Turner-Stokes 2009) whereby an experienced and novice observer, or clinician and non-clinician, simultaneously observe the same worker, activity or process to ensure that both observers time and record activities in the same way. The process may be repeated until consensus or a high degree of reliability is reached, calculated using statistical measures (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Elganzouri, Standish & Androwich 2009; Westbrook et al. 2011).

At this point it is also worth mentioning studies that explore the impact of new technologies on workload. These studies frequently use a pre-test, post-test design, meaning that a period of observation is conducted prior to installation of the new information system and repeated post implementation. Zheng, Guo and Hanauer (2011) identified in a systematic review of 24 TM studies that 62.5% (n=15) of pre and post-test design studies did not identify whether the same observers were involved in both observation periods. This is important as different observers for each observation period could influence results. Therefore tests for inter-rater reliability should be conducted prior to both observation periods.

In light of the multiple methods used in observational studies, calls have been made for a standard method of training and testing for inter-rater reliability. The use of clinician-observers is also recommended, as they are more likely to recognise subtle differences between similar activities (Blay et al. 2014a; Zheng, Guo & Hanauer 2011). This is important for data accuracy particularly when multiple observers are used. However, for this study all observations would be undertaken by the one nurse-observer eliminating the need to test for inter-rater reliability.

4.1.8 Timing Devices

To record observed activities, tasks or processes, a timing data collection tool is necessary. The timing data collection tool in the original and most basic form consists of a stopwatch, camera and data collection sheet (Wilson 1935). Manual timing and recording using a stopwatch and clipboard are still used today (Abbey, Chaboyer & Mitchell 2012; Dwibedi et al. 2011; Gartemann et al. 2012; Webster et al. 2011) although personal digital assistants (PDA) (Ballermann et al. 2011; Hendrich et al. 2008; Hollingworth et al. 2007; Thomson et al. 2009; Westbrook et al. 2008; Westbrook et al. 2011) or laptop/tablet computers (Keohane et al. 2008; Lo et al. 2007; Tang et al. 2007) with timing software are gaining in popularity.

The selection between manual and electronic forms of recording observations is important in view of the frequency of interruptions and multitasking (performing several tasks at the same time) that is characteristic of healthcare work (Biron, Lavoie-Tremblay & Loiselle 2009; Cornell et al. 2011; Munyisia, Yu & Hailey 2011b; Thomson et al. 2009; Tipping et al. 2010b; Tucker & Spear 2006; Westbrook et al. 2008; Westbrook et al. 2010; Westbrook et al. 2011). Although several researchers (Cornell et al. 2011; Keohane et al. 2008) claim that nurses are more likely to switch tasks in rapid succession converse to multi-tasking, the basic premise is that the organisation of nursing work is complex and prone to unanticipated interruptions (Vardaman, Cornell & Clancy 2012) making observation and timing difficult. In light of these difficulties, it is recommended that interrupted tasks are recorded as suspended, resumed and/or completed if a PDA is used, allowing for timings to be summed together to give the duration of time per activity. Some timing software allows for tasks undertaken simultaneously with another (multi-tasking) to be recorded as a separate entity (Ballermann et al. 2011; Westbrook et al. 2010). For manual timing using a stopwatch, two methods were reported in the literature. Abbey and colleagues (2012) used a manual recording system to time observed activities performed by ten intensive care unit (ICU) nurses. Activity starting and completion times were recorded using a 24 hour stopwatch, running continuously. This method allowed activities performed simultaneously with another to be recorded as a separate entity 'within' the time period of the main activity (Abbey, Chaboyer & Mitchell 2012).

Dwibedi et al. (2011) used two calibrated electronic stopwatches to time nurses administering medications. One stopwatch was set to time the entire medication administration process whilst the second stopwatch was set to record the individual tasks that contribute to administering medications to a patient (Dwibedi et al. 2011). The former method of manual recording as described by Abbey and colleagues (2012) was considered suitable for this study.

4.2 Observational Research Study Designs

4.2.1 Study Duration

Convention dictates that researchers report the length of time taken to conduct a study. Observational studies differ from convention in that the study duration is often not indicative of hours of observation, as much variation in study design exists, and as a consequence comparing the length of various studies can be misleading. Some studies are conducted over short periods of time while other studies appear to be much longer in duration. Then again, studies exploring the impact of new technologies on workload and workflow frequently employ a pre-test and post-test design with two or more observation periods. Baseline observations are undertaken prior to the introduction of the new system, with a second period of observation after implementation, which can be several months or even one to two years later (Lo et al. 2007; Munyisia, Yu & Hailey 2011b; Overhage et al. 2001; Pizziferri et al. 2005).

4.2.2 Observation Periods

One way to compare results between studies is to examine the period of observation. Typically timing periods for TM studies range from 7-14 days (Abbey, Chaboyer & Mitchell 2012; Azzopardi et al. 2011; Elganzouri, Standish & Androwich 2009; Gartemann et al. 2012) although data collection periods up to two months (Burke et al. 2000; Dwibedi et al. 2011; Hurst 2005; Tang et al. 2007; Tipping et al. 2010b; Webster et al. 2011) to one year are not that unusual (Hendrich & Lee 2005; Hollingworth et al. 2007; Keohane et al. 2008; Lo et al. 2007; Thomson et al. 2009; Zheng et al. 2010).

The study by Burke et al. (2000) is a good illustration of why observation periods can differ. Exploring aged care nurses' work, results from TM direct observation were compared to self-reporting. The study site was a large aged care facility that contained residential cottages plus an on-site medical unit. Eight nurses working in four different sections of the facility were observed for 40 hours each. The observation period differed according to the section in which the nurse worked and shift rostering. Nurses assigned to certain cottages worked fewer weekends compared to nurses assigned to other cottages and the medical unit. The nurses working few weekends were able to be observed for five consecutive weekdays over two weeks, whilst the remaining nurses needed to be observed on non-consecutive weekdays over a five week period, due to being rostered off-duty during the week. The observational period was then followed up by each nurse completing five days of self-reporting.

The duration of the observation period depends to some extent, on whether an individual or process such as transfers (Hendrich & Lee 2005) is being timed, and whether the study spans multiple sites (Hendrich et al. 2008; Hollingworth et al. 2007; Lo et al. 2007). Studies with these criteria had longer data collection periods of anything from 5 to 12 months, although the actual period of observation would be much less. When Webster et al. (2011) timed nursing activities associated with 517 unoccupied beds this took over 9 weeks, while Hendrich and Lee's (2005) earlier study took five months to track 200 patient transfers. One reason for the longer duration in studies focussing on a process such as patient transfers compared to studies examining workload, is that transfers occur at irregular times. Transfers from the Emergency Department (ED) are based on current bed availability and subject to the rate of ED presentations, which are not a predictable event (Lowthian et al. 2011). Although many transfers such as those to the operating theatre are planned, the precise time of the transfer is frequently unknown being dependent on other factors such as operating room availability and staffing levels (Brown et al. 2013). As a result, many planned transfers occur at short notice (Hanne, Melo & Nickel 2009) making observation of the transfer process protracted and difficult.

To complicate matters further, the pattern of observation varies considerably. Some studies collect data on weekdays (Abbey, Chaboyer & Mitchell 2012; Burke et al. 2000; Gartemann et al. 2012; Tipping et al. 2010b; Westbrook et al. 2011) whilst others encompass weekends (Ballermann et al. 2011; Hendrich et al. 2008; Munyisia, Yu & Hailey 2011b) making comparisons between studies difficult. Observation and timings may be restricted to daytime working hours (Abbey, Chaboyer & Mitchell 2012; Zheng et al. 2010) include the evenings (or part of) (Tipping et al. 2010b; Webster et al. 2011; Westbrook et al. 2011) or be extended to encompass part (or all) of the night shift (Ballermann et al. 2011; Munyisia, Yu & Hailey 2011b; O'Leary, Liebovitz & Baker 2006; Tang et al. 2007; Wong et al. 2003; Yen et al. 2009). These differences between studies lend support to the argument for publication of total observation hours.

4.2.3 Observation Hours

As has been demonstrated above, the period of observation is dependent upon many factors. Examination of the number of hours spent observing allows for comparison between studies. In a systematic review of eleven TM articles that examined physician workload, Tipping et al. (2010a) found that the mean time for observation was 254 hours (range 48-720hrs) as much data can be gleaned in short timeframes (Finkler et al. 1993). Elganzouri, Standish and Androwich (2009) for example, used two data collectors to observe medication administration within three medical-surgical wards in three hospitals. Spending 72 hours per ward, or nine days overall, elicited data from 980 medication administrations.

The majority of TM and other timing studies published the total hours that observations were performed (Abbey, Chaboyer & Mitchell 2012; Ballermann et al.

2011; Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Cornell et al. 2011; Ong & Coiera 2010; Pizziferri et al. 2005; Tipping et al. 2010b; Westbrook et al. 2011; Yen et al. 2009; Zheng et al. 2010). At other times the total hours spent observing was not indicated (Azzopardi et al. 2011; Gartemann et al. 2012; Munyisia, Yu & Hailey 2011b; Storfjell et al. 2009) or provided in alternative formats. Hendrich and Lee (2005) reported 114 hours of 'observed event times' for their study on transfers while Wong (2003) and Hollingworth (2007) provided the mean observation hours by subject.

Some researchers provided the total number of observed activities. The continuous nature of TM observation means that the number of observed activities can be substantial. In studies where the total number of observed activities were reported, these ranged from 916 (Webster et al. 2011) to 14,928 activities (Ballermann et al. 2011) (refer to Appendix C2). As a standalone figure the number of observed activities is subject to misinterpretation. Studies can be vastly different depending upon who is being observed, the type of work performed, the number of interruptions and of course, multi-tasking. The ideal situation is to publish the number of observation hours and total observed activities making for easier comparisons between studies (Blay et al. 2014a). Few authors of timing studies provided both of these figures (Abbey, Chaboyer & Mitchell 2012; Ballermann et al. 2011; Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Cornell et al. 2011; Westbrook et al. 2011) (refer to Appendix C2).

Likewise, the period or 'block' of time over which observation was conducted ranged from a few hours (Hollingworth et al. 2007; Thomson et al. 2009; Wong et al. 2003; Yen et al. 2009) to full shifts or longer (Abbey, Chaboyer & Mitchell 2012;

Azzopardi et al. 2011; Elganzouri, Standish & Androwich 2009; Pizziferri et al. 2005; Tang et al. 2007; Tipping et al. 2010b; Webster et al. 2011; Yen et al. 2009). Studies that collected data by self-reporting were among those that collected data for the entire shift (Farquharson et al. 2013; Hendrich et al. 2008). To prevent observer fatigue, Tipping et al. (2010b) changed observers every three hours during each 10-12 hour shift. For the majority of studies however, the duration of time spent observing and recording by individual observer(s) is not known. Research is therefore needed to determine the optimum period for observation and/or self-reporting and the burden on nursing staff (Blay et al. 2014a).

4.2.4 Sample Size

As a general rule, TM studies have small sample sizes (Zheng, Guo & Hanauer 2011) although much variation exists. One reason for the small sample size is that observers shadow (follow) subjects in order to continuously time and record activities being performed (Finkler et al. 1993) providing a great deal of data. Time and motion is a labour intensive procedure needing much concentration and training on the part of the observer. As a consequence the effort necessary for timing and recording limits the observer to shadowing no more than one worker at a time. Studies using a large number of subjects generally require a greater number of independent observers (Finkler et al. 1993) and as such are resource intensive (Burke et al. 2000).

The number of subjects varied according to study purpose, with studies focusing on a process or an activity tending to have larger sample sizes compared to those following individuals examining workload or workflow. However, it is difficult to make comparisons between studies as several exceptions to this trend were found.

Moreover, 'subjects' could be a bed, healthcare workers, a procedure and even 'time' as demonstrated by the following examples. The four observational studies that focussed on a healthcare process (Azzopardi et al. 2011; Fieldston et al. 2012; Hendrich & Lee 2005; Webster et al. 2011) have been described more fully earlier in this Chapter and therefore are only mentioned here in terms of their samples. Sample size ranged from 24 Paediatric ICU beds in Fieldston et al.'s (2012) study examining paediatric bed utilisation and patient flow; approximately 200 patient transfers in Hendrich and Lee's (2005) empirical study examining the transfer process; 517 unoccupied beds in the study by Webster et al. (2011); and 1779 patients presenting to a Maltese ED for a study examining waiting times (Azzopardi et al. 2011).

Likewise, four studies timing a nursing activity (medication administration and tight glycaemic control) had sample sizes ranging from 46 -151 (Elganzouri, Standish & Androwich 2009; Gartemann et al. 2012; Keohane et al. 2008; Thomson et al. 2009). Three studies focussed on the time taken for nurses to administer medications in various settings, ranging from 23 medical-surgical wards and six ICUs in a 753 bedded tertiary referral hospital (Keohane et al. 2008); medical-surgical wards (number not specified) in rural, community and tertiary level hospitals (Elganzouri, Standish & Androwich 2009); and a long-term care centre with over 700 beds (Thomson et al. 2009). Nurses were the subjects in all three studies. Keohane et al. (2008) observed 108 nurses and 116 medication administrations making it the smaller study in terms of subject size; Thomson et al. (2009) observed 144 nurses performing 126 medication administrations and Elganzouri, Standish & Androwich (2009) observed 151 nurses performing 980 medication administrations. Although the number of subjects (sample size) was comparable between studies, the number of medication administrations differed considerably. This has not been explored further but could be a factor of total observation hours or the frequency that medications are administered to patients. Administering medications to aged care residents in long term care may not be as frequent as administering medications to intensive care patients for example.

As mentioned earlier, studies following individuals to explore nursing work, frequently had small samples due to the intensity of the observation period. Two TM studies examining the work of critical care nurses had sample sizes of ten nurses respectively (Abbey, Chaboyer & Mitchell 2012; Wong et al. 2003). Similarities exist between the studies in that both were conducted in an ICU with 12 or less beds, albeit within two different hospitals. Convenience sampling was used in both studies, therefore participants were readily available and most likely volunteered to participate. The aim of Wong et al.'s (2003) study was to determine if the implementation of a critical care information system changed the amount of time nurses spent on activities, whereas Abbey, Chaboyer and Mitchell (2012) wanted to describe ICU nurses' day-time activities. Although the sample was small, the number of observed activities in Abbey, Chaboyer and Mitchell's (2012) study were considerable. In just 76 hours, more than 3081 activities were observed. Wong et al. (2003) used a pre-test, post-test design and provided the mean observation hours per nurse and the percentage of time nurses spent by activity category, limiting comparisons between the studies.

Mention should be made about Hendrich et al.'s (2008) extensive study that explored nursing work in 17 healthcare organisations across five U.S. states. The study described in detail in Section 4.1.6 recruited 767 nurses, of whom 385 were randomised to participate in protocol A. One disadvantage of collecting data on a large sample in multiple sites, is that data collection either requires multiple observers or is extended over a long period. Both of these are resource intensive, therefore it is probably safe to assume that observing over 700 nurses in multiple organisations would have been cost prohibitive. Hendrich et al. (2008) avoided the first problem by collecting self-reported data for seven consecutive days. This required nurses on all shifts to enter their own activities into a PDA. While not conforming to the direct, continuous observation principle of TM, several researchers have used this technique.

4.3 Variants of Time & Motion Techniques

As has been alluded to throughout this Chapter, TM techniques vary considerably which has led to some confusion (Lopetegui et al. 2014; Zheng, Guo & Hanauer 2011). Systematic and other reviews have revealed methodological differences to the classic TM technique of independent, continuous observation with studies utilising a plethora of research techniques being included under the banner of TM (Lopetegui et al. 2014; Tipping et al. 2010a; Zheng, Guo & Hanauer 2011). Variously called TM or modified TM, some studies fit more closely with work sampling in that timing of activities were undertaken in short increments (Westbrook et al. 2011; Yen et al. 2009) or were stopped temporarily when subjects were off the unit or during personal time (Ballermann et al. 2011; Douglas et al. 2013; Yen et al. 2009). In these cases, the observation of subjects and recording of activities are not undertaken in a continuous fashion. A number of studies did not employ independent observers but used a self-reporting format whereby subjects documented the activities that they were currently performing (Burke et al. 2000; Farquharson et al. 2013; Hendrich et al. 2008). To complicate matters further, study designs also varied with respect to the duration of data collection and the medium used to collect data (Tipping et al. 2010a; Zheng, Guo & Hanauer 2011) making comparisons between studies complex (Lopetegui et al. 2014). This is not a new concept, having been recognised back in the 1950's by Bindra and Waksberg (1956) who wrote that studies using timing measures are difficult to understand and compare because of the multiple methods and terminologies used. In light of these methodological disparities, calls for a generic TM approach have been made (Lopetegui et al. 2014; Tipping et al. 2010a; Zheng, Guo & Hanauer 2011). Tipping et al. (2010b) developed a standardised data collection tool complete with a data dictionary for use with future studies and Zheng and colleagues (2011) designed a 29 item checklist that they believe will help standardise TM research. While the authors acknowledged that not all the items on the checklist will be universally applicable, the checklist was perceived to be able to assist with TM research design, meta-analyses and result reporting (Zheng, Guo & Hanauer 2011).

4.3.1 Time and Motion, Work Sampling or Timing Study?

Due to similarities in technique between TM and work sampling, some studies are labelled TM but more closely resemble work sampling. The following sections discuss and compare the various techniques of TM, work sampling and another variant of the TM technique called WOMBAT (Work Observation Method by Activity Timing). As there is a plethora of published studies using these techniques, only published TM, work sampling and other observational publications relevant to this thesis (meaning that patient transfers or transporting patients were included in the activity list or categorisation process in some way) have been explored in any detail. As a case in point Yen et al. (2009) conducted an observational study labelled as TM, however the methodology more closely resembled work sampling (refer to Appendix C) while Hendrich et al.'s (2008) extensive self-reported study (described in Section 4.1.6) was again labelled as TM but contained features of both work sampling and timing studies.

WOMBAT or Work Observation Method by Activity Timing is a method that combines the principles of work sampling and timing techniques by observing tasks and entering data directly into purpose designed software. The system, described by the Australian researchers and designers as a 'modified TM' approach (Westbrook & Ampt 2009; Westbrook et al. 2011) has been extensively tested in the Australian environment (Westbrook et al. 2010; Westbrook & Ampt 2009; Westbrook et al. 2011) with further validation in the Canadian setting (Ballermann et al. 2011). Several differences are apparent between TM and WOMBAT. The major distinction between the two methods is that WOMBAT uses purposefully designed PDA software which allows observers (or subjects) to easily record activities according to ten pre-defined categories as is the custom with work sampling (Ballermann et al. 2011; Farquharson et al. 2013; Westbrook & Ampt 2009; Westbrook et al. 2011). With WOMBAT software, the time that an activity is selected on screen is automatically saved as the start time by the software, while the end time is recorded when a new task is selected (Ballermann et al. 2011). Although not impossible, recording of activities being performed simultaneously (multi-tasking) can be difficult with TM, as described under Section 4.1.8. The WOMBAT software allows observers to indicate if another activity has been commenced simultaneously to the first, by the application of an 'add' feature (Westbrook & Ampt 2009). Once the second activity is selected, the system will automatically record the start time and the end time when the observer indicates that the second activity has been completed

(Ballermann et al. 2011) thereby providing the duration of time taken to complete each activity.

As with TM, independent observers are the preferred method to record activities in WOMBAT although the WOMBAT software has also been used with nurse self-reporting (Farquharson et al. 2013). In studies that used direct observation, observers shadowed a randomly selected nurse for a maximum of 1.5 hours (Ballermann et al. 2011; Westbrook et al. 2011) which is comparable to the two hour period used in some work sampling studies (Chaboyer et al. 2008; Gardner et al. 2010a; Gardner et al. 2010b; Hoffman et al. 2003) but less than the three or more hours favoured by TM studies (Abbey, Chaboyer & Mitchell 2012; O'Leary, Liebovitz & Baker 2006; Pizziferri et al. 2005; Tipping et al. 2010b; Wong et al. 2003). It is unclear whether the observer then followed another nurse or whether observation periods were also selected at random. These slight distinctions in the way observations are carried out are important. Shadowing a second nurse aligns with TM's continuous observation principle whereas random observation periods more closely follow work sampling methods. Further challenging the principle of continuous observation used in TM, Ballermann et al. (2011) ceased observation when subjects were off-unit and during personal time. It could be argued that some off-unit instances are work related as when transferring a patient, collecting equipment and other errands, meaning that observations and timings in this instance were not continuous. The description of WOMBAT as a 'modified' TM technique as well as the system's distinct and more subtle features as highlighted here, have influenced the decision to include WOMBAT as a 'timing' study contrary to a TM study in a summary table demonstrating the differences in between TM, work sampling and other observational studies (refer to Appendix C1). A summary of the articles and descriptive elements included in the table can be found in Appendix C2 and Appendix C3.

In summary, it has long been recognised that TM methods vary considerably. A lack of generic tools and a standard method of categorising TM activities has contributed to such variations leading to calls for a generic approach. Some of these variants are discussed more fully in the following sections.

4.3.2 Self-reporting

Self-reporting of performed activities by subjects has frequently been used by nursing workload researchers (Ampt et al. 2007; Dearmon et al. 2012; Farquharson et al. 2013; Harrison & Nixon 2002; Hendrich et al. 2008; Myny et al. 2010). Despite several researchers arguing that the self-reporting of activities does not conform to the basic principles of TM (continuous direct observation) (Lopetegui et al. 2014; Tipping et al. 2010a; Zheng, Guo & Hanauer 2011) self-reporting does have its advantages. One advantage is that it is less costly than direct observation (Burke et al. 2000; Finkler et al. 1993) and hence is more feasible for multi-site studies as described previously.

A second possible advantage of self-reporting over direct observation is that any ambiguity on deciding between nursing procedures which may occur with a non-clinical observer, is eliminated. The participating nurse records the relevant activity that they are performing (Ampt et al. 2007) either manually as used by nurses in Burke et al.'s (2000) study or by direct entry into a PDA (Farquharson et al. 2013; Hendrich et al. 2008). Moreover, it could be argued that the difficulty with observing nursing procedures lies not with determining what the procedure is, because observers are able to clarify any queries with the nurse (Chaboyer et al. 2008;

Cornell et al. 2010; Munyisia, Yu & Hailey 2011b; Williams, Harris & Turner-Stokes 2009), but more with the frequency of interruptions or multitasking.

Self-reported studies have the major advantage over observation in that patient privacy is maintained (Ampt et al. 2007). In order to maintain patient privacy, some studies prohibited observers from entering patient rooms (Cornell et al. 2010; Dwibedi et al. 2011; Elganzouri, Standish & Androwich 2009; Yen et al. 2009) in which case observations were undertaken from outside the room. At other times, observers were permitted entry to rooms following nurse and patient permission (Keohane et al. 2008). Remaining outside the room has the disadvantage that observers may not always have a clear line of vision due to nurse, other healthcare workers and/or patient positioning. Whilst observers are able to clarify queries with the nurse, the observer still needs to ensure that activities can be seen or timing accuracy may be compromised.

4.4 Limitations of Observational Research Techniques

Thus far the Chapter has discussed the TM technique and differences between TM, work sampling and other timing studies. For the most part, observational studies are well established techniques that can inform on healthcare work, activities and processes. There are as with most research techniques, some limitations to observational research.

4.4.1 Timing Methods

The major limitation of work sampling compared to TM is that the time calculated to be spent on an activity is a proportion of the frequency that the activity is observed (Blay et al. 2014b). If the number of observations is not adequate, the proportion of spent time on short repetitive tasks or longer infrequently performed activities is not accurately represented (Finkler et al. 1993; Rosander, Guterman & McKeon 1958). Furthermore, Cornell et al. (2010) argue that interval sampling as used in work sampling provides a large number of observations, but the technique is unable to provide detail on work flow and the sequence of activities. For some processes such as patient transfers, the sequence of activities is of paramount importance, as the successful relocation of a patient relies on a succession of activities being carried out. This probably explains why work sampling researchers have only captured one aspect of the transfer process as discussed in Chapter 3.

Time and motion as a continuous observational method, provides the duration of time taken to complete an activity and the sequence of activities. The limitation is that TM is resource intensive. Observational-timing techniques, such as WOMBAT are therefore a compromise between work sampling and TM. Using predetermined categories as in work sampling, subjects are shadowed (or self-report) in short blocks of time up to a maximum of 90 minutes (Ballermann et al. 2011; Farquharson et al. 2013; Westbrook & Ampt 2009). The disadvantage of short observation blocks is that the time that an activity is observed and recorded is not necessarily the time that the activity was commenced. Furthermore some activities will not be captured.

Following on from the timing issue, work sampling has been criticised as the technique is task focussed and therefore insight into the reasoning or complexity of nursing is lost (Brady et al. 2007). Information related to patient acuity, quality of care and nursing performance are not provided (Ampt et al. 2007; Brady et al. 2007). However, TM or other forms of observational research do not do so either.

Observational research techniques are more concerned with what activities are being performed and how long they take, converse to why or how such activities are being performed. To obtain qualitative data, observers need to hold interviews or focus groups, combine with a period of self-reporting or with field notes taken at the time of observation (Baxter & Jack 2008; Mulhall 2003). Focus groups can be time consuming for participants (Greenwood & Parsons 2000; Krueger & Casey 2009) and the impact of self-reporting on subjects' time has not been well researched (Blay et al. 2014a). Field notes taken at the point of observation were therefore considered to be the most practical method to record qualitative data on patient transfers and bedspace moves.

4.4.2 Non-observed Time

Zheng, Guo and Hanauer (2011) have criticised some studies for inadequate explanation of what they call non-observed time. By non-observed time, Zheng and colleagues refer to personal time such as lunch breaks, periods off–site and the period following shift hand-over as some researchers stop observation during these periods (Ballermann et al. 2011; Douglas et al. 2013; Yen et al. 2009). The advent of communication and information technology has enabled and possibly encouraged working when off-site or during personal time. For example clinicians may use personal (lunch) time for documentation (Zheng, Guo & Hanauer 2011) while it is not unusual for nurses to transfer patients to the operating theatre or to another ward on their way to taking a break. Transfer activities undertaken during or prior to personal time will need to be recorded.

4.4.3 Hawthorne Effect

The Hawthorne effect is often cited as a limitation in observational studies (Ampt et al. 2007; Azzopardi et al. 2011; Ballermann et al. 2011; Chaboyer et al. 2008; Dwibedi et al. 2011; Munyisia, Yu & Hailey 2011a, 2011b; Westbrook & Ampt 2009; Yen et al. 2009). Observational work conducted by Mayo to determine the effect of lighting levels on workers at the Hawthorne plant of Western Electric Company in the late 1920's, resulted in increased worker productivity. French later asserted (in the 1950s) that the rise in productivity was in response to being observed, labelling his theory the 'Hawthorne effect' (Adair 1984; Diaper 1990; Wickström & Bendix 2000). In light of this, different techniques have been used to try and control for the effect when observing nurses and other subjects for research purposes. These techniques include pilot studies and extended observation periods (Ampt et al. 2007; Dellefield, Harrington & Kelly 2012; Dwibedi et al. 2011; Munyisia, Yu & Hailey 2011a, 2011b; Westbrook & Ampt 2009) on the premise that subjects will become accustomed to observer presence and less likely to change behaviour.

Several nursing authors have theorised that healthcare workers are most likely to change their behaviour when observed at breaks and during personal time (Ampt et al. 2007; Ballermann et al. 2011). By this they probably mean that the likelihood of taking extended breaks is reduced during observation periods to give the impression of much work being performed. In support of this theory, healthcare workers in Ballermann et al.'s (2011) WOMBAT validation study were concerned that recording personal time (called social time in this study) would reflect upon them personally. To determine if healthcare workers altered their social behaviour, the researchers calculated the proportion of time spent in social activities at several time points and for the entire 90 minute sampling period. The premise was that staff would be less likely to change their behaviour as the observation period progressed. No significant differences were found for social time at any point during the observation period which the authors believed were possibly due to subject-observer familiarity (Ballermann et al. 2011). It could be argued that as each subject was observed and followed for a maximum of 90 minutes, any extended social time would be taken (if at all) after completion of the observation period. In which case, any behavioural changes would not be witnessed. The authors concluded that no evidence of the Hawthorne effect was apparent.

Ampt et al. (2007) compared results from self-reporting to indirect observation of nine surgical ward nurses in an Australian tertiary level hospital. At the time of self-reporting, nurses were unaware that a period of observation would follow. Although fewer self-reports were made, the researchers reported no significant differences between the proportion of personal time and breaks taken by the nine surgical nurses between self-reported and observational data, supporting the authors' statement that no evidence of the Hawthorne effect was found. Interestingly, nurses preferred the period of observation compared to self-reporting, as it was less intrusive (Ampt et al. 2007).

Burke et al. (2000) also compared TM observational techniques with self-reporting of activity times. Eight nurses working in a developmental disability unit were observed for a total of five days each followed by five more days of self-reporting. For the observation component, two nurses were observed by two independent observers over a four hour period. After an individual nurse had been observed for five randomly selected days, the self-reporting component would commence. In this study, self-reporting yielded fewer reported activities compared to the observation period, and considerable differences in timings between self-reporting and independent observation. As with the nurses in Ampt et al.'s (2007) study, the nurse participants in this study also found the self-reporting element to be arduous (Burke et al. 2000) although no negativity was expressed about the period of observation. Changes in nurse behaviour in response to being watched were therefore unlikely.

As little evidence has emerged in support of the Hawthorne effect in over 60 years, the theory is now under scrutiny (Adair 1984; Diaper 1990; McCambridge, Witton & Elbourne 2014; Wickström & Bendix 2000). Multiple factors could have influenced productivity at Western Electric at that time. For one thing, relationships between workers and some supervisors were not favourable. During the observation period, the researchers aimed to make the environment as friendly and less threatening as possible. Supervision by supervisors was reduced during the project and periods of rest were increased. At the same time two of the original subjects were replaced by enthusiastic younger workers who may have contributed to the rise in output, although at times production actually decreased. Moreover, information has come to light that workers were paid on a piecemeal system and provided with frequent output tallies. It is now argued that the economic situation at the time (the start of the great depression), the provision of tallies and the method of payment may have heavily influenced worker productivity (Adair 1984; Diaper 1990; Wickström & Bendix 2000). Despite limited evidence of the Hawthorne effect in these and many other studies, the act of being observed in the workplace might be intimidating to some individuals and as a consequence researchers should aim to make themselves as unobtrusive as is possible.

4.4.4 Examining Workload Associated with Transfers and Bedspace Moves

In order to examine the impact of patient transfers and bedspace moves on nurse workload an observational-timing approach is required. Studies incorporating transfers or transportation were almost equally divided into work sampling and Time and Motion studies or variants of the two techniques. Work sampling uses proportions of time per category converse to actual times, and therefore is not an appropriate technique for this study. In order to calculate the cost of transfers on nurse time, activities that contribute towards the transfer process will need to be timed from start to finish, requiring an observational-timing approach.

Using TM is problematic as the technique requires timings to be conducted in a continuous manner. Previous works support the involvement of multiple healthcare workers and departments in the transfer process meaning that some transfer activities may not lend themselves to continuous timing as used in TM. Interruptions and multi-tasking, which are features of nurses' work, could impact on transfer preparations, contribute to transfer delays and make continuous observation and timing difficult. It is reasonable to assume that nurses will switch between transfer related activities and other tasks while waiting for transfer confirmation or while waiting for the patient to arrive. Moreover, attending to other nursing tasks is not the focus of this thesis and could lead to frequent periods of 'non-observed time' as discussed previously. As it is envisaged that timings of the transfer process might not be continuous in nature, this study will use an observational-timing approach rather than the traditional TM technique. As a direct observational approach is necessary, nursing activities will be observed and timed inside and also outside the ward environment if the nurse leaves the ward to escort a transferring patient. Observations will be performed by an independent nurse-observer.

Extensive literature searches have identified only one published study that timed the transfer process from start to finish (Hendrich & Lee 2005), but it is uncertain whether a continuous timing approach was taken in this study. As Hendrich and Lee (2005) examined transfers from a cost and productivity perspective, timing commenced when the decision to transfer was made until the time that the transfer was completed, which was sometimes a day or two later. Including the period whilst waiting for a bed to become available can be lengthy, and will not accurately inform on transfer related workload. To overcome this potentially long period of time, this project will categorise and observe transfers as either sending or receiving transfers. Research on bedspace moves is yet to be found. Bedspace moves will be observed in their entirety.

4.4.5 Conclusion

Work sampling, time and motion and modified versions of the same are well established research techniques that have been used to explore healthcare workload, specific activities and healthcare processes, here in Australia and overseas. This Chapter has explored observational research methods in depth to inform on the most appropriate technique for exploring nurse workload associated with transfers and bedspace moves. Time and motion and variants of the same are used widely by nurse researchers to explore nursing workload and nursing work. Similarities exist between the methods, in that direct observation by an independent observer or self-reporting by subjects can be used with either method, with direct observation considered the most reliable.

With respect to patient transfers, the involvement of a range of healthcare professionals across multiple departments can lead to transfer delays and disrupt continuous observation. As a consequence an observational-timing technique will be used for the prospective component (Stage 2) of this research study to determine the time spent by nurses moving patients. However, the time impact of patient moves on nurses' workload is of little consequence if the rate of patient transfers and bedspace moves remains unknown. Secondary inpatient data over one financial year will be analysed to identify the frequency that patients are being relocated during each episode of care. Combining the results from the secondary analysis with the results from the observational-timing study will provide an indication of the overall time spent by nurses moving patients. Further information on the impact on nursing workload can be gained by a focussed review of the patient transfer process. A case-study approach will help to raise our understanding of the impact of moving patients on nursing workload. The following Chapter will sequentially describe the three distinct research stages, the research techniques and the procedures that were utilised in this multiple methods study.

Chapter 5. Research Method

The research was divided into three stages using a sequential approach. The purpose of the first Stage of the research was to retrospectively examine the rate of patient transfers between wards or units over a one year period within one acute hospital. Results from Stage 1 were used to inform for Stage 2 of this project which utilised a prospective, observational-timing approach to examine the impact of patient transfers and bedspace moves on nursing workload. The third Stage developed case studies to examine the patient transfer process in greater detail and to further knowledge on the impact of patient transfers on nursing workload.

5.1 Research Questions

1. What is the rate of patient transfers and bedspace moves in adult inpatients hospitalised for greater than 48 hours?
2. Which clinical units have the highest rates of transfers and bedspace moves?
3. How much time is spent by nurses working on activities associated with patient transfers and bedspace moves and what effect does this time have on nurses' workload?
4. What is the designation of the nurse(s) involved with moving patients and the role of the nurse(s) in the transfer and bedspace moves process?
5. What is the sequence of activities performed when nurses are transferring a patient?

5.2 Design

This multiple methods study was conducted in three sequential stages as detailed below and as summarised in Table 2.

5.2.1 Stage 1.

The first Stage retrospectively explored administrative and health datasets for the financial year 2008-2009, to identify the number of patient transfers and bedspace moves for all emergency and planned (booked) admissions to the site hospital over a one year period. Only episodes of care of 48 hours or greater duration were included.

The NSW data repository, Health Information Exchange (HIE) was used at hospital level to extract data from the Admission, Transfer and Separation (ATS) database and the patient management system iPM (isoft Patient Management). Data extracted included demographic variables, International Classification of Diseases – Australian Modification 6th Edition (ICD-10-AM), Australian Refined Diagnosis Related Groups version 6 (AR-DRGs) (AIHW 2015b) and unit/ward transfers and bedspace moves. Based on the results from Stage 1, one medical and one surgical ward with high rates of transfers and bedspace moves were selected for the prospective second Stage of this project.

5.2.2 Stage 2

A prospective observational-timing approach was used for Stage 2, meaning that nurse activities associated with patient transfers and bedspace moves were observed and timed. The timing study focused on nursing activities associated with patient transfers and bedspace moves as defined by an extensive literature search and pilot observation.

5.2.3 Stage 3

The third and final Stage of this study used an embedded case study approach. The case study is an ideal method for the study objective as it focuses on describing contemporary populations, roles, individuals or events (Bourgeois et al. 2014; Hamel, Dufour & Fortin 1993; Lalor et al. 2013) in order to better understand the 'why' or 'how' behind actions or events (Yin 2006; Yin 2009). An embedded case study was used as this design enables descriptive data to be combined with quantitative time-series data to enhance validity (McDonnell, Jones & Read 2000; Yin 2012) and provides a chronicle of events that may help to explain the reasoning behind actions (Yin 2006; Yin 2012). A major feature of the embedded case study is that the case is considered to be the main unit and secondary or subunits of data are considered to be 'embedded' within the main unit (Casey & Houghton 2010; Scholz & Tietje 2002; Yin 2012). In this study, the patient movement is the main unit of analysis and nurse activity and timing data are considered to be subunits of analysis. Observer field notes and published literature from timing and work sampling studies as described in earlier Chapters represent a second subunit.

5.2.4 Inclusion and Exclusion Criteria

Day-only admissions and short-stay admissions of less than 48 hours were excluded from Stage 1 of this study. Patients admitted for a primary DRG of haemodialysis treatment(s), mental health disorders, obstetric and gynaecological conditions and patients under the age of 18 years were also excluded.

In Stage 2 only intra-hospital transfers and bedspace moves were observed and timed. Inter-hospital and inter-facility transfers, defined as transfers to or from other organisations, were excluded. Temporary transfers, whereby the patient returned to the same bed in the same clinical unit after a short period, were excluded as the transfer destination was not provided.

Transfers and bedspace moves that were not commenced and completed during the observation period were also excluded. For example, lengthy delays with the transfer process sometimes meant that the transfer would not occur during the period of observation, and at other times, transfers that had been scheduled to occur, were cancelled.

Nursing activities that were associated with the patient transfer or bedspace process were timed. Non-nursing activities, or activities associated with the transfer or bedspace move process that were performed by other healthcare workers were not timed.

5.2.5 Site

The site for this study was a 500 bed tertiary referral hospital (Peer group A) in metropolitan Sydney, Australia.

5.2.6 Setting

The timing study (Stage 2) was conducted in two wards with high rates of patient transfers and/or bedspace moves as indicated from results of analyses of the retrospective hospital data in Stage 1. One medical and one surgical ward were selected as the setting for Stage 2. From Stage 1 results it was identified that medical ward (labelled M5 in this thesis), performed the most patient movements and of the surgical wards three had similar rates of patient movements. Permission was sought from the site hospital to conduct the timing study on the medical ward and one of the three identified surgical wards. Following discussions with the Director of Nursing one medical and one surgical ward (labelled here as S2) were selected as sites for the observational-timing study. Stage 3 presents two sending transfers. The medical ward was the setting for both of these transfers.

Ward Design

Two ward designs, single corridor and double corridor (otherwise known as the racetrack design) (Yi & Seo 2012) feature throughout the hospital. The 26 bed surgical ward selected for Stage 2 is of a single corridor design. Five multi-bedded rooms each containing 2-4 beds and five single-bedded rooms are positioned along one corridor. The 30 bed medical ward has six single-bedded rooms and six four-bedded rooms positioned either side of a double corridor. One multi-bedded room is designated as an Acute Stroke Unit and a second room is reserved for patients with a high falls risk.

5.2.7 Subjects

Stage 2 subjects included all nurses (n=39) of any designation, who consented to be observed and timed performing an activity associated with patient transfers or bedspace moves. The nurses studied included the Nursing Unit Manager, Clinical Nurse Consultant (CNC)[4], Nurse Educators[5], the Team Leader (TL)[6], Registered and

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[4] The Clinical Nurse Consultant is a senior nurse with advanced clinical skills and/or qualifications who provides specialist care to patients (Baldwin et al. 2013; Bloomer & Cross 2011).

[5] The Nurse Educator, an RN with clinical and/or education qualifications is responsible for the education of nurses at hospital or community health service level (NSW Department of Health 2011).

[6] In this hospital, the Team Leader is an experienced RN working in a supernumerary capacity who is responsible for the daily coordination of patient movements and patient care in the ward.

Enrolled Nurses (EN)[7] and student nurses. Six nurses were the subjects for Stage 3. Three nurses were observed to be actively involved in each of the sending transfers selected as cases.

5.2.8 Instruments

Stage 1: Data were extracted via the NSW Department of Health Corporate data warehouse network Health Information Exchange (HIE) as detailed earlier. One such system is iPM, (inPatient Management) which contains relevant inpatient and outpatient clinical management data. Data were not able to be extracted from electronic patient records as NSW introduced a staged rollout at State and hospital level. The rollout had been commenced at the study hospital, but only a minority of clinical units had been completed at that time. As the study focus was on transfers between clinical units there was potential for incomplete data if patients were nursed in areas with differing systems.

Stage 2: Data for the second Stage of the study were collected on a purposefully designed data collection tool. The Transfer Timing Tool (TTT) was designed to record the times of observed activities associated with either patient transfers or bedspace moves. The design of the form was initially based on the 'Time motion study data collection form' by Yen et al. (2009) in that the times of observed activities, organised into categories, could be entered into columns adjacent to the observed activity. The TTT differed from Yen et al.'s (2009) form in that an

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[7] In Australia, Enrolled Nurses (equivalent to a Licensed Practical Nurse in the U.S.) require a Certificate IV or Diploma in Nursing to provide nursing care usually under the direct supervision of an RN (Health Workforce Australia 2013).

additional column was added to record the designation (level) of the nurse(s) performing the observed activity(ies). Provision was provided to record if the observed activity was interrupted or performed simultaneously with another activity by the same nurse (multi-tasking). Codes were used for this purpose. Space on the form also allowed for field notes and/or comments relating to the observation process or the individual transfer to be recorded (refer to Appendix D3).

Stage 3: Nursing activities and timing data collected in Stage 2 using the TTT for two sending transfers were examined in greater detail. The TTT also allowed for data on nurse designation(s) and field notes to be recorded.

Table 2: Summary Table showing the Three distinct Research Stages

Stage	Design	Purpose	Site & Setting	Sample & Subjects	Instrument(s)
1	Retrospective analysis of administrative health data over one financial year.	To determine the rate of patient moves in the inpatient population.	500 bed, tertiary referral hospital in Sydney, Australia.	Adult patients (n=10,733) and 14,157 episodes of care.	Health Information Exchange (HIE). inPatient management (iPM) system and Admission, Transfer Separation (ATS) databases.
2	Prospective observational-timing study.	To record and time activities performed by nurses when moving patients.	One medical and one surgical ward identified as having a high rate of patient movements.	75 patient movements. Nurses of all designations working in the two wards (n=39).	Transfer Timing Tool.
3	Embedded case study with two cases.	To further understanding of the factors that influence the time required to move a patient and the impact on nursing workload.	Medical ward.	Two sending transfers. Registered and Enrolled Nurses (n=6).	Transfer Timing Tool. Observational field notes.

5.2.9 Ethics Approval

Human Research Ethics Committee (HREC) approval was sought and granted from the relevant Health Service and the University of Technology, Sydney. Approval included access to the health administrative dataset and de-identified patient data, and permission to observe and time consenting nursing staff in the clinical setting (refer to Appendix G).

5.3 Stage 1 Procedure

Stage 1 used secondary data routinely collected by hospitals and health services to determine the rate of intra-hospital transfers and bedspace moves. This method was selected as patients are increasingly being transferred after hours and at short notice and an observational study to determine the rate of patient transfers would be difficult. In the very least, the number of transfers studied would be limited. Research studies of a similar nature have successfully utilised secondary data from pre-existing datasets for their analyses (Kanak et al. 2008; Picone et al. 2008).

Inpatient health service data at the study hospital for the Financial Year 2008-2009 were extracted at the health service organisational level from iPM and Admission, Transfer and Separation (ATS) databases via the data warehouse Health Information Exchange (HIE). This process was selected as healthcare primarily remains a manual (paper-based) system (Hillestad et al. 2005; HiMSS Analytics 2013) complemented by informal methods such as verbal communication between staff and the ward whiteboard (Clark, Moller & O'Brien 2014; Sehgal et al. 2010). Data that are stored electronically are often stored on disparate systems that are difficult to merge (Kuperman 2011; Wong et al. 2014). HIE enabled data from the various repositories and disparate information systems within the NSW public hospital system to be captured, transmitted, stored and interpreted more readily (Bureau of Health Information 2010; Doran & Sara 2006; Kuperman 2011).

Following extraction from HIE, data were exported at organisational level into a Microsoft Office Access database in table format and de-identified to maintain confidentiality and privacy of patient information. Data requested from the hospital included patient demographic, episodic and transfer variables as detailed in Table 3 below. Extracted data contained individual de-identified records for 22,172 overnight patient admissions, 20,780 patient separations and 79,657 transfers for the 2008-2009 financial year. Clinical variables for each admission included patient demographics (gender, age), major diagnostic category (MDC) responsible for each inpatient hospital admission as defined by Australian Refined Diagnosis Groups (AR-DRG) and major procedure code (ICD10-V6) for each inpatient hospital admission.

Data variables were in coded format as determined by NSW Health patient information systems. The Microsoft Office Access database consisted of 14 tables. Eleven tables contained information necessary for interpretation of database codes while three tables contained extracted de-identified patient data. Only the tables containing demographic, patient episodes (transfers) and discharge data were used for Stage 1 of this study.

Table 3: Episodic, Patient and Transfer Variables

Variable Type	Definition
Episode of Care (Admission) Variables	
Episode ID	Unique code identifying patients' episode(s) of care.
Admission data	Admission date and time.
Admission day	Day of week of admission.
Admission source	Source of hospital admission e.g. alternative hospital, residential aged care, outpatient clinic.
Admission type	Emergency or planned (booked) admission.
Discharge data	Discharge date and time.
Separation data	Status of a patient at separation (discharge/transfer/death) and the place to which the patient is released e.g. home, aged care facility.
Length of stay	Duration of hospital length of stay.
Readmissions	Readmission within 28 days of hospital discharge. Readmission rate per individual per financial year.
Demographic Variables	
Age	Patient age in years at time of admission.
Gender	Patient gender.
AR-DRG-V6	Australian Refined Diagnosis Related Group (Version 6). 'A patient classification scheme that provides a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital'.
ICD-10-V6 diagnosis and procedure code	'International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification'.
Transfer Variables	
Date of transfer	Date that the transfer occurred.
Time of transfer	Time that the transfer occurred.
Ward ID	Ward identifier or name.
Ward specialty	Major clinical specialty as defined by hospital.
Ward bed ID	Bedspace identifier/number.

5.3.1 Inpatient and Transfer Variables

Patients were identified by two numerical code formats. The table containing discharge and demographic data utilised a unique de-identified patient identification number (DID) while the 'patient episodes' (transfer) tables identified patients by 'Stay Number'. Stay numbers were unique for each hospital admission, but they were not unique per transfer; meaning that stay numbers were repeated many times within the databases. The third table contained both DIDs and Stay Numbers.

Admission variables included the date, time and day of the week for each inpatient admission and/or readmission and the date and time of each recorded inpatient discharge. Admission data also included length of hospital stay calculated in days, and the source of hospital admission. The source of admission referred to emergency admissions, booked (planned) admissions as well as transfers from other healthcare facilities. Inpatient episode variables included data on 79,657 patient transfers. Episode data included the date and time details for each unit or ward transfer, the relevant unit or ward names and their clinical specialty. The bedspace number occupied by each inpatient was provided per admission and transfer. In addition to the above, data included the financial typeset change[8] for each transfer e.g. acute, rehabilitation or geriatric evaluation with relevant medical officer details.

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[8] In Australia, a typeset change refers to the reclassification of an inpatient code in response to a change in financial class and care level. Transferring a patient to the rehabilitation ward signifies the end of the acute care phase and commencement of the subacute phase of hospitalisation. The length of hospital stay is calculated for each phase.

5.3.2 Merging and transposition of data in PASW

Data were exported into Microsoft Excel from Microsoft Access and then into PASW (IBM SPSS Software 2009). Prior to exporting the data, amalgamation of the three Microsoft Access patient data tables was required. It was also necessary to ensure that patient records were identifiable by both medical record number (MRN) and Stay Number. A query was designed in Microsoft Access for this purpose. Following exportation of the three datasets into PASW, data were transposed and the three tables merged to produce one large dataset containing all relevant variables.

Following data transposition and merging, one large dataset with multiple stay numbers for each DID was provided. Each case in the dataset therefore contained individual patient level data, episode of care data and transfer data. The final dataset contained over 200 variables consisting of patient demographics, transfer dates and times, DRG and ICD10 descriptors and codes per inpatient episode.

Excluded Diagnosis Related Groupings

Following successful verification, inpatient cases with DRGs that were not consistent with the study objectives were removed from the database (n=269). As per the exclusion criteria (refer to Section 5.2.4) these were primarily antenatal/obstetric DRGs, haemodialysis DRGs or low volume diagnoses associated with a minimal length of stay.

Other Exclusions

Hospitals calculate length of stay using the midnight census (Simon et al. 2011). This means that, depending on the time of hospital admission, patient admissions classified as one day can be less than 24 hours and in some instances less than 12 hours. Therefore, in order to reduce the data and fulfil study criteria of admissions of 48 hours or more, all patient admissions were calculated in hours. The length of hospital stay in hours was calculated by subtracting the admission date and time from the discharge date and time. Patients whose length of hospital stay was less than 48 hours were then eliminated from the database (n=7433). Episodes of care with greater than 12 transfers per inpatient episode were also excluded. Preliminary examination of the frequency of transfers per episode of care determined that the transfer rate was diverse. The number of transfers experienced ranged from 1-132 per episode of care. As 98.4% of patients experienced 12 or fewer transfers per episode of care, a decision was made to exclude all episodes of care with 13 or more transfers (n=313). Corresponding to the high transfer rate, these patients also had long hospitalisations and as such were considered outliers. Following the exclusion criteria as outlined above, a total of 8,015 episodes of care were removed. The final database consisted of 14,157 episodes of care and 273 variables.

5.4 Data Management

5.4.1 Coding of Admissions, Transfers and Discharges

Data were extracted from iPM, a patient management system designed to track and manage patients' journeys through the healthcare system (iSoft Australia 2012). Extracted data included seven codes used for financial and patient flow purposes, namely: Admission, Transfer, Reclassify, Update, Leave/Return and Discharge. 'Admission' codes were used to identify the first clinical unit that the patient attended. Overwhelmingly (96.2%) the initial clinical unit was coded as an admission. The 'leave' and subsequent 'return' codes are used for 'gate' or weekend leave and were not examined in any detail in this thesis. The financial codes

‘Reclassify’ and ‘Update’ are used to reflect typeset changes (see page 105, Footnote 8 for a definition of a typeset change) and update financial codes. ‘Transfer’ codes reflected a transfer from one clinical area to another and ‘Discharge’ codes were applied to the clinical unit from which patients were discharged home or to an another facility.

The financial nature of the database meant that some codes were used in preference to others. ‘Reclassify’ codes for example were used for approximately one third of transfers whereby the transfer represented a change of financial class, such as occurs following transfer from a high nursing intensity area to a lower nursing intensity area e.g. from Intensive Care to a ward or from the ward to subacute care. A similar situation occurred for a minority of patients who experienced only one transfer, from the ED to a ward. In some circumstances, patients were transferred to a clinical unit from which they were then discharged. For reporting and financial purposes, it is imperative that discharges from hospital are accurately recorded, in which case the discharge code held precedent over the transfer code. These database nuances could have led to transfers being under or over estimated. To ensure that all transfers were captured in analyses, financial codes were cross-referenced with the clinical unit name and bedspace ID.

Temporary Transfers

At times patients were coded as a transfer but the clinical unit and sometimes the bedspace ID remained the same. Transfer times were recorded. It is most likely that the patient attended another department for a procedure or diagnostic service, and returned to the same clinical unit sometime later. As the names of the departments were not available, these temporary transfers could not be verified and were excluded from any transfer analyses.

5.4.2 Data Cleansing

To ensure that all patient transfers between clinical wards, units and departments were captured extensive recoding was required. Within Australia, subacute periods of a hospital stay (such as for rehabilitation) are reported as separate classifications (typeset change) which means that the acute hospital length of stay excludes the rehabilitation length of stay (AIHW et al. 2007). For this study, episodes of care included the acute and subacute phases of hospitalisation, and were therefore considered to commence at admission and continue through to separation from the admitting hospital. This was necessary to ensure that transfers to subacute areas were captured. For this reason, ‘reclassify’ codes signifying a typeset change were removed from the database. For the most part, patients would have experienced a transfer at the time of a typeset change e.g. from acute to subacute or from ICU to general ward level care. Transfer codes were verified with ward and unit names for data accuracy.

During the course of the study in response to capital works and hospital restructuring, clinical units were reorganized, renamed and relocated. In some cases, clinical units were relocated and renamed more than once during the course of the study. This meant that the number of *named* clinical units increased. To facilitate analyses of the rate of transfers and bedspace moves, unit and ward names were regrouped and recoded based on their principle clinical speciality. Twelve clinical specialties were identified as shown in Table 4 below.

Table 4: Clinical Specialities as Coded in this Thesis

Clinical Specialty	Criteria	Wards or Units (n)
Medical	Cardiology, general medicine, immunology, neurology, respiratory and rheumatology.	6
Surgical	Cardio-thoracic surgery, general surgery, gynaecology, head neck and plastics, neuro-surgery, orthopaedics, urology and vascular surgery.	6
Assessment units	Units designed for the rapid assessment and treatment of patients (medical).	2
High nursing intensity units	Intensive Care (ICU), Coronary Care (CCU), High Dependency (HDU).	3
Day-only and short-stay	Day-only and short-stay units (surgical).	3
Operating theatre	Operating theatre and Post Anaesthetic Care Unit (PACU).	2
Oncology	Oncology and oncology-haematology.	2
Dialysis	Renal and dialysis.	2
Aged care & Rehabilitation	Aged care and rehabilitation.	2
Emergency Department	Emergency Department (ED)and Emergency Medical Unit (EMU).	2
Paediatrics & Maternity.	Paediatric, antenatal, delivery suite and postnatal.	4
Transit lounge	Area for pre-discharge or discharged patients.	1

5.5 *Stage 2 Procedure*

Stage 2 of this study focuses on the time taken by nurses involved in a range of tasks that comprise the transfer process. Results from Stage 1 provided information on the pattern of transfers and bedspace moves at the study site and therefore became the basis for the selected period of observation for the prospective phase of this study. The following sections describe the observational-timing study which formed the second Stage of the study.

5.6 Development of the Data Collection Tool

Patient transfers (and bedspace moves) were considered to consist of two phases, namely sending and receiving phases based on whether the nurse responsible for the patient was sending or receiving the relocating patient. The data collection tool or Transfer Timing Tool (TTT) was so designed that the one form could be used for either sending or receiving transfers. Bedspace moves were considered to have activities consistent with some aspects of sending and receiving transfers and therefore the same form could be used for the entire bedspace move.

5.6.1 Identification of Nursing Activities

Activities associated with patient transfers were identified from the published literature, intra-hospital transfer policies from Australia, the U.K. and the U.S.A. and current ward clerk role descriptions. The site hospital does not currently have a clear policy on intra-hospital transfers and therefore policies published on the internet were used.

Publications used to design the tool (n=47) included nursing workload studies (Ballermann et al. 2011; Duffield & Wise 2003; Westbrook et al. 2011; Williams, Harris & Turner-Stokes 2009), nursing studies that focussed on an aspect of nurse work such as communication (Chan, Jones & Wong 2013; Clarke et al. 2012; Manser et al. 2010), quality improvement studies that aimed to identify problems and errors associated with the transfer process (Hindmarsh & Lees 2012; Kibler & Lee 2011;

Nakayama et al. 2012; Ong & Coiera 2010; Silich et al. 2012) as well as studies that examined or timed the transfer process (Abraham & Reddy 2010; Hendrich & Lee 2005; Shimizu et al. 2011) (refer to Appendix D).

Twenty-seven activities were identified for inclusion in the tool from the published literature, hospital policies and role descriptions. Fourteen activities were initially identified for sending transfers and 13 activities were identified for receiving transfers but these were increased to 15 for both transfer phases following the pilot study (refer to Table 5 for sending transfer activities and Table 6 for receiving transfer activities). Identified nursing activities were similar, if not the same, for both sending and receiving transfers. For example, communication between the nurse and the patient/family/carer are essential activities for both receiving and sending transfers and were included on the tool for both phases. It is not unusual to have similar activities within two phases of the transfer process as demonstrated by other studies examining the transfer process (Collins et al. 2010; Hendrich & Lee 2005; Silich et al. 2012). Furthermore, activities performed prior to transfer can be repeated (in reverse) after arrival in the new location e.g. packing and then unpacking belongings.

Overall, identified activities were diverse and ranged from tasks essential for arranging the transfer and associated services to patient care activities. Some of the identified activities are routinely performed by other staff members such as the ward clerk (SESLHD 2013). Because nurses may be required to perform these tasks in the absence of clerical assistance (Stevenson et al. 2011) clerical activities were included in the tool. (A full listing of the publications and grey literature used to identify nursing activities and inform the design of the tool are tabulated in Appendix D).

The final list of activities (following a pilot study) contained 30 defined nursing activities, with 15 activities for sending transfers and 15 for receiving transfers (refer to Table 5 and Table 6). Capacity was also made to add any activities associated with the transfer process that had not been previously identified but were observed to occur during the observation period. Following identification of the nursing activities to be included on the data collection tool, activities were divided into categories.

Face Validity

Face validity of the list of activities was tested by consultation with clinical experts to determine if the activities identified were representative of nursing work associated with patient transfers. The activity list was initially given to two Clinical Nurse Consultants (CNCs)[9] and two Nurse Educators (NEs)[10] at the site hospital for verification and their comments. Both are considered to be senior nurse clinicians and clinical experts working in the medical-surgical environment and therefore appropriate to assist with face validity. The list of activities was considered to be comprehensive and accurate, so no changes or additional nursing activities were suggested by the nurse experts. Validated activities formed the basis of the Transfer timing Tool (TTT).

5.6.2 Identification of Activity Categories

Having identified the nursing activities associated with each transfer phase, activities were categorised into one of six categories (Administration, Communication, Direct

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[9] Refer to page 98, Footnote 4 for a definition of CNCs in Australia.

[10] Refer to page 98, Footnote 5 for a definition of NEs.

care, Documentation, Indirect care and Other) based on those developed for use with work sampling (Duffield & Wise 2003) and time studies (Ballermann et al. 2011; Westbrook et al. 2011). The idea of categories is to facilitate the location of activities on the tool, during the observation, timing and recording process (Douglas et al. 2013). The same categories were identified for both sending and receiving transfers and bedspace moves, although it was recognised that some activities might not be necessary for all bedspace moves. For example, a nursing handover will not be required if the same nurse remains responsible for the patient's care. The number of activities per category ranged from 1-4 for sending transfers and 1-5 activities per category for receiving transfers as shown in the tables below.

Table 5: Sending Transfer[11] Categories and Activities

Category	Activity	Definition
Administration	Request wardsperson/ porter.	Request the services of a wardsperson or porter to aid in the transfer/bedspace move.
	Redirect services e.g. diet, pharmacy.	Update information systems or contact dietetics and pharmacy to inform of new location and reorganise services.
	Compile medical record and charts.	Manually compile medical records, charts, x-rays and other forms of documentation for the transfer/bedspace move.
	Environmental services.	Coordinate environmental (cleaning) services.
Communication	Bed Management.	Communicate with Bed Management regarding transfer/bedspace move.
	Healthcare professionals.	Communicate with other healthcare professionals regarding the patient or the transfer/bedspace move.
	Patient, family or carer.	Communicate with patient, family or carer regarding the patient or transfer/bedspace move.
	Nursing handover (telephone).	Telephone handover with nurse on receiving ward.
Direct care	Patient preparation.	Ensure the patient is wearing an accurate identity band & prepare the patient for transfer.
	Perform vital signs, administer medications, dressings, procedures.	Perform vital signs, administer medications and dressings, or any other nursing procedures necessary for the scheduled transfer/bedspace move.
	Disconnect and prepare equipment for transfer.	Disconnect equipment from mains power and/or connect to battery power within 30 minutes of scheduled transfer/bedspace move.
	Nurse escort.	Check patient ID. Observe and monitor the patient and equipment during the transfer/bedspace move.
Documentation	Medical Record, EMR, charts, care plan.	Update and/or complete nursing documentation prior to transfer/bedspace move. Includes transfer forms and/or checklists
Indirect care	Pack patient belongings.	Pack patient's belonging, including any prescribed medications.
	Move bedside table and locker.	Move the patient’s bedside table and locker to the new location (bedspace move).
Other		Any nursing activity associated with transfers /bedspace moves not previously been identified.

[11] Includes bedspace moves

Table 6: Receiving Transfer[12] Activities and Categories

Category	Activity	Definition
Administration	Staffing/beds.	Adjustment to nurse staffing or beds as a direct result of the transfer/bedspace move.
	Compile medical record and charts.	Manually compile medical records, charts, x-rays and other forms of documentation following the transfer/bedspace move.
	Update iPM, admission-discharge book or unit board.	Update information systems to reflect transfer/bedspace move.
Communication	Bed Management.	Liaise with bed management to confirm transfer/bedspace move.
	Healthcare professionals.	Communicate with other healthcare professionals regarding the relocated patient or transfer/bedspace move.
	Patient/family/carer.	Communicate with patient/family or carer regarding the patient or transfer/bedspace move.
	Nursing handover (face-face).	Direct handover between escort nurse and receiving nurse.
	Nursing handover (telephone).	Receive telephone handover from nurse on sending ward.
Direct care	Settle and orientate patient.	Check patient's ID, welcome the patient, ensure their comfort and orientate to the new surroundings.
	Disconnect/reconnect equipment.	Disconnect equipment from battery power and/or connect to mains power within 30 minutes of arrival in new location.
	Patient assessment.	Assessment of patient by receiving nurse within 30 minutes of arrival in new location.
	Perform vital signs, administer medications, dressings, procedures.	Perform vital signs, dressings, administer medications and other nursing procedures following arrival in new location.
Documentation	Medical Record, EMR, charts, care plan.	Update and/or complete nursing documentation following transfer/bedspace move.
Indirect care	Unpack patient belongings.	Unpack patient's belongings. Ensure any medications are correctly stored.
	Move bedside table and locker.	Move the patient's bedside table and locker to the new location (bedspace move).
Other		Any nursing activity associated with transfers/ bedspace moves not previously been identified.

[12] Includes bedspace moves

5.6.3 Data Collection Tool

To test the format and structure of the draft data collection tool, practise timing sessions were conducted with undergraduate nursing students in a clinical laboratory. These sessions highlighted that additional space on the tool was needed to record the times of observed activities. Subsequently the tool's layout was amended by reducing the width of the 'Code/Nurse' columns and increasing the width of the 'Time' columns. Descriptors relating to defined activities were refined to maximise space on the form and to enable quicker location of the activity during observation and timing. For example, the activity 'Communicate with receiving ward (telephone handover)' was amended to 'Nursing handover (telephone)'. The use of concise descriptors enabled activities for sending and receiving transfers to fit onto one sheet of A4 landscaped paper. It was proposed that one transfer or bedspace move be recorded on each page.

5.6.4 Pilot Study

An observational pilot study was undertaken at the site hospital to test the feasibility, utility and accuracy of the data collection tool and to provide practice with observation and timing of transfers and bedspace moves. Pilot observations and timings were undertaken on the selected medical and surgical wards, over eight non-consecutive weekdays during May and June. Observations were carried out between the hours of 0900 and 1700 hours in blocks of time lasting from 4-6 hours. During this period 16 patient movements, consisting of four sending transfers, six receiving transfers and six bedspace moves were observed and timed.

The pilot study confirmed the pattern of transfers observed from the secondary data. Stage 1 results demonstrated that the majority of transfers and bedspace moves occurred during the morning shift. The peak period for patient moves was from 1000-1200hrs in line with hospital policy to discharge patients in the morning (SESIAHS 2009). No patient movements were observed between the hours of 1400-1700hrs.

The pilot study conducted in the two selected wards resulted in two amendments to the TTT activity list. Firstly, it was noted that receiving ward nurses often took handover from the Emergency Department over the telephone and therefore ‘Nursing handover (telephone)’ was added as a receiving transfer activity on the tool. The second activity observed during the pilot study had not previously been found in the published literature. Six bedspace moves were observed during the pilot study and on four occasions (66.6%) the nurse moved the bedside locker and/or table from the patient’s primary bedspace to the new bedspace. Moving the bedside locker and table was recorded under the ‘other’ category during the pilot study but in light of the frequency that the nurse was observed to be moving lockers or tables this activity was added to the indirect care category on the tool. The activity was added to the tool for both sending and receiving transfer (bedspace move) activities as the lockers and tables were moved in two stages. Firstly, tables and bedside lockers were moved to the ward corridor to make space in the patient’s room, and then following the relocation of the patient’s bed, the lockers and tables were moved from the corridor to the new location. The procedure was the same on both the medical and surgical wards.

The need to record the number of nurses involved in a transfer or bedspace move was identified. Pilot observation highlighted that while one nurse usually prepared a patient for transfer, often two or more nurses assisted with receiving transferred patients and bedspace moves. The TTT was amended so that the number of (individual) nurses observed to be involved in the transfer or bedspace move could be recorded (refer to Appendix D3).

5.7 Observation and Timing of Patient Transfers

Hendrich and Lee (2005) described the transfer process in three phases namely Pre-transport, Transport and Post-transport Events. These three stages are acknowledged, but patient transfers are not as clearly defined as this, particularly if multiple transfers are being observed and the entire process can take many hours (Hendrich & Lee 2005; Kibler & Lee 2011; Williams & Leslie 2004). To aid data collection, transfers were divided and observed into two phases (sending transfer or receiving transfers) according to the transfer location. Sending transfers were defined as transfers to other wards, units or departments from the selected ward and a receiving transfer was defined as a transfer received by the nursing staff on the selected wards. As bedspace moves were defined as a patient move from one bed to another within the same ward or unit, bedspace moves were observed on medical ward M5 and surgical ward S2 as one complete process.

Studies that focus on a process need to observe the process from commencement to completion but unrelated tasks will not need to be timed. For this reason, a timing approach was used (as described in Section 5.9.3) to observe and time nursing activities associated with transferring patients. As has been discussed, transferring patients involves many departments and disciplines, but for the purposes of this study, only activities associated with the transfer process that were performed by nurses on the two selected wards were timed. Clerical activities associated with transfers that are usually performed by the ward clerk were not observed and timed, unless undertaken by the nurse. The time in between tasks such as moving between or around beds (in transit) was not recorded. The following sections describe the timing of sending and receiving transfers and bedspace moves in greater detail.

5.7.1 Sending Transfers

To transfer a patient to another unit, a great deal of pre-transfer organisation and preparation is required. For this reason, sending transfers includes pre-transfer organisation such as liaising with Bed Management, liaising with other services and healthcare professionals, preparing the patient for transfer, through to the time that the sending nurse or nurse escort relinquishes care of the patient. Relinquishing care was considered to be at the time that the patient departed the ward (when escorted by a person(s) other than a nurse) or when nursing handover had been provided by the escort nurse. All designations of nurses involved with transferring a patient were observed. Nurses attending patients residing on the medical ward M5 or the surgical ward S2 and who were to be transferred to other wards or departments within the hospital were observed and timed. Only nurses who were involved in the sending transfer preparation process were observed.

5.7.2 Receiving Transfers

Receiving transfers, as with sending transfers, were observed and timed on the two selected wards, M5 and S2. Nursing work associated with receiving patients transferred into wards M5 and S2 from other locations within the hospital, formed the basis of timing receiving transfers. Based on results of analyses from Stage 1 of this project, it was anticipated that the majority of patients transferred into wards M5 and S2 would be from the Emergency Department (ED) or Emergency Medical Unit (EMU) (refer to Appendix B1).

5.8 Stage 2 Data Collection

The following sections detail how the observational-timing study was conducted. The initial sections focus on the observation process, sample and participants while the subsequent sections focus on the timing process.

5.8.1 Observation Periods

Observation for Stage 2 was held on 27 randomly selected weekdays, over a seven week period during the Australian Winter from June to mid-August 2013. Each weekday was selected for observation between 4-7 times during the seven week period. During the period of observation, it was noted that Mondays had fewer patient movements compared to other days, confirming the pattern of movements noted in Stage 1. A decision was made to cease data collection on Mondays once four Mondays had been included in the observation period. Observations occurred in blocks of time (n=27) ranging from 2-6 hours between the hours of 0800 and 1700hrs. A total of 118 hours of observation were undertaken during this period.

5.8.2 Sample Size

In the past, convenience sampling has been used to collect data associated with patient transfers (Hendrich & Lee 2005; Ong & Coiera 2010; Webster et al. 2011). The unpredictable nature of many patient transfers and the tendency of planned transfers to be left to the last minute (Hanne, Melo & Nickel 2009; Rowe & Jones 2008) make random sampling methods impractical. To avoid a prolonged period of data collection, convenience sampling was used. A total of 83 patient moves were observed during the observation period. Eight patient moves were excluded from data analyses as they did not fulfil the study criteria. Seven of these movements were subject to unforeseen delays and therefore the entire process was unable to be observed and one movement was a combined transfer-bedspace move. As the activities associated with this specific patient movement could be attributed to either the transfer or bedspace move, the patient movement was removed from further analyses. The remaining 75 patient movements were considered to be representative of the work undertaken by nursing staff when moving patients and retained for analysis.

5.8.3 Participant Consent

Staff were informed of the study through two presentations on each of the wards selected as study sites. The purpose of these information sessions was to inform the clinical nursing staff of the study and invite participation. Participation was voluntary, free from coercion and no enticement was offered. All designations of nurses working on the two wards were invited to participate. Written participant information sheets detailing the study objectives, design and method (see Appendix G1) were distributed to those present with additional forms left with the Nursing Unit Manager (NUM) for nurses working on alternative shifts. Nurses who were to be involved with a patient transfer and who had not been at the information sessions were approached on the ward during the study observation period. The aim of the study was explained and an invitation to participate was extended. Signed consent forms were obtained from 39 nurses working across the two wards. Only one nurse declined to participate.

5.8.4 Identifying Transfers and Bedspace Moves

The NUMs at the site hospital attend a daily Bed Management meeting. Held at the same time each morning, the purpose of the meeting is to allocate beds for admitted and post-operative patients based on the number of patient discharges. At times during the observation period, major hospital-wide bed block occurred. Bed block in this context, refers to the inability to discharge patients (Anderson et al. 2001; Harris & Sharma 2010) and subsequently the inability to transfer patients from other clinical areas. During these periods of bed block, a second Bed Management meeting would be held in the afternoon. On return from the Bed Management meeting the NUM would liaise with the ward Team Leader (TL) who takes responsibility for the daily coordination of patient movements and patient care. As a supernumerary position at the site hospital the TL does not have a patient load but may assist with patient care as needed. At the beginning of each observation period, the nurse-observer determined the likelihood of any transfers or bedspace moves from the TL of the two participating wards and sought (verbal) confirmation to observe the process. As transfers rely on bed vacancies associated with separations such as discharges, external transfers and deaths, the nurse-observer liaised with the TL throughout the day to ensure any previously unanticipated patient movements were captured.

Upon confirmation of a patient transfer or bedspace move, the nurse-observer sought clarification from the clinical nurse to observe the process and ensured that the individual had previously provided written consent. The nurse-observer followed the clinical nurse timing any transfer or bedspace related activities as described below. Any transfer related activities being performed were observed and timed until the nurse completed the activity, moved onto an unrelated task (Hollingworth et al. 2007) or indicated to the observer that the transfer was complete. The designation of the nurse was recorded.

5.9 *Timing Procedure*

5.9.1 The Timing of Sending Transfers

Timings for sending transfers and bedspace moves commenced at the point following confirmation of an available or allocated bed and the clinical nurse had been notified of the need to transfer a patient. Timings ceased once the patient had been relocated, nursing handover completed (if applicable) and the sending (escort) nurse had returned to the sending ward. If the patient was escorted by a person(s) other than a nurse, such as the wardsperson, orderly or family members, timing of transfer related activities undertaken by the sending nurse ceased at the point that the sending nurse relinquished care. This was considered to be at the time the patient departed the sending ward.

5.9.2 The Timing of Receiving Transfers

The receiving transfer phase commenced at the time that the receiving nurse started preparation and/or took responsibility for the patient's care. This could be on the receiving ward if the patient was transported by an orderly or escorted by a nurse from the sending location. At other times the receiving nurse was required to collect (escort) the patient from the sending location to the receiving ward. For example, ward nurses were frequently required to collect (escort) Emergency Department patients from the radiology department to the ward or collect the postoperative patient from the Post Anaesthetic Care Unit (PACU) for return to the ward. In order to gain a perspective of the time that the nurse is away from the ward and unable to attend to other patients under their care, timing commenced at the time the receiving nurse left the ward to go and collect the patient.

For receiving transfers and bedspace moves, observation and timing continued until the patient had been orientated to the new surroundings, a nursing assessment and other essential nursing activities e.g. post-transfer documentation had been completed or until such time that the nurse indicated to the nurse-observer that the transfer activities had concluded.

5.9.3 The Timing Process

Timing of the transfer/bedspace move process focussed on the nurse responsible for the patient's care. Previous studies examining a healthcare process have focussed on the patient bed (Fieldston et al. 2012; Webster et al. 2011) observing the most visible and primary event (Fieldston et al. 2012). The disadvantage of using this method for patient transfers is that some activities performed away from the bed are not captured. For these reasons, a decision was made to focus on the nurse(s) responsible for the transferring/transferred patient at the time, and record all observed transfer related activities where possible.

A 24hr electronic timer running continuously was used as it enabled the observer to record the real-time in hours, minutes and seconds that observed activities were commenced and completed. An added advantage was that observed activities performed by more than one nurse in the same vicinity could be recorded. For example, commencement times of observed activities performed by the primary nurse would be recorded on the TTT. If a second nurse joined the primary nurse to assist with the patient, the starting time of this second activity could be recorded. Meanwhile the primary nurse completes the activity being performed and possibly commences another activity. Both times can be recorded. Activities performed behind closed bedside curtains were not recorded.

Timing Interruptions and Multi-tasking

As nursing is characterised by interruptions and multi-tasking, the time of any interruptions to an observed activity were recorded with a notation "I" plus a numerical indicator (I^1, I^2 I^3) indicating that the activity was interrupted and the number of times that an interruption occurred. A maximum of three interruptions were recorded. For tasks performed simultaneously (multi-tasking) the same timing procedure as described above was followed using the alpha-numerical indicators M^1, M^2 and M^3.

5.9.4 Privacy and Confidentiality

Patient privacy and confidentiality was maintained. Patient and nurse characteristics (other than the nurse(s) designation) were not recorded for privacy reasons and in line with the low and negligible risk ethics approval (Refer to Appendix G3). Therefore each transfer or bedspace move was identified by a unique alpha-numeric code. The nurse-observer remained outside the patient room except during those transfers whereby the patient was escorted by a nurse. At these times, the nurse-observer shadowed the escort nurse to the new location. Permission to follow the patients' bed to the transfer destination was sought from the patient (if clinically stable) or the patient's carer, via the clinical nurse responsible for the patients' care. At other times the nurse-observer followed the nurse responsible for the patient's care as the nurse moved throughout the ward, recording any transfer related activity. For the most part, transfer related activities were performed at the bedside or in the patient's room, although compilation of the medical record and related documentation were sometimes performed at the nurses' station. If the nurse being observed moved beyond the line of vision, such as behind closed bedside curtains the nurse-observer followed the standard process as used by other observational nurse researchers, and sought clarification from the nurse about the activity being performed (Cornell et al. 2010; Dwibedi et al. 2011; Elganzouri, Standish & Androwich 2009; Yen et al. 2009). Many nurses assisted with this by providing a running commentary of the activities that they were performing "I am now checking/doing ...". The nurse-observer did not participate in any nursing activity and nurses' performance(s) were not judged or assessed in any way. On one occasion in the interest of patient safety and in response to a query from a newly graduated nurse, the nurse-observer advised the nurse to seek medical assistance.

5.9.5 Data entry

Following completion of the observation and timing study, activity data and nurse designation were coded and entered into a Microsoft Access database and subsequently imported into PASW (IBM SPSS Software 2009) for analysis purposes. Three major databases were designed with one database detailing the observation periods, another for the movement data (sending or receiving transfers or bedspace move), and a third database for the observed activities and timing data.

As timings were conducted using an electronic timer running continuously, the time that activities were observed to commence and complete were entered into PASW in 24 hour time including minutes and seconds. Field notes were entered verbatim into the database.

5.10 Stage 3 Procedure: Case Study

Stage 3 involves in-depth analyses of two cases. Two sending transfers were selected for analysis from a possible 75 patient moves. The cases were selected based on their similarities and then their contrasting characteristics (Yin 2009, 2012). Comparisons between diverse cases can be difficult and open to criticism if cases span a period of time (Jensen & Rodgers 2001), therefore two cases were selected based on their similarities in terms of ward, nursing shift, month of the year and time of day. The cases (sending transfers) took place on the medical ward during the morning nursing shift in the month of August, within two hours of each other. The only difference between the transfers in terms of the period of time was the day of the week on which the transfer occurred.

The cases were also selected to demonstrate the differences between the duration of time that was taken to complete the move. Case 1 was completed within 30 minutes whereas Case 2 took more than one hour to complete. Furthermore, the same number of nurses were observed participating with each patient movement (n=3).

5.10.1 Field Notes

Observer field notes were taken during the period of observation. Field notes are a rich source of data and can provide a comprehensive perspective of the transfer process and help establish credibility (Baxter & Jack 2008; McDonald 2005). The field notes were unstructured in that they were not pre-scripted as can occur with interviews or focus groups (Mulhall 2003), nor did the field notes attempt to answer any ideological questions associated with patient moves. Rather the field notes reflect what the observer witnessed and/or sensed in the ward or other clinical units at the time of observation (Edvardsson & Street 2007; Mulhall 2003). Following the period of observation the field notes were reviewed and organised into themes. Organising into themes such as ‘Nurse Activities’ enabled comparisons to be made between field notes (field note to field note) (Reddy & Spence 2008) and helped to identify sub-themes e.g. ‘Nurse Activities: nurse escort’(refer toAppendix F).

5.11 Analyses

5.11.1 Stage 1 Analyses

Descriptive and frequency statistics were used for Stage 1 data. Using the secondary dataset, the admission unit was described and the admission and readmission rate calculated for patients included in this study. The length of hospital stay and the rate of patient moves was calculated by episode of care. Further analyses included the frequency of patient moves by month of the year, day of the week and nursing shift. These results were compared to the rate of admissions for the same period. Patient transfer and bedspace moves rates were calculated for both sending and destination locations, clinical specialty and unit level. The procedures used to calculate the transfer and bedspace move rates are detailed below.

Patient Transfers

To accurately determine the number of patient transfers per episode of care, calculations included transfers from the area of admission e.g. Emergency Department. The clinical destination rather than the sending (despatching) area were used to calculate transfer rates. The post-transfer destination was chosen in order to more accurately reflect the pattern of inpatient transfers. For example, it could be expected that using the sending unit, such as the ED, would not give a true indication of the pattern of transfers as shown in Appendix B1. Temporary transfers whereby the patient transferred to another department for the provision of a service (Webster et al. 2011) such as to the radiology department, before returning to the same bed in the same clinical unit were not included in this research project, as the (temporary) destination could not be verified.

Bedspace Moves

To calculate the rate of bedspace moves and to avoid including the bedspace immediately following a transfer in the calculation, only subsequent moves from one bedspace to another within the same ward or unit were included in analyses. Furthermore, as patients are regularly moved within the Emergency Department and at times, can be accommodated on trolleys and in non-designated areas (Lim et al. 2015; Richardson & Mountain 2009; Weber et al. 2011) which may not be accurately recorded, bedspace moves within the ED were excluded from these analyses.

Syntax Commands

To ensure that all known transfers and bedspace moves were captured in the analyses, syntax commands were designed. The intent was to recognise if the subsequent ward or bedspace differed from the former ward or bedspace, therefore reflecting a transfer or bedspace move. Consecutive entries for the same ward were excluded from analyses, unless the bedspace ID differed (refer to Appendix A, Syntax 1). In this case, the entry was classified as a bedspace move within the ward. Following removal of the duplicated entries, blank spaces necessitated that all subsequent entries be moved to the left (refer to Appendix A, Syntax 2). To maintain homogeneity with date and time variables, the same procedure was repeated for these variables. Commands were repeated 12 times for transfers to account for patients who were nursed in more than clinical unit up to a maximum of 13 locations i.e. 12 transfers.

To calculate the transfer rate per episode of care, the compute function in PASW was utilised. All units and wards attended per episode of care were counted and subtracted by 1 to give the transfer rate using (COMPUTE N_TF2=N - 1). As an additional checking mechanism, the *Count Values within Cases* feature was used to count the number of clinical units including and excluding the ED.

To calculate the rate of bedspace moves a slight amendment was made to the procedure used to calculate unit transfers. As described previously, for accuracy it was necessary to exclude any bedspace moves as a result of a transfer from another clinical area. Admission units, with the exception of the ED, were included in analyses. The rationale for this is that while some episodes of care may not involve a transfer, bedspace moves within the admission unit were still possible. Bedspace moves within the ED were excluded because some patients are nursed in corridors and other non-clinical areas during periods of high activity (Lim et al. 2015; Richardson & Mountain 2009; Weber et al. 2011). Known as over-census, patients nursed in non-clinical areas may not be allocated a distinct bedspace, in which case, any subsequent move to an 'official' bedspace might not be captured in the data.

The procedures as specified for transfers were repeated for bedspace moves using a modified syntax (refer to Appendix A, Syntax 3). Following application of the syntax, a simple equation was necessary to calculate the number of bedspace moves (bs). This entailed performing a count of all the clinical locations (l) per episode of care (including all bedspace IDs) less the number of transfers (t) per episode of care, minus one i.e. $bs = (l - t) - 1$. The minus one ensured that bedspaces associated with a transfer were not included in the calculation. Table 7 gives examples and results using the above equation for the calculation of bedspace moves.

Table 7: Calculation of Bedspace Moves

Clinical Locations (l) (n)	Transfers (t) (n)	Bedspace Moves (*bs*)* Result (n)
4	2	1
3	1	1
2	1	0
2	0	1

*$bs = (l - t) - 1$

Date and Time Calculations

The date and time of each transfer were provided as separate fields. To calculate the duration of each transfer, dates and time of day were combined into one variable. This enabled the sending unit date and time to be subtracted from the destination date and time and converted to hours. To calculate the time of transfer or time of bedspace move by nursing shift, transfer or bedspace times were re-coded to correspond with the nursing shift times.

5.11.2 Stage 2 Analyses

SPSS Version 22.0 (IBM 2013) was used for the analysis of Stage 2 data. Descriptive statistics were used to portray the number of observed patient movements, designation of the nurse, the number of observed activities and activity categories. Chi-square was used to test for association between the categorical values such as the type of transfer (sending/receiving) and ward specialty.

The total time spent by nurses on each patient movement and for each activity was calculated. The duration of time taken per movement and activity was calculated in minutes and seconds by subtracting the time an activity was observed to commence from the time the same activity was observed to have been completed. In a minority of instances (n=23, 2.6%) the activity completion time was not observed and/or recorded meaning that the duration of a task could not be calculated. Mean times were not imputed because the percentage of missing data were less than 5% which is considered to be the standard margin of error (Penny & Atkinson 2012; Polit & Beck 2010) and data that are 'missing at random' have been found to have a minimal impact upon results (Penny & Atkinson 2012). Activities with incomplete timing data were retained in the dataset for descriptive purposes but the timing data were excluded from calculations to establish the duration of time spent on the relevant activity(ies).

To determine if there was a significant difference in the mean time to relocate a patient by type of move, mean activity times and the mean number of nurses attending to each move, the Kruskal-Wallis test was used. These analyses were then repeated using Analysis of Variance (ANOVA) as it is considered to be the more robust test (Gleason 2013; McDonald 2014). Minimal differences were seen in the results between the two tests therefore the results from ANOVA are presented in this thesis. The *t*-test was used to determine if there was any difference in the time taken between RNs and ENs by activity category. Tukey's HSD test was used for post-hoc comparisons. All statistical analyses were performed at the 0.05 significance level.

Results from Stage 1 were combined with results from Stage 2 to calculate the duration of time (hours/days) spent by medical-surgical nurses on patient transfers and bedspace moves. The number of sending and receiving transfers associated with medical-surgical wards over one year as determined in Stage 1, were multiplied with the average time taken by nurses when attending to transfers and bedspace moves as determined in Stage 2. This enabled the average time spent by nurses attending to patient transfers per month and per annum to be calculated. The sum of the time spent on transfers and bedspace moves indicated the overall time spent by nurses moving patients. The time spent attending to patient transfers and bedspace moves was converted to Full-time Equivalents using standard formulae as recommended by government departments (Government of Western Australia n.d.).

5.11.3 Stage 3 Analyses

Two sending transfers are presented as case studies. In line with multiple sources of data and the embedded design, several analytical methods were incorporated in the case study analysis (Scholz & Tietje 2002; Yin 2006). Descriptive statistics were used for activity data as described above (Stage 2 Analyses). Activity and timing data for the selected cases were sorted sequentially and the duration of time between the completion of one activity and the commencement of the following activity was calculated.

Confidence intervals were used to determine if the duration of time taken to move the patients in the selected cases were representative of the mean time taken to send a patient to another ward or unit. A one-sample *t*-test was used to compare the time taken to perform each activity in the selected cases compared to the time taken to perform the same activities across the sample of sending transfers.

Field notes taken at the point of observation supported the quantitative data by reflecting what the observer witnessed and/or sensed at the time of observation (Edvardsson & Street 2007; Mulhall 2003). Data were analysed using Microsoft Office Excel 2007 and SPSS version 22.0 (IBM 2013).

Chapter 6. Stage 1 Results

This Chapter will present the results of the Stage 1 study undertaken to determine the pattern and rate of patient transfers and bedspace moves within a tertiary level hospital, Sydney Australia, using retrospective data extracted from hospital administrative datasets. Transfers and bedspace moves were examined for adult patients with a minimum hospital stay of 48 hours.

Results from database analyses are presented by episodes of care that detail admission characteristics such as length of hospital stay. Transfer and bedspace move rates per episode of care are also presented. These are followed by the results of detailed analyses of patient transfers and bedspace moves that explore which clinical areas experience the most patient movements. The results from the timing study conducted as Stage 2 and the detailed analysis of two sending transfers in a case study format (Stage 3) are presented in subsequent chapters.

6.1 Patients

The sample represented patients admitted to a tertiary level hospital during 2008-2009 for a hospital stay of 48 hours or more. In this study, there were 10,733 individual patients and 14,157 episodes of care during the 12 month period. The majority of patients (79.6%, n=8542) were admitted to the site hospital on one occasion during the year. However, 20.4% (n=2191) of patients were admitted to hospital at least twice (range 2-10). Admission to hospital for the majority (77.0%, n=8269) of patients was via the Emergency Department (ED).

6.2 Episodes of Care

6.2.1 Average Length of Stay

Analyses in this section have used episodes of care or hospital admissions rather than patients, as the denominator. The average length of stay (ALOS) was calculated for all episodes of care, and then separately for hospital readmissions. The ALOS per episode of care was 9.1 days (median 5.9, SD 10.46) increasing to 9.5 days (median 6.5, SD 9.07) for readmissions. The ALOS per unit was 3.4 days (median 5.9, SD 3.52) while the average time spent in each bedspace was 2.8 days (median 2.1, SD 2.40) demonstrating that patients would often move between wards and units and between bedspaces within each ward or unit.

6.2.2 Admission Unit

Episodes of care were examined in greater detail to determine the frequency by different admission units. As referred to previously, the majority of hospital admissions occurred via the Emergency Department (ED) or Emergency Medical Unit (EMU). Second to the ED, patients were most commonly admitted to day-only or short stay units (9.0%), surgical units (4.6%) or oncology units (3.0%) (Table 8). Admissions to the day only/short stay units are interesting as patients with a length of stay of less than 48 hours were excluded from the study, yet clearly patients were staying longer than this. Direct admissions to the paediatric/maternity units, the transit lounge an area reserved for discharging patients and the operating theatre were in the minority.

Table 8: Admission Unit

Admission unit	n	%
ED/EMU	10,892	76.9
Day only/short stay	1275	9.0
Surgical	638	4.6
Oncology	431	3.0
Medical	307	2.2
Assessment units	272	1.9
ICU/CCU/HDU*	189	1.4
Dialysis units	63	0.4
Aged care/Rehabilitation	42	0.3
Paediatrics/Maternity	26	0.2
Transit lounge	20	0.1
Operating theatre	2	0.0
Total	14,157	100%

*Intensive Care Unit (ICU); Coronary Care Unit (CCU); High Dependency Unit (HDU)

6.3 Transfers

Transfers, the movement between clinical units, were frequent. Over the study year a total of 27,142 patient transfers were performed. The vast majority of episodes of care (92.9%, n=13,149) involved at least one transfer, only 7.1% (n=1008) of episodes of care had nil transfers. The transfer rate averaged 1.9 transfers (SD 1.35) per episode of care as shown in Table 9.

The high rate of episodes of care incorporating at least one transfer is to be expected as the vast majority of episodes of care commenced in the ED (76.9%, n=10,892) and patients being admitted to hospital need to be transferred to another clinical unit following assessment. Patients admitted directly to a clinical unit other than the ED were also transferred. The majority of patients (91.6%, n=2990) admitted directly to a clinical area were transferred at least once (mean 1.88, median 2.0, range 0-11). This means that in only 275 (8.4%) episodes of care, patients were admitted directly to a clinical unit and remained in that one unit throughout their hospital stay.

Table 9: Transfers and Bedspace Moves by Episode of Care

Type of Move	Total	Mean	SD	Range
Transfers	27,142	1.9	1.35	0-12
Bedspace moves*	7573	0.5	0.95	0-10
All moves	34,715	2.4	1.78	0-12

*Excludes moves within the ED

6.4 Bedspace Moves

In addition to transfers between units, patients were moved from one bedspace to another within a clinical unit. Transferring a patient between units would mean that they would be nursed in at least two different bedspaces (one in the sending unit and one in the destination unit). To avoid duplication with transfers, the bedspace associated with a transfer destination was excluded. In which case, only subsequent bedspace moves within units were included in analyses. As detailed earlier, bedspace moves within the ED were also excluded from analyses (refer to Section 5.11.1).

Of the 14,157 episodes of care, one third (33.5%, n= 4744) involved a bedspace move. Table 9 shows that 7573 bedspace moves were conducted, resulting in a mean rate of 0.5 bedspace moves per episode of care. Compared to transfers, fewer episodes of care involved a bedspace move within the same clinical unit.

6.5 Transfers by Clinical Specialty

Transfers were examined in more detail to determine which clinical specialties (as detailed in Table 4) were most likely to receive a transferred patient. For this reason, analyses excluded the admission unit. As can be seen in Table 10 the most frequent transfer destinations were medical units (23.5%, n=6379) followed by surgical units (21.3%, n=5787) and the high nursing intensity units (ICU, CCU or HDU) (14.1%, n=3819). Less than 5% of transfers were to the dialysis units, day only, short-stay, paediatric or maternity units.

Table 10: Frequency of Patient Transfers by Clinical Specialty

Transfers	n	%
Medical	6379	23.5
Surgical	5787	21.3
High nursing intensity units	3819	14.1
Assessment units	3309	12.2
Aged care/Rehabilitation	2434	9.0
Operating theatre	1664	6.1
Transit lounge	1194	4.4
Oncology	1111	4.1
Emergency Department*	595	2.2
Dialysis	488	1.8
Day only/short-stay*	319	1.2
Paediatrics/Maternity	43	0.2
Total	27142	100%

*Excluded as admission unit

As previously mentioned, transfer analyses were performed using destination units and therefore excluded admission units. However, over 900 (3.4%) transfers were to units traditionally classified as admission areas. For example, 595 (2.2%) transfers were to the ED or EMU and 319 (1.2%) of transfers were to the day-only or short-stay units. This means that some patients transferred to these units at some point during their hospitalisation, after having been admitted elsewhere. For further details on the nature and destination of transfers by clinical specialty refer to Appendix B2.

6.6 Bedspace Moves by Clinical Specialty

Bedspace moves followed a similar pattern to transfers. Patients admitted to medical and surgical units experienced the most bedspace moves within the one unit. Table 11 shows that over 38% of bedspace moves occurred within the medical units and 23% occurred in surgical units. Patients admitted to some areas experienced far fewer bedspace moves, indicating that they generally remained in the one bedspace throughout their unit stay.

Table 11: Frequency of Bedspace Moves by Clinical Specialty

Bedspace Moves		
	n	**%**
Medical	2921	38.6
Surgical	1774	23.4
Aged care/Rehabilitation	1333	17.6
ICU/CCU/HDU	747	9.9
Oncology	436	5.8
Assessment units	285	3.8
All other areas*	77	1.0
Total	7573	100%

*ED excluded

6.6.1 Patterns of Patient Movements

Based on published literature indicating that patients were more likely to be transferred on days associated with a high rate of admissions and few discharges (refer to Section 2.2.3), analyses were performed to determine the rate of admissions, transfers and bedspace moves by day of the week. Monday was the busiest day for hospital admissions (17%) but the quietest in terms of moving patients (6.6%). The busiest day for moving patients was Wednesday, with 18.3% of all transfers and 16.4% of bedspace moves being carried out on this day.

Fewer patients were admitted on the weekends. However, the rate of patient moves differed between Saturdays and Sundays. Slightly fewer patients were moved on a Saturday (n=5822) 16.8%) compared to the midweek average (mean 5902, 17%) whereas only 8.6% (n=2982) of patient moves occurred on a Sunday (Table 12**).**

Table 12: Admissions, Transfers and Bedspace Moves by Day of the Week

	Admissions		**Transfers**		**Bedspace Moves**	
Day of Week	**n**	**%**	**n**	**%**	**n**	**%**
Monday	2412	17.0	1464	5.4	835	11.0
Tuesday	2206	15.6	4748	17.5	1152	15.2
Wednesday	2156	15.2	4957	18.3	1240	16.4
Thursday	2091	14.8	4763	17.6	1144	15.1
Friday	2156	15.2	4445	16.4	1158	15.3
Saturday	1611	11.4	4715	17.4	1107	14.6
Sunday	1525	10.8	2045	7.6	937	12.4
Total	14,157	100%	27,137*	100%	7573$	100%

*Missing data (n=5)
$ED excluded

6.6.2 Transfers by Nursing Shift

The time of day that transfers were carried out was examined. Hourly rates were collapsed into nursing shift times based on work by Baernholdt and colleagues (2010). As shown in Table 13, the majority of hospital admissions occurred during the day or evening shifts. Almost half of hospital admissions were during day time hours on the am nursing shift (49.5%) while 35.7% were during the pm shift. Almost 15% of hospital admissions were during the night shift. Patient transfers and bedspace moves followed a similar pattern to admissions.

Table 13: Admissions, Transfers and Bedspace Moves by Nursing Shift

Shift Time (hrs)	Admissions		Transfers		Bedspace Moves	
	n	%	n	%	n	%
0700-1459 (am shift)	7000	49.5	14210	52.4	3374	44.6
1500-2259 (pm shift)	5057	35.7	11941	44.0	3494	46.1
2300-0659 (night shift)	2100	14.8	986	3.6	705	9.3
Total	14157	100%	27137*	100%	7573$	100%

*Missing data (n=5)
$ED excluded

6.7 *Medical-Surgical Transfers and Bedspace Moves*

As Table 10 and Table 11 indicated that medical-surgical specialties received the most transferred patients and also moved more patients between bedspaces compared to the other clinical specialties, analyses from hereon have focussed on the medical-surgical wards.

To determine the pattern of patient moves for the medical and surgical specialties, analyses were performed by month of the year. As demonstrated below in Figure 1, patient moves increased from Autumn (March), remained at a steady (high rate) throughout the Winter (June to August) until early Spring (September) at which point the number of moves declined. January and February were the quietest months in terms of the overall number of patient moves. A further breakdown by type of move, medical and surgical specialties, and by month of the year are shown in 0 B5-6.

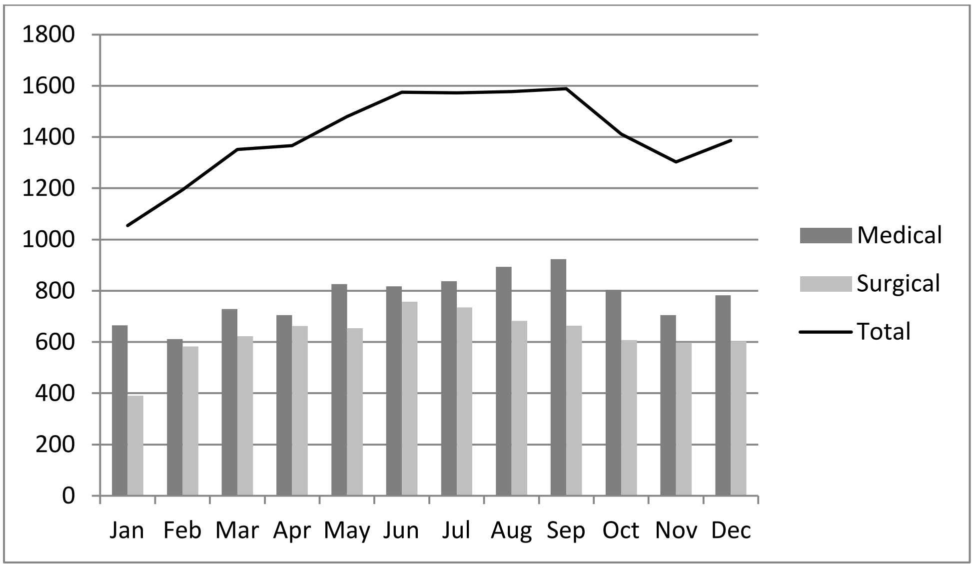


Figure 1: Medical-Surgical Patient Moves by Month of the Year

6.7.1 Transfers and Bedspace Moves by Medical-Surgical Units

Transfers and bedspace moves were examined by individual medical and surgical units to determine whether specific units were more likely to receive transferred patients or move patients between bedspaces.

Medical Units

The medical units consisted of six individual wards, labelled here as M1 to M6. Table 14 shows that the medical unit that received the most transfers (M1) was not the medical unit with the greatest number of patient moves. The busiest unit in terms of total patient moves was M5 (neurology) that had an almost equal number of transfers (n=1293) as bedspace moves (n=1267). Over 25% (n=2560) of all patient moves across the medical specialty were associated with this unit. Second to M5 was the respiratory unit (M4) with 2190 (21.5%) moves, closely followed by M1 with 2143 (21.0%) patient moves. Almost one third (32.4%, n=3307) of patient moves occurred on the three remaining units, M2, M6 and M3. The total number of patient movements associated with the six medical units can be considered to be quite substantial. However, as this study excludes short-stay patients and temporary transfers for diagnostics, the actual patient turnover rate per unit is likely to be much higher.

Table 14: Frequency of Patient Moves in the Medical Units

Unit ID	Specialty	Transfers		Bedspace Moves		Total Moves	
		n	%	n	%	n	%
M5	Neurology	1293	20.3	1267	43.4	2560	25.1
M4	Respiratory	1411	22.1	779	26.7	2190	21.5
M1	Medical	1640	25.7	503	17.2	2143	21.0
M2	Medical	802	12.6	103	3.5	1805	17.7
M6	Cardiology	1122	17.6	265	9.1	1387	13.6
M3	Medical	111	1.7	4	0.1	115	1.1
Total		6379	100%	2921	100%	10200	100%

Surgical Units

Within the surgical clinical specialty, 12 clinical units were identified. These 12 units represented the nine surgical specialty areas of head and neck, plastic surgery, neurosurgery, cardio-thoracic, vascular, urology, orthopaedic, gynaecology, and general surgery. Hospital restructuring and capital works meant that wards/units were repeatedly relocated and renamed giving the appearance of multiple units. Therefore for the purposes of this analysis, the 12 units were collapsed into six units. These were grouped by their surgical specialty and labelled as S1-S6.

Table 15 reveals that 86.2% (n=6519) of patient movements occurred in four surgical units. The unit with the most moves was S3 (neurosurgery) with a total of 1827 (24.2%) patient moves, closely followed by S1 the cardio-thoracic unit (22.0%), S2 the general surgical ward (20.2%) and S5 the orthopaedic unit. The vascular-urology (S4) and gynaecology (S6) units had few moves. S1 the cardio-thoracic unit, should receive special mention. The unit contained three discreet areas within the one geographical location. Namely a cardio-thoracic intensive care unit (CICU), cardio-thoracic ward beds and at one time, an annex used for short-stay patients and for patients nearing discharge. Almost one third of transfers within the cardio-thoracic unit (31.6%, n=462) was the result of transfers between these three clinical areas (bedspace moves excluded).

Table 15: Frequency of Transfers and Bedspace Moves within Surgical Units

Unit ID	Specialty	Transfers		Bedspace Moves		Total Movements	
		n	%	n	%	n	%
S3	Neurosurgery	1469	25.4	358	20.2	1827	24.2
S1	Cardio-thoracic	1463	25.3	201	11.3	1664	22.0
S2	Surgical	1073	18.5	453	25.5	1526	20.2
S5	Orthopaedics	917	15.8	585	33.0	1502	19.9
S4	Vascular-urology	688	11.9	146	8.2	834	11.0
S6	Gynaecology	177	3.1	31	1.7	208	2.8
Total		5787	100%	1774	100%	7561	100%

6.7.2 Summary

The exploration of health administrative datasets for patient transfers and bedspace moves has yielded data on the frequency that patients with an overnight stay of at least two days are moved within and between clinical units during their hospitalisation. The pattern of patient moves by month of the year and nursing shift was realised.

Importantly, the data have highlighted that medical and surgical specialities receive more transferred patients and perform more bedspace moves than any other clinical specialities. Further analyses identified which medical-surgical wards were the busiest in terms of patient movements. From these results one medical and one surgical ward were selected for Stage 2 of this project. An observational-timing approach was used in Stage 2 to explore how much time is required by nurses when transferring and moving inpatients. The results from the second stage of the study will be discussed in the following Chapter.

Chapter 7. Stage 2 Results

This Chapter presents the results from Stage 2, the observational-timing study which determined the time taken by nurses when moving a patient between wards or bedspaces. Stage 1 as described in Section 5.3 examined secondary data to identify the frequency and pattern of patient transfers and bedspace moves. Those results presented in Chapter 6 laid the foundation for Stage 2 by identifying the pattern of patient movements and the medical and surgical wards to be used as sites for the observational-timing study. Results from Stage 2 are presented by frequency of patient movements, the time taken by nurses to move a patient by activity category and by individual activity and the number and designation of nurses observed to be participating with patient movements.

7.1 Observed Patient Moves

Over the seven week observation period 83 patient movements were observed across the two wards. Eight observed moves were considered ineligible according to the study criteria (see Section 5.2.4) and were removed from further analyses. Seventy-five patient moves fulfilled the study criteria and were retained for analysis. These moves consisted of 58 transfers and 17 bedspace moves. Of the transfers, 22 were sending transfers and 36 receiving transfers (Table 16). The majority (68%, n=51) of these patient moves were performed for clinical reasons, however 32% (n=24) were performed for non-clinical reasons as discussed in Chapter 2. For the purposes of this study, non-clinically based moves included those undertaken to accommodate another patient on the ward (n=10, 42%), to relocate outliers or over-census patients (n=8, 33%), to maintain gender-specific rooms and/or in response to patients' requests (n=4, 17%) and in two instances (8%) because of nursing staff shortages associated with an industrial dispute (strike action) (see Appendix F, Field notes 14.5 and 14.6).

A total of 39 (52%) patient moves were observed on the medical ward and 36 (48%) on the surgical ward. A significantly greater number of sending transfers were observed on the medical ward (n=16, 21%) compared to the surgical ward (χ^2(1, N=22) =4.54, p=.03)). This demonstrates a different pattern from Stage 1, whereby the number of sending transfers was almost equal for the medical and the surgical wards (see 01). Reasons for these differences are not known. The percentage of receiving transfers did not differ between the wards (χ^2 (1, N = 36) = 1.77, (p = .18)). The number of bedspace moves observed was almost equal on both wards.

Table 16: Patient Moves by Ward Type

	Sending Transfers		Receiving Transfers		Bedspace Moves	
	n	%	n	%	n	%
Medical (n=39)	16	21.3	14	18.7	9	12.0
Surgical (n=36)	6	8.0	22	29.3	8	10.7
Total	22	29.3%	36	48.0%	17	22.7%

7.1.1 Pattern of Moves

In this small sample of moves, the busiest day of the week for the observation of transfers and bedspace moves was Wednesday. Nineteen transfers and four bedspace moves (30% of the total movements) were observed on this day. The least moves were observed on a Monday. which is consistent with the data from Stage 1 (refer to Figure 2).

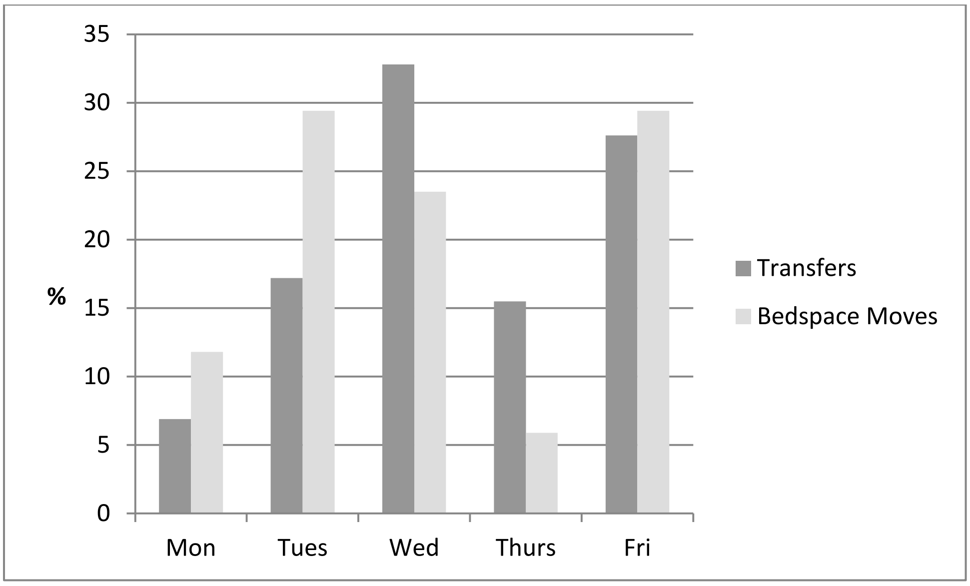


Figure 2: Percentage of Transfers and Bedspace Moves by Weekday

Within the period of observation (from 0800 to 1700hrs Monday to Friday), 86% (n=151) of transfers and bedspace moves occurred between 0900hrs and 1300hrs, whereas no moves were observed before 0900hrs or after 1500hrs (refer to Figure 3). The pattern of observed patient moves is similar to that found in Stage 1, although at that time the peak period for moving a patient occurred later in the day from 1200 to 1600hrs (refer to Appendix B4).

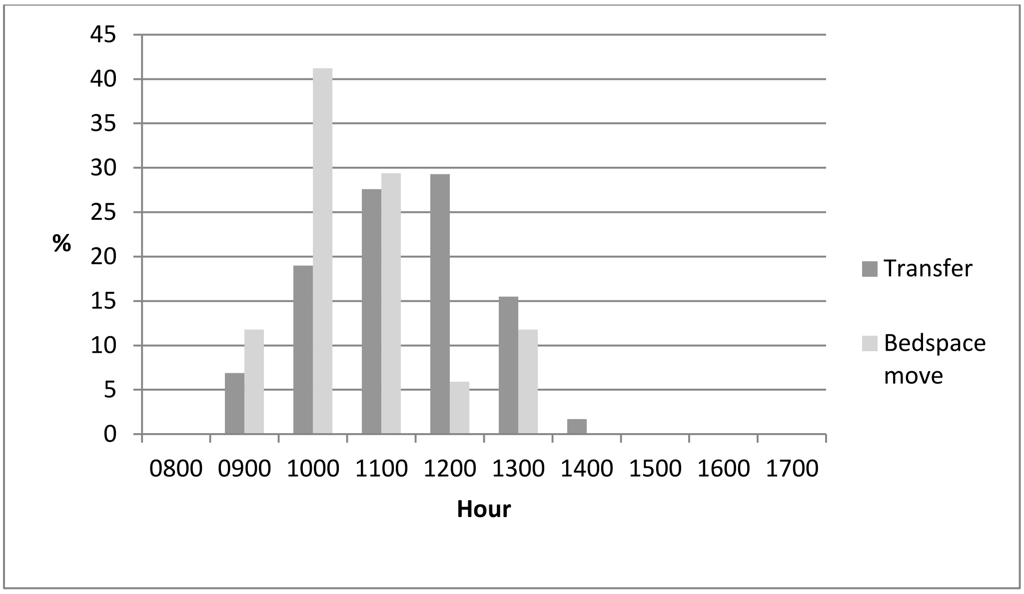


Figure 3: Time of Observed Transfers and Bedspace Moves

7.1.2 Duration of Patient Moves

Relocating a patient took 57.5 minutes on average (SD 50.09, range 5.2-235.6) from the time that the move was confirmed to the time that the move was completed. Transfers averaged 65.8 minutes (SD 53.14, range 5.3-235.6) and bedspace moves 29.2 minutes (SD 21.13, range 5.2-67.4).

There was a significant difference between the mean time for the type of move [$F(2, 72) = 3.91$, $p = .024$]. Receiving transfers took a mean of 68.3 minutes (SD 49.16) and bedspace moves took a mean of 29.2 minutes (SD 21.13) (*Post hoc* comparisons Tukey HSD test $p = .020$). There was no statistically significant difference for the duration of other moves. The box-plot below shows the duration and distribution by type of move.

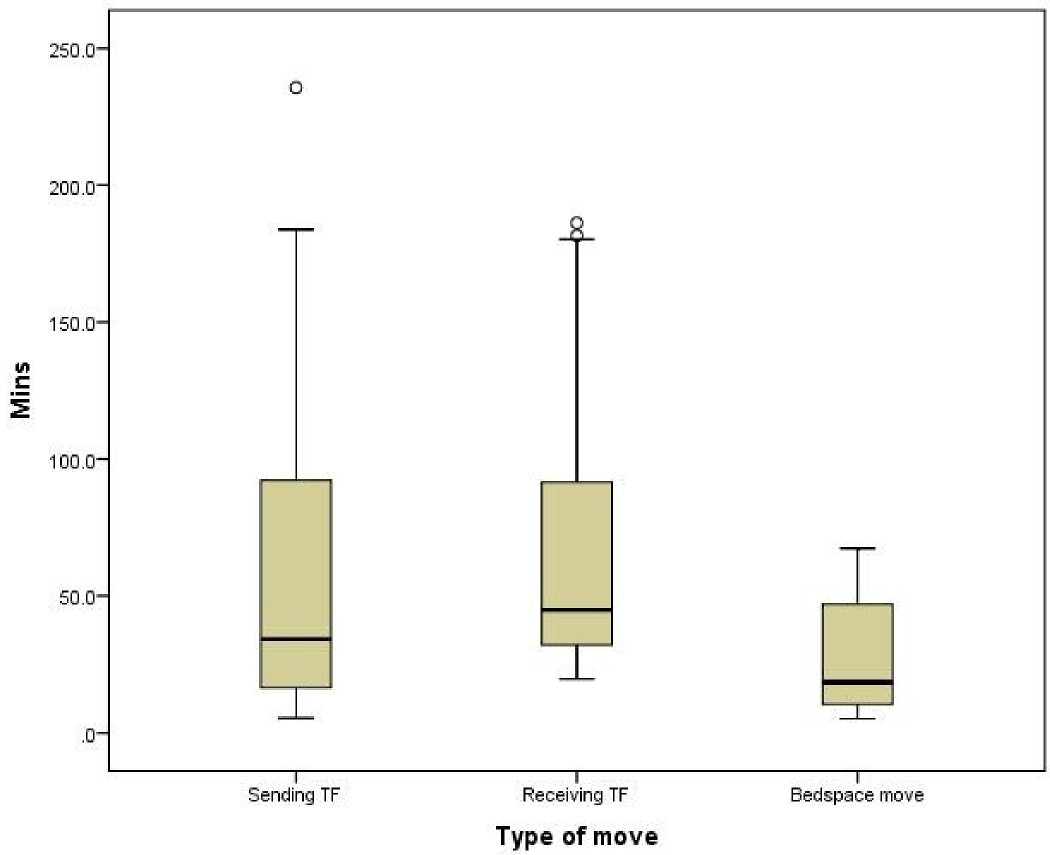


Figure 4: Duration by Type of Move

7.2 Activities

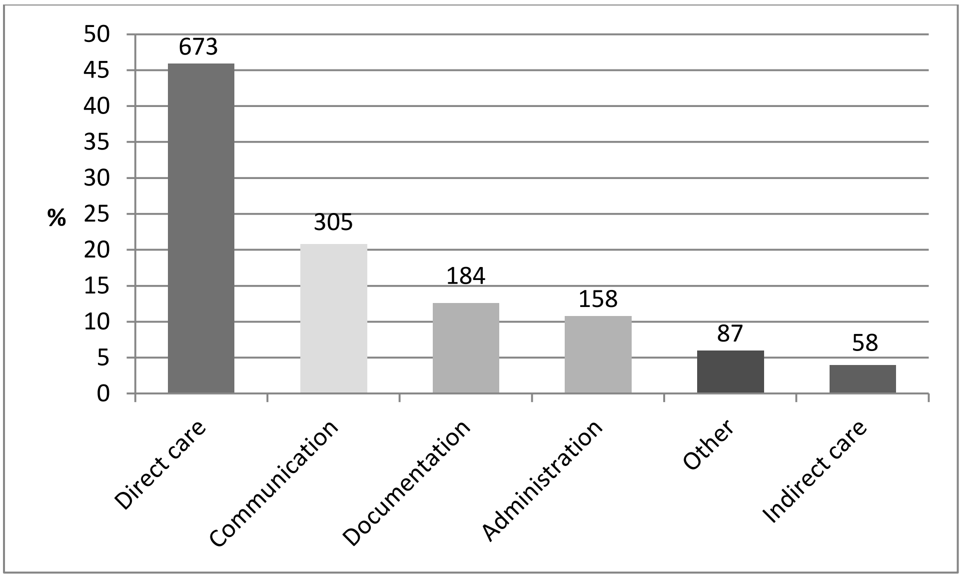
A total of 891 activities were observed and 868 timings of these activities completed. This means that for 23 (2.6%) recordings the completion (end) time of an activity was not captured. These recordings were excluded from timing analyses.

The following sections will initially display the frequency of activities and the duration of time spent on nursing activities by activity category. Subsequent sections will focus on the individual activities that nurses were observed performing when moving a patient. The frequency and the time taken to perform these activities are demonstrated.

7.2.1 Activities by Activity Category

The majority of activities performed by nurses were communicative (35.7%, n= 318) or related to direct patient care (31.2%, n=278). Documentation was the third most frequent activity (12.3%, n=110), followed by administrative tasks (8.6%, n=77), activities not previously identified (categorised as ‘other’) (7.3%, n=65) and indirect care activities (4.8%, n=43).

The most frequently performed activities (communication) did not take the most time (20.8%). As shown in Figure 5, the majority of nurses’ time was spent on direct patient care activities (45.9%). Similar proportions of time were spent on documentation (12.6%) and administrative tasks (10.8%). Indirect care activities took the least amount of nurses’ time.



Note: Figures indicate total minutes spent on activities by category

Figure 5: Percentage of Time Spent by Nurses by Activity Category

Activity Categories by Type of Move

Activity categories were examined by type of move. As shown in Figure 6, communication was the most frequent activity for sending (36.4%, n=84) and receiving transfers (38.5% n=205), but also featured highly in bedspace moves (22.8%, n=29). Direct care activities were frequently recorded for receiving transfers (37.3%, n=199) and to a lesser extent for sending transfers (23.8%, n=55) and bedspace moves (18.9%, n=24). A feature of sending transfers was that 19.9% of nurses' activities were in the form of documentation compared to 11.3% for receiving transfers and only 3.1% for bedspace moves.

Bedspace moves showed a different pattern with 'other' activities the most frequently performed (25.2%, n=32), followed by indirect care activities and communication in equal proportions (22.8%, n=29). The percentage of Administrative tasks was comparable between the three movements (see Figure 6).

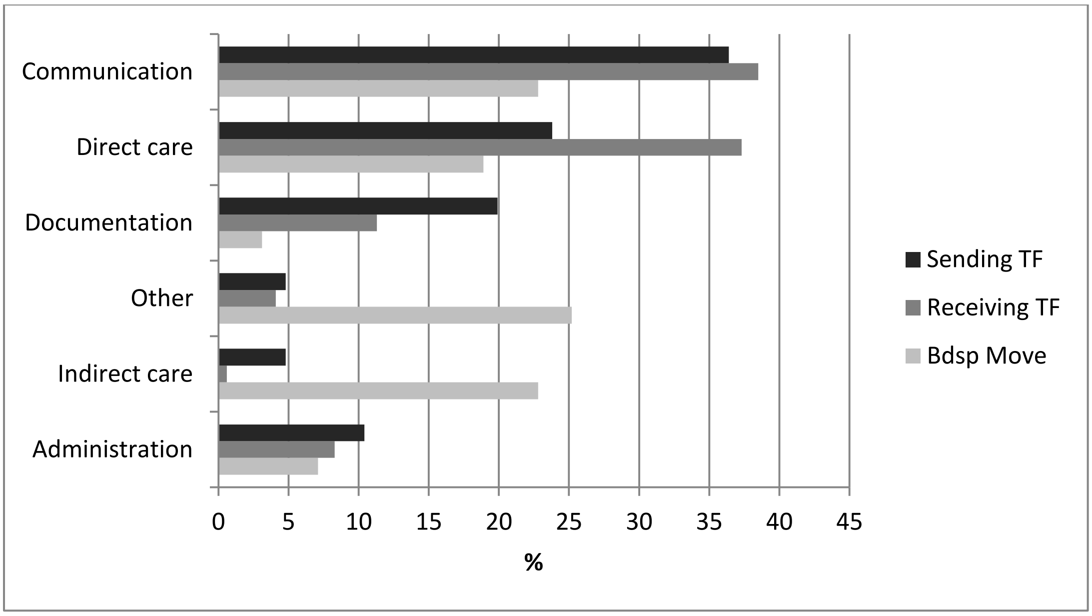


Figure 6: Percentage of Activity Categories by Type of Move

7.2.2 Activities Associated with Transfers and Bedspace Moves

The following sections explore in greater depth the activities undertaken by nurses when attending to patient moves. Table 17 demonstrates the accumulated (total) time spent on an activity in order to determine which activities had the greatest impact on nurses' time and therefore workload. Subsequent sections demonstrate the frequency and average time spent by nurses on individual activities. Activities are presented by activity category by order of frequency as shown in Figure 6.

The greatest (accumulated) amount of nursing time (63%) was spent on five activities as shown in Table 17. Escorting the patient and documentation took the greatest amount of nurses' time overall. Almost 22% of the nurses' time involved escorting 17 patients from one location to another and a further 12.6% of their time involved documentation. Direct nursing care activities such as performing vital signs occupied 11.2% of nurses' time.

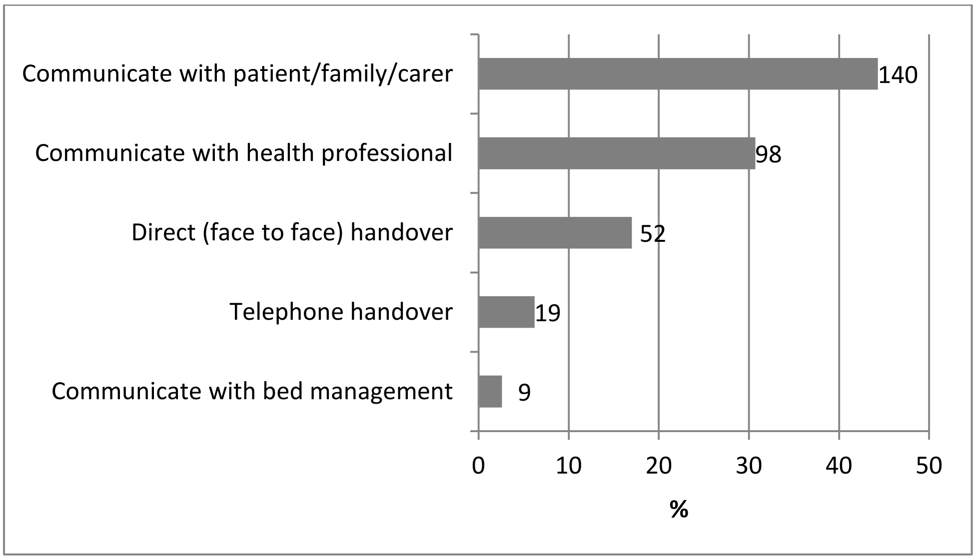
Table 17: The Five Activities that Accounted for the most Time (minutes)

Activity	Total*	%
Nurse escort (n=17)	320.3	21.8
Document (in) medical record, electronic medical record, charts or care plan (n=106)	184.4	12.6
Perform vital signs, medications, dressings, procedures (n=99)	163.8	11.2
Compile medical record/charts (n=55)	140.6	9.6
Direct (face to face) handover (n=52)	118.9	8.1
All other activities (n=540)**	539.1	36.7
Total	1467.1	100%

*Total time (minutes) spent on each activity across all moves.
**Refer to Appendix E2 for a complete listing of activities and accumulated times.

7.2.3 Communication

As shown previously, nurse communication was the most frequently observed activity associated with patient moves. The nurse was most often observed communicating with the patient and/or family members (43.5%, n=140) or other health professionals (30.7%, n=97) (see Figure 7).



Note: Figures indicate number of observed activities

Figure 7: Percentage of Frequency of Activities within the Communication Category

In terms of time, nursing handover took the most nursing time within the communication category. Direct or face-face handovers were observed almost three times more often than telephone handovers but occupied less nursing time. Telephone handovers averaged 3.2 minutes compared to 2.3 minutes for direct handovers. Communications ranged between 0.5-1.5 minutes with the lengthiest conversations occurring with the bed management team (Table 18).

Table 18: Nurse Time Spent on Communication Activities

Communication Activities	Duration (mins)	
	Mean	SD
Telephone handover (n=19)	3.2	2.13
Direct (face to face) handover (n=52)	2.3	1.72
Communicate with bed management (n=8)*	1.5	2.07
Communicate with health professional (n=94)*	0.6	0.60
Communicate with patient/family/carer (n=133)*	0.5	0.57
All communication activities	1.0	1.37

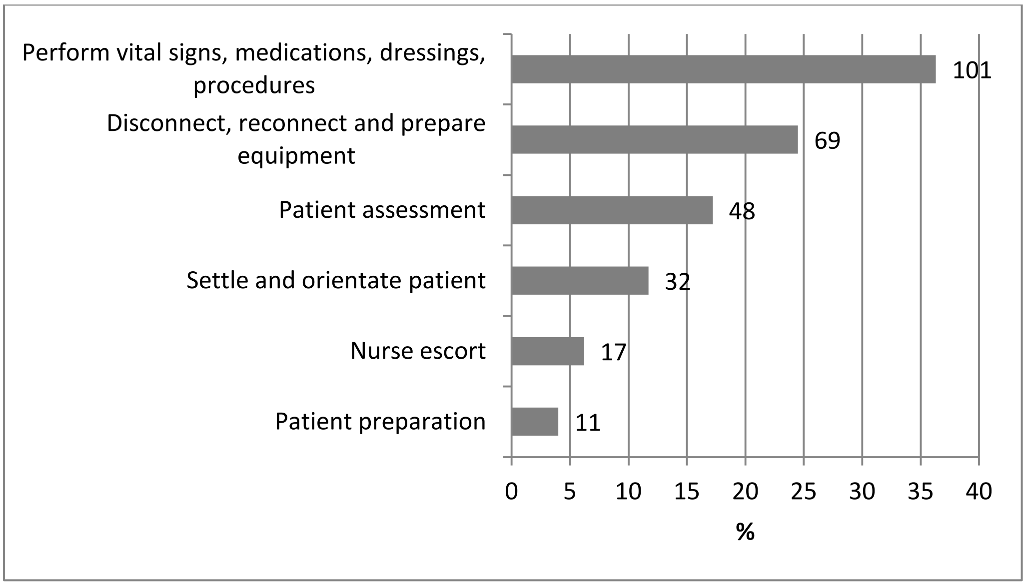
Note: *Missing data (timing data not available for all observed activities)

Nursing Handover

Nursing handover was observed and timed on 71 occasions for 52 (69%) patient moves. In 24% (n=18) of patient moves more than one handover was provided. There was no handover observed as being provided in 30.6% (n= 23) of patient moves. These were primarily during bedspace moves (n=11, 64.7%). The number of nursing handovers was not significant at the .05 level when compared to the type of move (ANOVA, p =.095).

7.2.4 Direct Care

As previously mentioned, much of the transfer process involved direct patient care. Performing vital signs, administering medications and performing dressings or procedures were the most often performed (n=99, 36.3%) direct care activities. Disconnecting and reconnecting equipment from a power supply was another frequently performed activity (n=67, 24.5%).



Note: Figures indicate number of observed activities

Figure 8: Percentage of Frequency of Activities within the Direct Care Category

Direct care activities took 2.5 minutes on average (SD 7.05) as shown in Table 19. Preparing the patient for transfer took almost seven minutes on average although some patients required an hour of the nurse's time. Escorting the patient took the nurse away from the ward for almost 19 minutes.

Table 19: Nurse Time Spent on Direct Care Activities

Direct Care	Duration (mins)	
	Mean	SD
Nurse escort (n=17)	18.8	16.52
Patient preparation (n=11)	6.6	17.83
Perform vital signs, medications, dressings, procedures (n=99)*	1.7	2.42
Patient assessment (n=47)*	1.1	1.69
Settle and orientate patient (n=32)	0.9	0.68
Disconnect, reconnect and prepare equipment (n=67)*	0.5	0.4
All Direct Care activities	2.5	7.05

Note: *Missing data (timing data not available for all observed activities)

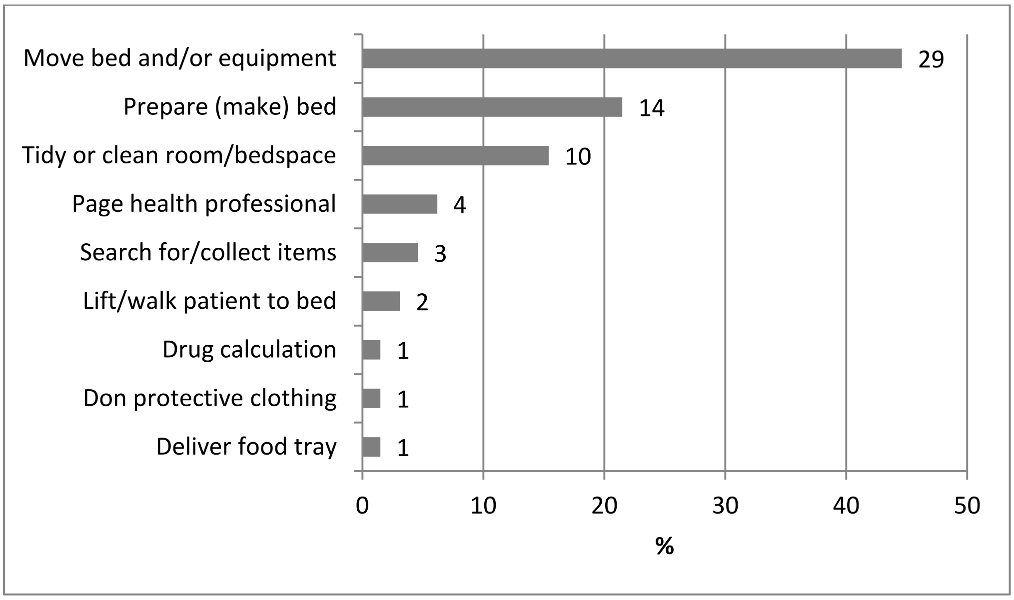
7.2.5 Documentation

Documentation related to the patient transfer process was frequent. Over 100 incidences of documentation were observed and timed. This took the form of documenting vital signs, updating care plans and writing in medical records. Reflecting the different forms of documentation and the complexity of the information required, this activity could take a few seconds to over one hour with an average time of 1.7 minutes (SD 1.37, range 0.1-61.3). (This nursing activity is not shown figuratively).

7.2.6 Other Activities

Nine other activities that had not been observed to be performed during the pilot study were observed and timed during data collection. Nurses were frequently observed moving patient beds and equipment for bedspace moves (44.6 %, n=29).

Other activities such as donning protective clothing prior to transfer were specific to the individual patient move and observed on one occasion (Figure 9).



Note: Figures indicate number of observed activities

Figure 9: Percentage of 'Other' Activities

Moving patient beds and equipment took 1.5 minutes on average, with a wide variation. Making the bed in readiness for, or following a transfer, averaged 1.8 minutes while tidying and/or cleaning the room, bedspace and equipment averaged 0.6 minutes (Table 20).

Table 20: Nurse Time Spent on 'Other' Activities

'Other' Activities	Duration (mins)	
	Mean	SD
Prepare (make) bed (n=14)	1.7	1.35
Move bed and/or equipment (n=29)	1.5	3.70
Tidy or clean bedspace, room, or equipment (n=10)	0.6	0.30
Page health professional (excludes orderly) (n=4)	0.4	0.15
Search for/collect items (n=3)	1.6	0.96
Lift/walk patient to bed (n=2)	0.7	0.00
Deliver food tray to transferred patient (on receiving ward) (n=1)	3.3	-
Don protective clothing (for transfer) (n=1)	2.3	-
Drug calculation (n=1)	0.6	-
All 'Other' activities	1.4	1.93

7.2.7 Indirect Care

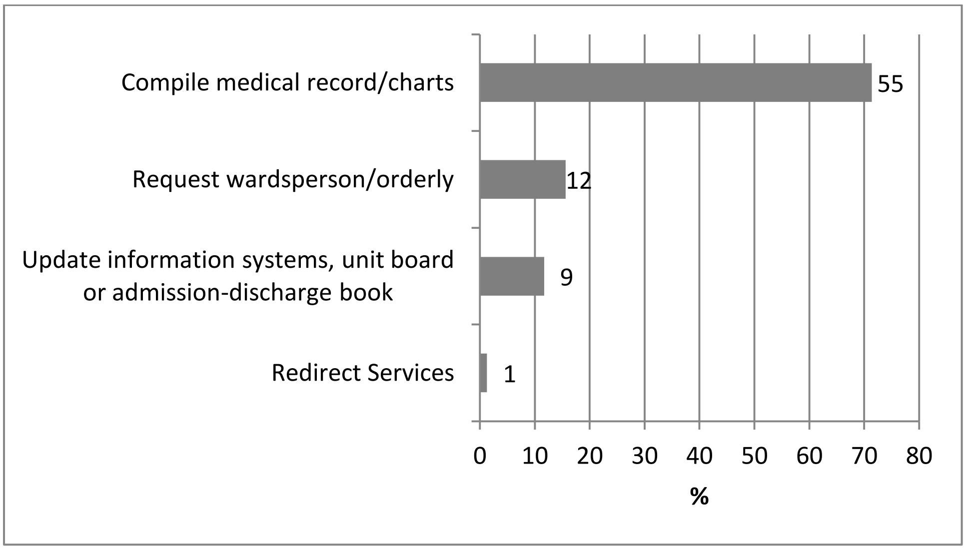
Only two activities were included in the Indirect Care category. Moving patients' bedside lockers and tables was performed by nurses on 29 (69%) occasions and packing or unpacking patient's belongings were observed on 13 occasions. Moving bedside lockers and tables took nurses less than one minute (47 seconds) on average. Packing or unpacking a patient's belongings took less than three minutes on average (Table 21).

Table 21: Nurse Time Spent on Indirect Care Activities

Indirect Care	Duration (mins)	
	Mean	SD
Pack/unpack patient belongings (n=13)	2.7	3.0
Move bedside locker/table (n=29)	0.8	0.64
All Indirect Care activities	1.4	1.93

7.2.8 Administration

Administrative activities were those considered to be essential for the organisation of a transfer. Nurses spent 10.8% of their overall time on administrative activities associated with patient moves. Within the administration category, compiling medical records was the most frequently observed activity (71.4%, n=55) followed by requests for an orderly (15.6%, n=12) as shown in Figure 10.



Note: Figures indicate number of observed activities

Figure 10: Percentage of Administrative Activities

Within the administrative category, compiling the medical records took the most time. This activity took 2.6 minutes (range 0.1-33.8) on average. Updating information systems (range 0.6-1.9) and calling for a wardsperson or orderly took less than one minute on average (range 0.0-1.6) (see Table 22). Nurses were not observed forwarding a request for environmental (cleaning) services or coordinating staffing and/or beds in response to a patient move. These administrative tasks may have been performed by the ward clerk or by a nurse positioned near or at the nurses' station. If the observer was timing activities in the vicinity of the patient's room, these tasks may not have been observed.

Table 22: Nurse Time Spent on Administration Activities

Administration	Duration (mins)	
	Mean	**SD**
Compile medical record/charts (n=54)*	2.6	6.07
Update information systems, unit board or admission-discharge book (n=9)	0.9	0.6
Request wardsperson/orderly (n=12)	0.8	0.5
Redirect Services (n=1)	0.3	-
All Administration activities	2.1	5.18

* Note: *Missing data (timing data not available for all observed activities)

7.3 Nurses

This section examines the number of nurses involved with patient moves, the nurses' designation and the time spent by nurses when attending to patient transfers and bedspace moves. Analyses were undertaken to determine if there were any differences in the duration of time spent by medical compared to surgical ward nurses, on the basis that medical ward nurses attended to a greater number of patient moves per annum (refer to Table 14 and Table 15). Medical ward nurses were also observed attending to a significantly greater number of sending transfers (which require less time) than surgical ward nurses (refer to Section 7.1). It could therefore be expected that the different types of patients and moves influenced the activities and workload of nursing staff.

7.3.1 Number of Nurses Involved in each Patient Move

The number of nurses observed to be assisting with each patient move was recorded. On average 2.0 nurses attended each move (SD 0.80, range 1-4). An average of 1.7 (SD 0.78, range 1-3) and 1.9 (SD 0.72, range 1-3) nurses assisted with sending and receiving transfers whereas an average of 2.4 (SD 0.80, range 1-4) nurses attended bedspace moves. The number of nurses was significantly different across the three types of moves (ANOVA, p =.024). Tukey's HSD *post-hoc* analyses confirmed that the differences lie between the mean number of nurses attending to sending transfers and bedspace moves (p = .020).

7.3.2 Number of Nurses and Duration of Moves

The time taken to move a patient was also examined to determine whether the number of nurses involved was associated with the duration of time taken to move a patient. When one nurse moved a patient, the duration averaged 57 minutes. This period reduced to 52 minutes when two nurses moved a patient and increased to 66 minutes when three or more nurses were involved in moving a patient. There was no statistically significant difference in the mean time taken to move a patient and the number of nurses (p = .612) (see Table 23).

7.4 Direct Nursing Time

The duration of time spent by nurses directly attending to transfer activities was calculated. As discussed earlier in Section 7.1.2, moving a patient took almost one hour, but the nurse does not spend this entire time on the process. Between attending to transfers and bedspace moves, nurses attended to other patient priorities not recorded in this study. When the time that nurses spent directly attending to activities associated with patient movements was calculated, each patient move averaged 19.6 minutes (SD 16.54, range 1-82.3) of nursing time (refer to Table 23). Transit times, or the time taken to walk between or around the ward, patient rooms and/or bedspaces were not timed.

Nurses spent more direct time on activities for receiving transfers than sending transfers and bedspace moves. Receiving transfer activities required an average of 24.6 minutes and sending transfers averaged 17.7 minutes. Therefore, to transfer an individual patient took 42.3 minutes of nursing time. Bedspace moves took a further 11.3 minutes. The time spent by nurses by the type of move was significant at the .05 level (ANOVA, $p = .017$) (Table 23). *Post-hoc* analyses (Tukey's HSD) showed that nurses spent significantly more direct time on receiving transfers than bedspace moves ($p = .015$). All other comparisons were not significant.

Table 23: Duration of Move by the Number of Nurses and Direct Nursing Time by Type of Move

	Duration (Minutes)				
	Mean	**SD**	**Range**	**F (*df*)**	***p* value**
All moves (n=75)	57.5	50.09	5.2-235.6		
Number of Nurses					
1 Nurse (n=23)	57.0	62.48	5.3-235.6		
2 Nurses (n=31)	51.9	42.44	8.5-181.6		
=>3 Nurses (n=21)	66.1	46.51	5.2-186.2		
Duration by no. of nurses				.494 (2,72)	.612*
Direct Nursing Time					
All patient moves	19.6	16.54	1.0-82.3		
Sending Transfers	17.7	14.59	3.1-66.8		
Receiving Transfers	24.6	16.91	4.0-82.3		
Bedspace Move	11.3	15.01	1.0-64.0		
Direct nursing time by type of move				4.30 (2,72)	.017*
Medical ward nurses	21.0	19.92	1.0-82.3		
Surgical ward nurses	18.0	11.95	1.6-43.3		
Direct nursing time by ward				.634 (1,73)	.429*

*ANOVA

7.4.1 Medical and Surgical Nursing Comparisons

The duration of time spent by nurses working on the medical and surgical ward were compared, in light of differences between the rate and type of moves and the potential impact on nurses' workload.

Patient moves associated with the medical ward took longer than surgical ward moves. An average medical ward move took 64.7 minutes (SD 58.1, range 5.2-235.6) whereas surgical moves averaged 49.7 minutes (SD 39.05, range 7.8-180.3). The difference in duration of moves was not significant at the .05 level (ANOVA, $p = .197$). In terms of the time spent directly attending to activities necessary for moving patients, nurses working on the medical wards spent an average of 21.0 minutes and surgical ward nurses 18.0 minutes directly attending to patient activities. Again, this difference in time was not significant (ANOVA, $p = .429$).

7.5 Nurse Designation

To determine the designation or level of nurse involved with transfers and bedspace moves, analyses were undertaken by activity category and by defined activities. Nurses observed to be involved in patient movements were Registered (RN) and Enrolled Nurses (EN), the Nursing Unit Manager (NUM), Clinical Nurse Consultant (CNC) and Nurse Educator (NE). Two types of nurses, supernumerary to the ward staffing profile, were observed assisting with aspects of patient movements. These were the ward Team Leader (TL), an RN responsible for the coordination of patient movements and patient care (refer to Section 5.8.4 for details on the TL role), and student nurses on the ward for clinical practicum. Few Assistants in Nursing are employed at the site hospital and none were observed participating with patient movements.

7.5.1 Activity Category by Nurse Designation

Activity categories were examined by nurse designation. As shown earlier (Figure 6) nurses most often attended to activities within the communication, direct care and documentation categories. Figure 11, shows the percentage of observed activities by nurse designation and activity category. Direct care activities accounted for approximately 50% of the CNC/NE's and student nurses' time and up to 42% of the RNs and ENs time. The majority of nurses spent less than 14% of their time on transfer documentation. Student nurses were the exception, spending almost 37% of their time on this activity. Less time was spent on administration, indirect care and other transfer related activities although some variation can be seen between designations of nurses. For all nurses except the TL, indirect care and other activities took less than 10% of their time. The TL spent almost 17% of his/her time on both indirect care and other transfer activities. Administrative tasks were primarily undertaken by the NUM or TL. Individual activities performed by each level of nurse are tabulated in Appendix E1.

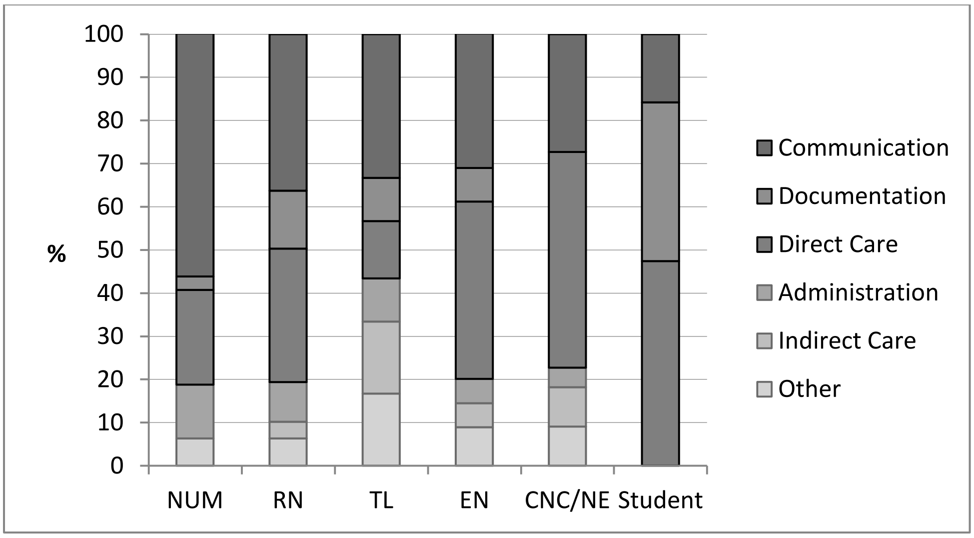


Figure 11: Percentage of Activity Categories by Nurse Designation

7.5.2 Activities by Nurse Designation

Nurses were observed performing 891 individual activities and the nurse's designation was recorded for 889 of these activities. The majority of activities related to transfers and bedspace moves were undertaken by RNs (74.9%, n=666), 10% of activities were performed by ENs and nearly 7% by the TL. The remaining activities were undertaken by other designations of nurses on the ward (Table 24).

Table 24: Frequency of Activities by Nurse Designation

Nurse Designation	n	%
Registered Nurse	666	74.9
Enrolled Nurse	90	10.1
Team Leader	60	6.7
Nursing Unit Manager	32	3.6
Clinical Nurse Consultant or Nurse Educator	22	2.5
Student Nurse	19	2.1
Total	889*	100%

*missing data (n=2)

7.5.3 Comparisons between Registered and Enrolled Nurses

As has been demonstrated, Registered and Enrolled Nurses are responsible for the majority of tasks associated with moving patients.

Table 25 shows the range and total time (in minutes) spent on each activity category by Registered and Enrolled Nurses and the mean and standard deviation is shown in Table 26. Nursing Unit Managers, Team Leaders, Clinical Nurse Consultant/Nurse

Educator and student nurses have distinct less clinically focussed roles and/or are supernumerary to ward staffing, therefore they were excluded from these analyses.

Table 25: Time (minutes) Spent on Activity Categories by Registered and Enrolled Nurses

	Registered Nurse		Enrolled Nurse	
	Total*	**Range****	**Total***	**Range****
Administration	106.8	0.0-33.8	9	0.1-3.2
Communication	214.2	0.0-7.8	42.2	0.0-6.6
Direct care	509.1	0.0-77.7	93.8	0.2-29.1
Documentation	105.1	0.1-6.4	9.5	0.2-1.4
Indirect care	45.9	0.1-10.4	3.3	0.2-1.4
Other	45.8	0.0-5.3	7.5	0.3-2.3

*Sum of minutes spent on activity category
** Duration of some activities <=2 seconds

A *t*-test was performed to determine if the mean time spent on activities within the six activity categories differed between RNs and ENs. There was no significant difference between the mean time for activities within the Administration, Direct care, Documentation, Indirect care and Other activity categories. However as shown in

Table 26, ENs spent significantly longer communicating than did RNs (p = .029). For the EN, communication was primarily with the patient and/or carers (67.9%, n=19) or took the form of nurse handover (25%, n=7) (refer to Appendix E1).

Table 26: Differences in Mean Time (minutes) Spent by Registered and Enrolled Nurses by Activity Categories.

	Registered Nurse		Enrolled Nurse			
	Mean	**SD**	**Mean**	**SD**	***t*(df)**	***p* value***
Administration	1.8	4.31	1.8	1.55	-.02(64)	.982
Communication	0.9	1.26	1.5	1.94	-2.20(260)	.029
Direct care	2.5	7.57	2.5	5.4	-.03(239)	.976
Documentation	1.2	1.46	1.4	0.84	-.24(91)	.808
Indirect care	1.8	2.36	0.7	0.48	1.10(28)	.282
Other	1.1	1.09	0.9	0.66	.37(48)	.712

*t-test

7.5.4 Summary

This Chapter has presented the results of Stage 2 of this project examining the nursing work associated with patient transfers and bedspace moves in a medical and surgical ward. Results demonstrated that moving a patient takes approximately one hour from start to completion and that the nurse spends approximately 20 minutes directly contributing to activities associated with each patient move. Within each activity category, much variation exists in the time taken by nurses when attending to activities for patient transfers and bedspace moves reflecting the diversity in nursing tasks required to transfer a patient. Attending to patients' vital signs and other essential nursing care activities could for example, take from a few seconds to over twenty minutes to complete. Despite the variation in the time taken for individual activities, little difference was seen in the time spent relocating patients by medical and surgical ward nurses.

The most frequently performed activity associated with moving a patient was communication. For the most part, communications with other health professionals, patients and family members were brief lasting less than one minute whereas nursing handover as a form of communication lasted for approximately two minutes. Despite the frequency that nurses were engaged in some form of communication and the longer time spent on handover, communication activities did not account for the majority of nurses' time. Most of the time required to move a patient was spent on direct care nursing activities. Preparing and escorting the patient took the nurse almost 7 and 19 minutes respectively. Other direct care activities including taking vital signs took less than two minutes.

Study results determined that on average two nurses were required to move a patient and that bedspace moves required more nurses than patient transfers. All designations of nurses assisted at various times. The majority of nursing activities associated with moving a patient were undertaken by the RN. However Clinical Nurse Consultants, Nursing Unit Managers and the Team Leader were also observed assisting with moving patients at various times.

In order to provide insight into, and further our understanding of patient transfers, two case studies were undertaken of the sending transfer process. The case studies form Stage 3 of this study.

Chapter 8. Stage 3: Case Studies

Two sending transfers were selected and examined in detail to provide greater insight into the differences in the time taken to relocate a patient and the impact on nursing workload. The cases demonstrate the sequence of nursing activities, the duration of time taken by the nurse(s) to complete each activity and the designation(s) of nurse(s) involved in the process.

Results in the previous Chapter demonstrated that the time taken to relocate a medical-surgical patient was diverse, therefore cases were selected that were representative of such diversity. For example, sending transfers averaged 61.6 minutes (n=22) but at times could take much longer (SD 60.07, range 5-235). In the first case the transfer is conducted quickly and the patient is transferred within 30 minutes (Table 28) whereas in the second case, the transfer took over 1.5 hours to complete (Table 29).

8.1 Field Notes

Field notes made during the observation and timing Stage of this study provide insight into the transfer process, the hospital environment and nurses' work. The field notes help to explain the reasoning behind nurses' actions and why some patient transfers can take longer than average. Importantly, they illustrate how extraneous factors that are beyond the nurses' control can have a major impact on the timely transfer of patients and subsequently, nurses' workload. They also highlight how factors such as organisational and/or ward policy can have a negative impact on continuity of care and therefore the nurse's ability to provide continuous care for patients. Examples of how such seemingly unrelated or inconsequential issues impact on nurses' work and the time to transfer are demonstrated by the selected field notes contained in Table 27. A complete listing of field notes taken during the observational-timing study can be found in Appendix F.

Table 27: Selected Field Notes Highlighting the Effect of Patient Moves on Nurses' Work

FN	Field Note	Issue
3.2	Urgent bedspace move to accommodate new patient into Acute Stroke Unit (ASU), nurses moved bed.	Impact of bed availability on nurse workload
8.5	Ward staff can receive urgent calls for beds, necessitating much coordination/bed preparation/bedspace moves. Despite 'urgency' patient arrival can be 2-3 hours later.	
2.3	Bedspace move x2. Patient moved from single room to 4 bedded room to accommodate new patient. Male patient moved from female room.	
5.2	RN to escort patient from Post Anaesthetic Care Unit to ward. Delays waiting for theatre wardsperson.	Availability of ancillary staff
5.4	Delay waiting for radiology orderly.	
4.1	Wait for bed cleaning delayed move	
3.1	[Bedspace move – delay with orderly] Nurses moved bed	
10.2	Nurse must remain in ASU and room 8 (high falls risk) at all times. [This means that] handover may not be conducted at the time patient is transferred from ASU to room 8. Nurses must wait for relief staff to enable handover to occur. Continuity of care compromised.	Delayed nursing handover and impact on continuity of care
10.4	Handovers often delayed due to [casual] staff working shorter shifts.	

The case studies are described and presented in the following sections. Details of the nursing activities and the time taken to perform each activity are shown in sequential order in the associated tables. At times nurses were recorded performing two transfer related activities at the same time (multi-tasking). While these cases show no evidence of multi-tasking, it is possible that two or more activities could have been performed simultaneously but were unable to be timed and recorded.

8.2 Case 1

Case 1 is an example of a sending transfer from the medical ward that was able to be performed in a timely manner. The transfer involved moving a patient from the medical ward to the rehabilitation ward as part of the clinical continuum. The transfer occurred during the late morning on a Friday in August.

The three nurses involved in the transfer were the Team Leader (TL)[13], a Registered Nurse (RN) and an Enrolled Nurse (EN)[14]. The ward clerk was also present on the ward. As shown in Table 28 the nurses worked cooperatively to complete the transfer within 26 minutes of an available bed being confirmed. This was significantly less (p = .011) 95% C.I. [9.06, 62.32] than the average time taken to transfer a medical-surgical patient to another ward within this hospital.

Twelve activities associated with the transfer process were observed and timed. These activities took a total of 13 minutes of nursing time and averaged 1.1 minutes (SD 0.70, range 0.1-2.4) per activity. The timing data show that the nurses worked

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[13] Refer to page 99Footnote 6 for a description of the TL role.

[14] Refer to page 99Footnote 7 for a description of the EN role.

consistently until the necessary transfer activities were completed, as the duration between one activity being completed and the next activity being commenced averaged one minute (SD 1.27, range 0.1-4.5). This short period included transit time or time spent walking around the ward, room or patient's bed (Table 28).

Table 28: Case 1 Sending Transfer of Short Duration

	Observed Activities	Activity times			Nurse
		Duration (mins)	Commenced (hh:mm:ss)	Completed (hh:mm:ss)	(n=3)
	Transfer confirmed		11:30:00		
1	Patient preparation	0.6	11:30:50	11:31:23	EN
2	Communicate with Health Professional	0.1	11:33:06	11:33:14	RN
3	Perform vital signs, administer medications, dressings, procedures.	1.4	11:34:16	11:35:38	EN
4	Document in medical record, Electronic Medical Record, charts or care plan	0.7	11:35:44	11:36:26	EN
5	Perform vital signs, administer medications, dressings, procedures	1.9	11:36:32	11:38:24	EN
6	Perform vital signs, administer medications, dressings, procedures	1.8	11:38:36	11:40:25	EN
7	Pack patient belongings	0.8	11:41:07	11:41:54	EN
8	Compile medical record and charts	1.5	11:42:26	11:43:57	TL
9	Tidy or clean bedspace or room	0.3	11:48:27	11:48:44	RN
10	Document in medical record, Electronic Medical Record, charts or care plan	2.4	11:49:29	11:51:54	RN
11	Tidy or clean bedspace or room	0.8	11:52:20	11:53:09	EN
12	Tidy or clean bedspace or room	1.1	11:54:50	11:55:54	EN
	Transfer completed			11:55:54	
	Total	13.3		0:25:54	

Examination of the sequence of activities performed and the designation of the nurse that performed the activities shows that each nurse undertook a different role in the transfer process and demonstrates that the nurses worked together as a team. Following confirmation of an available bed, the EN immediately started preparing the patient for transfer. Activities associated with preparing the patient included checking that the patient was wearing an accurate identity band and was appropriately attired for transfer (refer to Table 5). The EN was also timed checking the patient’s vital signs, packing the patient’s belongings and medications into a bag and documenting in the medical records and/or patient charts. Meanwhile the TL started gathering and compiling the medical records, charts and other patient forms that were to accompany the patient to the new ward. The RN assisted by tidying and cleaning the bedspace. This activity included removing any bedside items no longer required for the patient e.g. medical equipment and miscellaneous items such as the carafe of water. The RN also completed any necessary documentation.

Some activities performed by the nurses were repeated several times. For example, the activity ‘Perform vital signs, administer medications, dressings, procedures’ was performed by the EN on three occasions. Field notes taken at the time of observation explain the reason for the repetition (refer to Appendix F, FN14.11). In this case, the EN experienced a malfunctioning with the electronic sphygmomanometer and needed to repeat the patient’s vital signs to ensure that a correct reading was obtained. Following completion of the nursing activities, the patient was transported to the destination ward in a wheelchair, accompanied by a hospital orderly.

This case highlights how transfers can be performed in an efficient manner. The activity and timing data demonstrated that the nurses worked consistently and as a team in order that the bed could be vacated. Teamwork between the nurses is demonstrated by each nurse focussing on a different aspect of the transfer process. The EN focussed on the patient, the RN completed the documentation and cleared the bedspace, while the TL gathered the medical records. The patient was transferred within 30 minutes despite the EN experiencing equipment problems making it necessary to recheck the patient's blood pressure several times. However, by doing so, the EN was ensuring that the patient was ready to be transferred without a nurse escort. In summary, teamwork and an awareness of what activities needed to be done, enabled the patient to be quickly and efficiently transferred, thereby enhancing patient flow.

8.3 Case 2

The second case presented here was a sending transfer that occurred on a Wednesday also in August, over the ward lunch-time period. An outlier patient (a patient whose clinical condition does not relate to that particular unit) was transferred from the medical ward to the oncology ward in order to accommodate a patient from the high dependency unit. As with Case 1, three nurses assisted with the transfer, although in this case all were RNs. The major difference with Case 2, was that at 102 minutes, the time to transfer was significantly longer than the average sending transfer at this hospital (p = .005) 95% C.I.[-67.34, -1.08].

For this transfer, 12 activities with an average duration of 1.6 minutes (SD 2.81, range 0.0-10.4) were performed by the nurses at 7.0 minute intervals (SD 8.4, range 0.5-22.4). The accumulated time between activities at 77.5 minutes, was almost four times greater than the time (19.6 minutes) spent by the nurses directly attending to activities associated with the patient transfer. As nurses spend an average of 19.6

minutes directly attending to each transfer (see Table 23) the duration between activities goes some way to explain why the transfer took much longer than Case 1.

Table 29 shows that six different activities were performed by the three RNs who assisted with the transfer process. However two activities, documentation and calling for an orderly or porter, were performed several times. The nurse made four entries (documentation) in the patient's records and/or charts, three of which were performed in succession. The final entry was made whilst the nurse was waiting for the orderly to arrive. The need for four episodes of documentation possibly explains why this activity is the second most frequently performed nursing activity when moving a patient (refer to Appendix E1).

The nurse(s) also made four attempts to call for an orderly or porter to transport the patient. These requests were made via the telephone and the Local Area Network (LAN) paging systems. A period of 54.6 minutes lapsed from the first orderly request until such time that the patient departed the ward with the orderly and family members. Prior to the first request for an orderly, one of the RNs updated the patient information system(s) to indicate that the patient would be leaving the ward and that the bed had been allocated to a patient being transferred from another area.

No direct patient care activities were observed being performed by the nursing staff for this patient, possibly indicating that the patient was physically stable and ready to be transferred. The RN assisted the patient by packing the patient's belongings. This indirect care activity took the nurse ten minutes to complete meaning that the nurse spent more time on this one activity than on the total amount of time for the other 11 activities. The duration of time spent attending to the patient's belongings and the interval between activities helps to explain why this transfer took much longer than the transfer presented as Case 1.

Table 29: Case 2 Sending Transfer of Lengthy Duration

	Observed Activities	Activity times			Nurse
		Duration (mins)	Commenced (hh:mm:ss)	Completed (hh:mm:ss)	(n=3)
	Transfer confirmed		12:48:36		
1	Communicate with Health Professional	0.8	12:53:49	12:54:38	RN
2	Document in medical record, Electronic Medical Record, charts or care plan	1.6	12:58:24	13:00:02	RN
3	Document in medical record, Electronic Medical Record, charts or care plan	0.3	13:00:42	13:00:58	RN
4	Document in medical record, Electronic Medical Record, charts or care plan	1.0	13:01:27	13:02:24	RN
5	Compile medical record and charts	1.3	13:12:47	13:14:05	RN
6	Update patient information system, unit board and/or admission-discharge book	0.5	13:16:01	13:16:30	RN
7	Request wardsperson/orderly	0.0*	13:36:20	13:36:22	RN
8	Request wardsperson/orderly	0.4	13:38:08	13:38:31	RN
9	Document in medical record, Electronic Medical Record, charts or care plan	1.9	13:39:24	13:41:15	RN
10	Request wardsperson/orderly	0.6	13:41:49	13:42:26	RN
11	Request wardsperson/orderly	0.9	14:04:50	14:05:45	RN
12	Pack patient belongings	10.4	14:20:31	14:30:54	RN
	Transfer completed			14:30:54	RN
	Total	19.6		1:42:18	

*Duration <=2 seconds

8.3.1 Comparisons between Case 1 and Case 2

Further analyses were undertaken to determine if the duration of time taken by nurses to perform the observed activities was representative of sending transfers..

Table 30 shows the differences in the time taken by nurses for the eight activities observed to be performed in Cases 1 and 2 compared to the sample of sending transfers (n=22). As demonstrated in the previous tables, some activities were observed to be performed more than once. The total time spent by nurses on a specific activity was therefore used for analyses.

Four activities (communicate with health professional, document in MR, EMR, charts or care plan, compile medical record and charts and pack patient belongings) were common to both cases, three activities (perform vital signs, medications, dressings or procedures, patient preparation and tidy or clean bedspace or room) were associated with Case 1 and two activities (request a wardsperson/orderly and update patient information systems) were associated with Case 2.

The results demonstrated that the nurses spent significantly less time communicating with other health professionals and packing the patient's baggage in Case 1 compared to the average time taken during sending transfers. Attending to the patient's vital signs took significantly longer than average. In Case 2, three activities, 'communicating with another health professional', 'documenting in the medical record' and 'packing the patient's belongings' took a significantly longer time to complete compared to the average sending transfer.

Although the duration of time was not significant, the activity 'compiling the medical records and charts' was performed in a shorter period of time in both Case 1 and

Case 2 compared to the average time spent by nurses on this activity when preparing to transfer a patient to another location. Reasons for the differences between the duration of activities and the average sending transfer are unknown.

Table 30: Comparisons of Time (Minutes) spent on Nurse Activities for Cases 1 and 2

Observed Activity	Sending Transfers		Case 1		Case 2	
	(n)	Mean Sum	Sum	*p* value*	Sum	*p* value*
Communicate with Health Professional	22	0.5	0.1	.029	0.8	.051
Document in MR, EMR, charts or care plan	18	2.9	3.1	.715	4.7	.004
Compile medical record and charts	10	4.8	1.5	.296	1.3	.270
Perform vital signs, medications, dressings, procedures	8	3.5	5.1	.051	-	-
Patient preparation	8	1.4	0.6	.131	-	-
Pack patient belongings	7	4.9	0.8	.021	10.4	.006
Request wardsperson/orderly	5	1.4	-	-	2.0	.243
Tidy or clean bedspace or room	3	0.9	2.2	.177	-	-
Update patient information systems**	1	0.5	-	-	0.5	-

*One sample t-test
** Case 2

8.3.2 Summary

The third Stage of this thesis has examined two sending transfers from the medical ward in greater detail. Purposeful selection of the cases was undertaken to ensure an understanding could be reached for why moving a patient can take varying amount of time.

The cases have aided our understanding of the transfer process by showing the sequence and timing between each performed activity and the factors that can contribute towards the time taken to transfer a patient. Nursing workflow as shown by the activity sequencing demonstrates that many activities are short-lasting and that nurses may repeat or switch between activities as required. The first case showed that the nurses worked well together as a team by each nurse taking a different role in the transfer process. Team work such as this likely ensured that the time taken to transfer the patient was significantly quicker than average.

The cases were similar in terms of the number of nurses assisting with the transfer and the time spent directly attending to nursing activities and yet one transfer took almost four times longer. Differences between the cases have highlighted that the duration between activities and other factors such as waiting for other personnel and the volume of patient belongings can adversely affect the time required to transfer a patient. These factors are often beyond the nurses' control. Field notes added to our understanding of the transfer process by providing the reasoning behind nurses' actions and by describing organisational processes that cannot be determined by the quantitative data alone.

Chapter 9. Discussion and Conclusion

This study used a three-stage sequential approach to examine the rates of patient transfers and the nursing time required to transfer patients between beds and/or clinical units in a large hospital in Sydney, Australia. Stage 1 retrospectively examined health administrative data to determine the frequency of patient transfers and bedspace moves. Results indicate that patients who spend at least two days in hospital could expect to be moved between beds or from one ward, unit or department to another at least twice during their hospital stay and that medical-surgical patients experienced the most moves during their hospitalisation. The second Stage of the study utilised a direct observation and timing approach to describe and time nursing activities related to patient moves. Stage 2 was conducted in one medical and one surgical ward found to experience high levels of patient moves. The third Stage utilised a case study approach to examine two sending transfers in greater detail. The purpose of the case studies was to sequence the activities performed, in order to provide insight into the transfer process and the reasons behind nurses' actions. This Chapter will integrate and discuss the findings of each of the three Stages associated with this research project.

9.1 Patient Flow

This was the first study to use multiple methods to comprehensively examine patient transfers and bedspace moves in an acute hospital setting and to examine the impact on nursing workload. The frequency of patient transfers and bedspace moves was calculated over a one year period in an acute hospital as a basis to calculate the impact on nurses' workload. The rate of patient transfers has not previously been determined as most researchers have examined patient transfers in relation to adverse events (Ciccolini et al. 2013; Cunningham, Kernohan & Rush 2006a, 2006b; Eveillard et al. 2001; Goldberg et al. 2015; Kanak et al. 2007; West 2010c) or inefficiencies, delays and costs (Hendrich & Lee 2005; Johnson et al. 2013; Kibler & Lee 2011; Silich et al. 2012; Williams et al. 2010; Wood, Coster & Norman 2014). Nursing studies that have utilised secondary data to calculate patient moves have been limited by database and reporting capacities (West 2010b), have focussed on a specific population such as the elderly patient (Kanak et al. 2008) and have not included bedspace moves (Duffield et al. 2007).

Findings from this study have determined that in one year, 10,733 patients remaining in hospital for at least 48 hours, were moved almost 35,000 times. Patients were transferred between clinical units more than 27,000 times and within wards or units almost 5,000 times. This means that on average, 4068 patients were moved within and between wards and other clinical units each month. This can have a significant impact on nurses' workload. The number of intra-hospital transfers and clinical locations is higher than that formerly reported by researchers who have examined transfer rates in acute hospitals in Australia (Duffield et al. 2007; Johnson et al. 2005), the U.K (Williamson et al. 2014) and the U.S.A. (Hughes et al. 2015), possibly because this was the first study to examine transfer rates from a whole of hospital approach and include moves between bedspaces. Irrespective of potential differences between research designs, hospitals and geographical locations, the data demonstrate a continuing trend to transfer patients between and within clinical units during their hospital stay. This trend has implications not only for nurses' workload but also for the wider community. Transferring patients between wards and units can increase feelings of anxiety in patients and family members (Chaboyer et al. 2005; Häggström, Asplund & Kristiansen 2014; Uhrenfeldt et al. 2013), increase the risk of delirium (Goldberg et al. 2015; Mudge et al. 2013; Potter & George 2006; Ryan et al. 2013) and falls in the elderly population (Goulding et al. 2012; Kanak et al. 2008) and increase the risk of health-care acquired infections (Cunningham, Kernohan & Rush 2006b; Dziekan et al. 2000; Kanak et al. 2008; Leverstein-van Hall et al. 2006) with consequences for length of hospital stay and patient flow.

Examination of the transfer destinations showed that almost 45% of patients were transferred to the medical and surgical specialties at some point during their hospital stay and that 62% of bedspace moves were within medical-surgical wards. The high rate of moves is consistent with the continuing need for medical-surgical beds (Buist et al. 2014; Harrison et al. 2013; Krall, O'Connor & Maercks 2009) and the diagnostic profile of patients admitted to hospital (AIHW 2014b). It is acknowledged that some medical-surgical transfers would have been planned such as those transfers from the operating theatre or from step-down units. However, if it is considered that 55% of all patients transferred to a medical-surgical unit experienced between 2-12 transfers during their episode of care (refer to Appendix B2), it is likely that some transfers were unrelated to clinical need or alternatively involved patient outliers being transferred to their appropriate ward.

Second to medical-surgical specialties, 27% of patient moves were associated with the aged care and rehabilitation wards, which reflects the substantial increase in the ageing population and in subacute hospital separations over the past five years (AIHW 2014b). What is particularly concerning is that 26% of patients transferred to the subacute wards had been transferred three or more times (refer to Appendix B2). Further research needs to be done in this area as the elderly account for 48% of patient days(AIHW 2013c, 2014b) and are more likely than younger patients to be transferred during their hospitalisation (Blay, Donoghue & Mitten-Lewis 2002; Mason et al. 2009; McMurdo & Witham 2013). As discussed previously, frequent transfers increase the risk of adverse outcomes (Goldberg et al. 2015; Goulding 2011; Kanak et al. 2008; McMurdo & Witham 2013; Mudge et al. 2013; Reid, Watkin & King 2013) that can negatively impact length of hospital stay and consequently, nurses' workload.

Findings such as these have implications for strategies that aim to increase patient flow. Most studies that have aimed to address patient flow have focussed on the time taken to transfer patients from the ED or from the intensive care unit (Johnson et al. 2013; Kibler & Lee 2011; Stokes 2011; Welch et al. 2006; Williams et al. 2010; Wright et al. 2008). These measures are important, but should not be examined in isolation. Delays from critical care are most often the result of bed shortages (Johnson et al. 2013; Williams & Leslie 2004; Williams et al. 2010) that are likely affected by the high percentage of medical-surgical and subacute transfers. For these reasons, strategies aiming to address patient flow need to pay attention to the frequency with which patients are transferred between specialties further 'downstream' such as general medical and surgical units. The impact of such strategies on nursing workload also needs to be considered.

A small percentage of patients were transferred to the short-stay and day-only units. Patients in this study had an average length of stay of 9 days meaning that by standard day-only and short-stay admission criteria (Downing, Scott & Kelly 2008; Ong et al. 2012; Scott 2010; Yong et al. 2011), they would have been ineligible for admission or transfer to these clinical areas. This implies that short stay areas are being used as general ward beds (Brand et al. 2010) to relieve pressure on the ED

(Corbally, Macri & Hawkshaw 2014). The National Emergency Access Target (NEAT) or 'Four Hour Rule' (see Section 2.1.3) had not been implemented at the time that data were collected for Stage 1. Preliminary evidence indicates that transfers between specialties within the first 48 hours of admission, have increased significantly since the implementation of the NEAT (Perera et al. 2015). It is likely that the number of transfers to short-stay and related areas has also increased, further impacting on patient turnover and the workload of nurses working within these units.

The time and day that patients were moved was examined to determine the impact of patient transfers and bedspace moves on patient flow and nursing workload. Differences in the time that patients were moved are apparent between Stage 1 and Stage 2, with a shift from afternoon transfers to morning transfers. In line with Harrison and Nixon's data (2002), in 2008-2009 the majority of patients were moved between 1200 and 1600hrs. Since that time, the peak period for moving patients has occurred earlier in the day between 0900 and 1100hrs. This is important in terms of nurse staffing and rostering practices as fewer staff are likely to be available during the busy morning period when many patient care activities are undertaken (Duffield & Wise 2003), and when nursing (and other hospital staff) tend to take their morning break (Furaker 2009; Lee 2001). Both of these are known contributory factors to transfer delays (Cowie & Corcoran 2012) and may explain why nurses can have difficulty contacting and obtaining an orderly or porter as demonstrated in the case study. It should also be mentioned that a key factor of policies to enact patient flow and the National Emergency Access Target, is that beds need to be vacated earlier in the day. The NEAT necessitated that patient flow be addressed from an organisation-wide approach (Mason 2014; Stokes 2011; Walters & Dawson 2009). Policies that seek to ensure patients are discharged home or transferred to the transit lounge by mid-morning (Maumill et al. 2013; SESIAHS 2009) form part of this process. Hospital managers therefore need to ensure that the rostering of nursing and ancillary staff aligns with service demand, taking into consideration the peak period for patient moves (Hughes et al. 2015; Odegaard et al. 2007a, 2007b; Twigg & Duffield 2009). In addition, the pattern of transfers and bedspace moves differed between Stages 1 and 2. Annual data from Stage 1 showed that with the exception of Mondays, the number of patient movements was consistently high throughout the working week. Four years later, the pattern had changed in that fewer patient moves were observed on Thursdays in addition to Mondays. Such a change could be an artefact of the data or a limitation of Stage 2. It is possible that fewer patients were moved during the observation period, that some patient moves were missed due to the random allocation of the observation periods, or because some moves occurred simultaneously as often occurred with bedspace moves. Another plausible explanation for fewer transfers on a Thursday is that of limited bed availability. Hospital occupancy levels are higher on Wednesdays and Thursdays during the Winter months (Fieldston et al. 2012; Fieldston et al. 2011) as a direct result of the admission-discharge pattern in the earlier part of the week (Ou et al. 2009). Unless some patients are discharged, there are fewer available beds into which patients can be transferred. Nurse Managers can possibly use this information to support discharge planning and staff rostering purposes.

9.2 Patient Moves and Nursing Work

Results from Stage 2 of this study have identified that much of the transfer and bedspace move process is workload intensive, particularly for nursing staff. The findings support the published literature that indicates that medical-surgical transfers can take approximately one hour (Hendrich & Lee 2005; Kibler & Lee 2011) but that there is also great variability. Consistent with previous work (Jennings, Sandelowski & Higgins 2013), in the current study some transfers took less than 10 minutes whilst others took several hours. Interruptions (Estryn-Behar et al. 2014; Kalisch & Aebersold 2010; McGillis Hall et al. 2010; Westbrook et al. 2010) and task switching (Cornell et al. 2010; Cornell et al. 2011) are a regular feature in nursing work that may impact on the duration of time taken to complete a task (Westbrook et al. 2010). As patient transfers are known to be a major cause of interruption for nurses (Jennings, Sandelowski & Higgins 2013; Myny et al. 2012), it is not unreasonable to assume that nurses may need to leave the transferring patient to attend to other patients' needs. As demonstrated in the case study, the duration between transfer activities in Case 2 was greater than that in Case 1 and four times longer than the time spent attending to the actual transfer. Having a designated nurse to attend to patient transfers may help in this respect. Further research into the effect of task switching and interruptions on the time taken to transfer a patient would therefore be of benefit.

However if it is considered that the average sending transfer takes 62 minutes and receiving transfers 68 minutes, the accumulated time spent on one transfer can amount to more than two hours. Such a protracted duration will impact upon the time that patients in the Emergency Department (and elsewhere) will wait for a bed and supports previous claims that the transfer process can be costly and inefficient (Hendrich & Lee 2005; Kanak et al. 2008). The availability of support services (as demonstrated by the case study) are integral to the transfer process and are an example as to why some transfers can take a protracted amount of time. The findings have also identified that moving a patient between bedspaces takes almost 30 minutes, but again there is great variability. As bedspace moves have not been studied previously, it is not known if this period of time is representative of the time taken in other hospitals.

Consistent with previous findings that have indicated that nursing work is characterised by activities of short duration and task switching (Cornell et al. 2011; Cornell, Clancy & Vardaman 2013; Farquharson et al. 2013; Westbrook et al. 2011; White et al. 2015) nursing activities associated with moving a patient were short-lasting. Examination of time spent on individual activities and the sequence of performed activities demonstrated that many transfer activities took less than two minutes and were repeated several times. Repetition can be a consequence of organisational or patient factors that are beyond the nurses' control. Repeated attempts to call for an orderly or porter (Case 2) and the need to recheck patients' vital signs due to malfunctioning equipment (Case 1), are practices that, on a regular basis, can pose serious consequences for patient flow.

The amount of time spent by nurses directly attending to the patient transfer process is considerable. The timing study determined that organising and preparing a patient to be transferred took nurses almost 18 minutes and receiving a transferred patient took slightly longer at 25 minutes. Taking into account the combined time spent by sending and receiving nurses, each patient transfer took approximately 42 minutes of nurse time. This is noticeably longer than the findings from a recent systematic review that determined nurses were spending at least 30 minutes of their time transferring patients (Blay et al. 2014b), possibly because this study included a more comprehensive list of nursing activities. Compiling the charts and medical records and packing patients' belongings are two examples.

To accommodate a transferring patient on the ward in a room appropriate for their clinical status and gender, the nurse would often need to relocate one, if not more, pre-existing patient(s) to other bedspaces. Each individual bedspace move took 11 minutes of direct nurse time. Taking into account the time spent each patient transfer and bedspace move, medical-surgical nurses can spend upwards of 53 minutes on the process. When it is considered that the majority of bedspace moves required more than two nurses (refer to Section 7.3.1), the time spent moving patients is substantial. Such a prolonged period of time may help to explain why casual nursing staff are often responsible for any patient admissions, transfers and discharges that occur during the nursing shift (Larson et al. 2012).

The impact on nursing workload of transferring a patient is most clearly realised when the rate of transfers is taken into account. Medical-surgical nurses for instance, transferred over 4500 patients to other clinical locations (Appendix B1) and received a further 12100 patients into their ward in one year (Table 10). This equates to an average of 1389 medical-surgical transfers per month. Based on the findings of this study that each transfer took 42 minutes of nurse time, it can be ascertained that medical-surgical nurses spend on average 526 hours (22 days) each month transferring patients. Following on from this, nurses working on the 12 medical-surgical wards at the site hospital, can expect to perform an average of 391 bedspace moves per month taking 4420 minutes (74 hours) of their time. In effect, the equivalent of 25 days each month is associated with relocating patients within and between wards or departments (referAppendix E4). It is therefore not surprising that nurses in Australia were only found to spend between 35-37% of their time, or approximately 3.1 hours per shift with their patients (Westbrook et al. 2011).

9.2.1 Patient Transfers and Nurse Staffing Requirements

Hospitals calculate nurse staffing requirements in terms of Full-time Equivalents (FTE) to take into account nurses working part-time hours. Converting the time spent by medical-surgical nurses on activities associated with moving patients into FTE positions demonstrates more fully the impact on nursing workload. Based on a 38 hour week as worked by nurses employed full-time in NSW and standard formulae, the number of FTE nurses can be calculated (Government of Western Australia n.d.). The results are surprising - for medical-surgical wards (n=12) in this 500 bed hospital, the workload associated with moving patients requires 3.9 FTE nurses. The need for four full-time nurses to move and transfer patients in addition to other nursing activities, goes some way to explain why wards with heavy workloads employ casual nurses (Hurst 2005) and why casual nurses are often utilised for patient admissions, transfers and discharges (Larson et al. 2012). Nurses' details were not recorded in his study, therefore it is not known if casual nurses were regularly utilised for patient moves in the site hospital.

Employing casual nurses to assist with patient moves may not be cost effective. Based on the average annual salary of registered nurses currently working in NSW (NSW Health 2014) the financial cost of 3.9 FTE nurses is approximately A$267,530 per annum. Casual nurses are paid a 10% loading on the base hourly rate (NSW Department of Health 2011). A more cost efficient solution for hospitals would be to employ nurses specifically for the admission, transfer and discharge (ADT) role which would aid clinical nurses' workload. As the work of the ADT nurse is less physically demanding compared to that of general ward-based nursing, the role suits the older experienced nurse (Spiva & Johnson 2012). This is also an ideal position for experienced nurse(s) working restricted duties, as occurs after a work-related injury.

9.2.2 Patient Moves and the Impact on Nursing Workload

The finding that on average two nurses were observed assisting with each patient move and that each transfer requires over 50 minutes of direct nursing time, supports the claim that patient transfers are workload intensive. The fact that the ratio of nurses made little difference to the time taken to relocate the patient is surprising although patient characteristics could have been an influencing factor. Nurses experienced with the receiving transfer process may well be aware that in some situations more than one nurse is needed to attend to the patient's needs and settle the patient into the ward. The pressure to transfer the patient out of the ward in a timely manner, might influence the number of nurses who provide assistance with a sending transfer.

Less nursing time was required and significantly fewer nursing activities were necessary for bedspace moves compared to patient transfers. And yet, (paradoxically), bedspace moves required two or more nurses. Moving the bed and bedside equipment from one bedspace to another necessitated several nurses, because of the 'domino effect' of one transfer or bedspace move leading to several other moves. Space limitations in the ward resulted in a complex procedure of moving, then temporarily 'parking' bed(s) and bedside equipment in the ward corridor to provide access. The bed(s) and associated equipment were then moved again into their appropriate places. Orderlies were often unavailable, as demonstrated by the case study, meaning that the nurse frequently undertook this role. In this study, over 53% of beds, bedside lockers and tables were manoeuvred into the ward corridor or patient rooms by RNs, 29% by the Team Leader and 12% by Enrolled Nurses. The average time taken by nurses to move each bed and associated equipment was 2.3 minutes (refer to Table 20 and Table 21). If nurses throughout the hospital conducted just 50% of all the 7573 bedspace moves that occurred in 2008-2009, the equivalent of 4354.5 minutes (72.6 hours) of nursing time would have been spent on a manual task, by each nurse involved. Moreover, if it is considered that each bedspace move requires at least two nurses (Section 7.3.1) and that several beds may be moved simultaneously, the time spent away from other patient care activities is large. Nurses' time saved, coupled with reductions in the time taken to transfer patients to the ward, would more than offset the financial cost of employing additional orderlies, porters or nursing assistants to aid the bedspace move process (Farris et al. 2010).

When nurses spend such a large proportion of their working time moving patients, beds and equipment it is likely that some patients are temporarily left unattended. Such conflicting priorities could lead to some essential nursing care activities being delayed or even omitted (Blackman et al. 2015; Duffield et al. 2011; Gravlin & Phoenix Bittner 2010; Kalisch, Landstrom & Hinshaw 2009) particularly as basic nursing care may be considered by some nurses to be a lower priority than some other activities (O'Neill et al. 2011). The pressure for beds can sometimes mean that nursing staff receive minimal notice of an impending transfer, leaving little time to prepare for the transfer and complete other tasks (James, Quirke & McBride-Henry 2013). Nursing activities and workflow are interrupted as the transfer and associated bedspace move(s) can take precedence over other nursing work (Chan, Jones & Wong 2013; Cornell, Riordan & Herrin-Griffith 2010; Jennings, Sandelowski & Higgins 2013; Yi & Seo 2012) that may lead to care omissions or delays (Blackman et al. 2015; Gonzalo et al. 2014).

As would be anticipated, communication formed an essential part of the transfer and bedspace move process. Directly linked to the number of transfers (Storfjell et al. 2009) the findings concur with other researchers that communication in its' various forms is one of the most frequent activities undertaken by nurses (Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010). Overall, communication accounted for almost 21% of nurses' time, ranking second to direct nursing care (Figure 5). Most of nurses' time was spent communicating with the patient and/or family members or with other health professionals (see Figure 7) and is greater than that formerly reported (Chaboyer et al. 2008; Hendrich et al. 2008; Upenieks, Akhavan & Kotlerman 2008). Keeping the patient and family members informed of any pending transfer or bedspace move and the reason behind the move is a key responsibility of the nurse (Clarke et al. 2012; Collins et al. 2010; Hindmarsh & Lees 2012; James, Quirke & McBride-Henry 2013) and a worthwhile investment of nurses' time.

An interesting finding is that the time spent communicating differed between RNs and Enrolled Nurses (ENs). As a proportion of nurses' overall time, RNs and ENs spent a similar amount of time communicating at 36% and 31% respectively (Figure 11). However, ENs spent significantly longer than the RN on each individual communication (see Table 26). Previous workload studies have not explored the communication practices between different levels of nurses in such detail (Ballermann et al. 2011; Chaboyer et al. 2008; Farquharson et al. 2013; Westbrook et al. 2011). It is therefore not known if such differences are unique to the transfer process or representative of the different nursing roles.

Nursing handover, which is a specific form of communication, was one activity that was sometimes not observed or may have been omitted due to workload pressures.

Handover was not observed to be provided in over 20% of patient transfers and 65% of bedspace moves. Reasons for handover omissions following patient transfers are not known, other than that some patients arrived from other departments prior to a telephone handover and without a nurse escort (Field notes 10.6 & 10.7). It is possible that some transfer handovers were provided but may not have been observed if handover was provided to a nurse other than the nurse responsible for the patient (Cognet & Coyer 2014; O'Connell, Macdonald & Kelly 2008) as did occur on occasions (Field notes 10.8-10.10). If some handovers occurred at a much earlier (see Field note 7.4) (or later) time than that of the patient transfer (Hilligoss & Cohen 2013) these may not have been captured during the period of observation.

The high percentage of bedspace moves that was not followed up with a nursing handover raises some concern. As bedspace moves were observed as a complete process and handovers occur between staff working on the same ward, it is less likely that the handover was unable to be observed. For some bedspace moves the same nurse remained responsible for the patient meaning that a handover was not necessary, but this was not always the case. Medical staff do not always provide a handover to other team members for patients considered to be stable or the handover may be very brief (Bomba & Prakash 2005; Martin, Frank & Fletcher 2014). Nurses may also consider handover for stable patients to be unnecessary, especially if a handover was provided for all patients at the commencement of the nursing shift.

Handovers could be brief taking less than 20 seconds or delivered ‘on the run’ as the nurses moved the bed or were in other locations of the ward (Field note 10.12). Perceived to be a time-consuming activity by some nurses (Street et al. 2011), it is not surprising when approximately 13 medical-surgical patients are moved between bedspaces each day (Appendix E4) that nurses brief their colleagues on a patient's progress as they carry out other duties (Hilligoss & Cohen 2013).

Handovers were noted to be delayed for several reasons. A common occurrence on the medical ward was that handover could be delayed following the movement of a patient from the acute stroke rooms to one of the step-down rooms. Ward policy dictated that a qualified nurse must remain in each of these rooms at all times (Field notes 10.2 & 10.5). As neither the sending nor receiving nurse was permitted to leave the vicinity of the patient rooms, nursing handover was delayed until such time as one of the nurses could be relieved. This could be at shift changeover or even later if the relieving nurse was working reduced hours (refer to Field note 10.4). To ensure familiarity with the patient's nursing needs the receiving nurse will need to review the patient's medical record and charts; a process that can take almost thirty minutes (Cheevakasemsook et al. 2006). As delays with handover pose a risk for patient safety (Hilligoss & Cohen 2013) and increase nursing workload, an argument could be made for electronic handover.

Consistent with findings that a significant amount of nursing work is administrative or clerical in nature (Cornell et al. 2010; Cornell, Riordan & Herrin-Griffith 2010; Duffield et al. 2005; Duffield, Gardner & Catling-Paull 2008; Furaker 2009; Harrison & Nixon 2002; Kaya et al. 2011; White et al. 2015) almost 11% of nursing activities associated with moving a patient were administrative. Compared to earlier studies (Harrison & Nixon 2002; Hendrich et al. 2008; Wong et al. 2003) this figure represents an increase in time spent coordinating patient transfers, and is possibly a reflection of the increasing trend to transfer patients during their hospitalisation. The nurse was not directly observed coordinating beds and staffing in this study, but this does not mean that the activity did not occur. For example, Westbrook et al. (2011) reported an increasing need for nurses to address beds and staffing issues possibly because of high patient turnover. It is likely that the coordination of beds and staffing is part of a continuous process rather than a distinct activity. In response to the notification of an impending transfer, the experienced nurse would be evaluating current staffing levels and nursing skill-mix. Unless the nurse verbalises his/her thought processes regarding the state of the ward and current staffing needs, this activity is unlikely to be 'observed' and recorded.

The majority of time spent on administrative activities was taken up with the organisation of the patient's charts and medical record. Earlier projections that the electronic medical record (EMR) will have a positive influence on the volume of paper records and subsequently administrative work (Department of Health 2012; Hillestad et al. 2005; Wang et al. 2003) are yet to be realised (HiMSS Analytics 2013; Yu et al. 2013). Considering that each patient discharge is estimated to take between 5-10 minutes of the ward clerk's time (Farris et al. 2010) and that patient turnover on some wards can be up to 65% of patients per day (Beglinger 2006; Cookson & McGovern 2014; Jennings, Sandelowski & Higgins 2013; Park et al. 2012; Siehoff, Gancarz & Wise 2009), the volume of administrative work could be more than the capacity of one ward clerk. Without the nurse's assistance with administrative tasks, it is possible that patient transfers would be further delayed. It is therefore concerning that hospital 'frontline' staff (which includes the ward clerk) have been targeted in proposed efficiency measures (Gerathy 2012; NSW Nurses and Midwives Association 2012). Such measures will have a detrimental effect on nursing workload (NSW Nurses and Midwives Association 2012) and are at odds with recommendations that additional ward clerical support be made available (Gabr

& Mohamed 2012; Kaya et al. 2011; Maumill et al. 2013; Mazengarb 2013; Sadler-Moore 2009).

Unlike workload studies that have found that nurses spent more time on indirect care activities than on direct care (Chaboyer et al. 2008; Duffield & Wise 2003; Westbrook et al. 2011) the reverse can be said for the transfer process. When transferring a patient, 46% of nurses' time was spent on direct care and 4% on indirect care activities. The majority of direct care time in this study was spent escorting patients during transfer whereas previous research found that the nurse spent minimal time transporting patients (Chaboyer et al. 2008; Duffield & Wise 2003) in relation to their many other nursing activities. Escorting a patient was also the most time-consuming activity of the entire transfer process. Nurses in this hospital spent four minutes longer or 2-3 times more time escorting patients than that previously reported (Blay et al. 2014b; Chaboyer et al. 2008; Duffield & Wise 2003; Williams, Harris & Turner-Stokes 2009). Notwithstanding hospital size, and therefore lesser or greater travelling distances between wards and departments, the reasons for these differences in times and proportions are not known. Further research into the need for a nurse escort is therefore warranted. The introduction of a centralised nurse escort/transport system would enable clinical nurses to remain on the ward and spend more time with other nursing activities (Capuano et al. 2004). It is also possible that some patients could be escorted by unregulated workers such as assistants in nursing as occurs elsewhere (Selph 2014).

As the third most time-consuming activity overall, the time spent on documentation (see Figure 5) substantiates findings from earlier studies (Farquharson et al. 2013; Furaker 2009; Westbrook et al. 2011; White et al. 2015). The time spent on documentation when moving a patient is comparable to the 2.6 minutes associated with the unoccupied bed (Webster et al. 2011) and the three minutes per patient/hr as reported by Hakes and Whittington (2008). It is however, substantially less than the 13 minutes spent on 'bedside charting' as reported by Hendrich and Lee (2005). Reasons for such differences cannot be explained other than by the number of charts or forms associated with the transfer process. Multiple forms and or checklists can result in the duplication of some transfer information (Abraham & Reddy 2010; Kim et al. 2011) and would increase the time spent by nurses on transfer documentation.

9.3 Policy Implications

The results from this study have demonstrated that patients are being transferred and moved within the hospital environment very frequently and that the frequency of such moves can have a significant impact on nursing workload. While it is likely that policies at national (Perera et al. 2015) and local level account for the rise in transfer activity, there is no evidence that the implications for nurses and their work have been taken into consideration.

There is a perception by some that the NEAT has increased the percentage of outlier patients (Goulding et al. 2012; Lipley & Parish 2008; Mason 2014) leading to more patient transfers (Perera et al. 2015). Perera (2015) from Western Australia (WA) reported a significant rise in the number of surgical patient transfers following the implementation of the NEAT, whereas a previous WA study found no evidence for staff claims of an increase in the number of patient transfers and/or outliers (Stokes 2011). South Australian (SA) research has indicated that 49% of patients are an outlier at some point during their hospitalisation (Perimal-Lewis et al. 2012). Results from the data presented here may support the SA view, considering that 52% of Stage 1 patients were transferred at least twice.

The emphasis on transferring patients from the ED within four hours has certainly increased the workload of nurses working in that department (Crawford et al. 2014; Lipley & Parish 2008; Mortimore & Cooper 2007; Vezyridis & Timmons 2014; Weber et al. 2011). Despite the perception that the responsibility and workload has primarily fallen on ED staff (Stokes 2011; Weber et al. 2011) it is also likely that the workload of medical-surgical nurses has also been adversely affected. Nurses working in these areas have to contend with the extra transfer activity that can occur at short notice (Field notes 3.2 & 8.5), associated interruptions to workflow and the continuous movement of patients between bedspaces. Furthermore, ward nursing staff are often required to collect ED patients from radiology (Field notes 10.6 & 11.2) a strategy employed to enhance patient flow (Emergency Care Institute NSW & Agency for Clinical Innovation 2014; NSW Department of Health 2012b) by reducing the time ED staff spend waiting for radiological services (Forero, McCarthy & Hillman 2011).

The impact of patient turnover on nursing workload has long been identified as an important issue by researchers. It is however, only recently that patient transfers have been incorporated into nursing workload and staffing measures (Hughes et al. 2015; Kortbeek et al. 2015; Twigg et al. 2011). Now that the time to transfer patients between and within wards has been determined, it is essential that such tools be revised to accurately to reflect the impact on nursing workload.

Several local policies have an impact on medical-surgical nurses' workload and the frequency of patient transfers. The policy to transfer or discharge patients by mid-morning is one example. The principle behind this policy is to enable ED patients to be transferred into a ward bed earlier in the day in order to reduce access block (Khanna et al. 2012; Stokes 2011) but hospitals need to ensure adequate resources are in place to aid the process. The medical ward policy requiring that a nurse remain in specified rooms at all times was perhaps enacted to enhance patient safety. What has not been considered is that without staff to help move patients and enable handover to be delivered, the policy has inadvertently increased the workload and responsibility of the other nurses working on the ward.

9.4 Recommendations

Patient transfers are a costly and often necessary exercise in terms of length of stay, patient outcomes and use of staff time (Blay, Donoghue & Mitten-Lewis 2002; Blay, Duffield & Gallagher 2012; Kanak et al. 2008). Reductions in frequency of patient transfers and the time taken to move patients will lessen the load on nursing staff and likely have a positive effect on patient outcomes and patient flow.

9.4.1 Acuity-adaptable rooms

One way that patient transfers and bedspace moves can be lessened is by the introduction of acuity-adaptable room(s). The ability to nurse patients in one location throughout their episode of care reduces the need to transfer patients from areas of high to lower acuity as often occurs (Besserman et al. 1999; Gallant & Lanning 2001; Hendrich, Fay & Sorrells 2004). Not only will a lessening of transfers result but also the number of bedspace moves will be reduced as these classically follow the pattern of patient transfers (05 and 06). Nurses benefit from acuity-adaptable rooms from the time saved in having to move patients (Drexler et al. 2013; Gallant & Lanning 2001; Hendrich, Fay & Sorrells 2004) allowing more time to be spent on nursing care. Other nursing benefits include increased skill level from nursing patients from the acute to subacute clinical phases and increased work satisfaction (Bonuel & Cesario 2013b; Drexler et al. 2013; Winter, Tjiong & Houston 2011).

Acuity-adaptable rooms have mostly been used within surgical specialties (Bonuel, Degracia & Cesario 2013; Clark, Roberts & Traylor 2004; Emaminia et al. 2012; Winter, Tjiong & Houston 2011) but medical wards could also benefit. Acuity-adaptable rooms can be designed to reduce transfers to aged care or rehabilitation (George, Adamson & Woodford 2011) and would be ideal for the medical ward used in Stage 2 and Stage 3, that currently moves patients from the acute to the step-down room and then to a ward bed on a regular basis. Transforming the acute and step-down rooms to the acuity-adaptable format would reduce bedspace moves and have a positive effect on nursing workload.

Costs associated with conversion from general rooms to the acuity-adaptable model may be prohibitive for some hospitals (Kwan 2011) but are offset by savings from the reduction in patient transfers (Boardman & Forbes 2011; Chaudhury, Mahmood & Valente 2003; Detsky & Etchells 2008; Hendrich, Fay & Sorrells 2004); length of stay (Bonuel, Degracia & Cesario 2013; Clark, Roberts & Traylor 2004; Kwan 2011); and a reduction in nurse turnover (Drexler et al. 2013; Kwan 2011; Winter, Tjiong & Houston 2011). It is likely that nurse retention was positively influenced by fewer patient transfers and the subsequent reduction in nurses' workload. Cost savings may also be realised from reductions in nurse overtime as evidenced by quality improvement programs that have reduced the time taken to transfer patients between wards (Kibler & Lee 2011).

If the acuity-adaptable room is not an option, hospitals should explore other alternatives to reduce nursing workload. For example, hospitals overseas utilise nursing or healthcare assistants to pack patient's belongings, make beds and transport stable patients in wheelchairs (Capuano et al. 2004; Lees 2013). Indeed it could be argued that such tasks need not be performed by registered nurses. Alongside the need for unregulated workers (healthcare assistants) is a need for additional orderlies and porters. The cost of nursing staff spending time moving beds and waiting for an orderly or porter to transfer a patient far outweighs the cost of employing additional ancillary staff (Farris et al. 2010).

9.4.2 Transport Teams and ADT Nurses

Perhaps the answer to reducing nurses' workload on the wards is to introduce a multidisciplinary transport team as favoured by some hospitals in the U.K and the U.S. For the most part, transport teams are responsible for ensuring the safe transfer of critically ill patients within and between facilities (ANZCA, CICM & ACEM 2010; Blakeman & Branson 2013; Kue et al. 2011; McLenon 2004; Pennsylvania Patient Safety Authority 2009; Warren et al. 2004; Wasserfallena et al. 2008; Winter 2010) but they may also assist with the transfer of other patients as the need arises (Portsmouth Hospitals NHS Trust 2012). A key member of the team is an experienced critical care nurse, who may be the nurse responsible for the patient in the sending unit (McLenon 2004; Winter 2010) or as sometimes occurs, an appropriately trained nurse from the receiving ward (Derby Hospitals NHS Foundation Trust 2011; Hurst et al. 1992). The impact of such teams on medical-surgical nurse workload is yet to be explored. However, as found with critical care nurses, utilising a nurse from the sending unit has a negative impact on the workload of the nurses remaining in the unit (Hurst et al. 1992).

An alternative solution to the use of ward nurses spending a large percentage of their time on patient transfers is to implement an Admission, Discharge, Transfer (ADT) nurse role (Giangiulio et al. 2008; Kirkbride et al. 2012; Spiva & Johnson 2012). Considering the time spent on the transfer process, it is not surprising that hospitals that have instigated an ADT nurse (or similar roles) have found it to be a cost effective (Hlipala et al. 2005; Spears et al. 2014), well supported role (Giangiulio et al. 2008; Kirkbride et al. 2012; Lane et al. 2009; Spears et al. 2014; Spiva & Johnson 2012) that has led to reductions in length of stay (Kirkbride et al. 2012; Spears et al. 2014). The ADT nurse takes full responsibility for the transferring patient until settled in the receiving location (Giangiulio et al. 2008; Kirkbride et al. 2012) thereby helping to reduce interruptions to nurses' work from the need to transfer a patient. The role may help to reduce the number of activity omissions and/or delays and thereby positively affect patient safety (Estryn-Behar et al. 2014; Hopkinson & Jennings 2013; McGillis Hall et al. 2010; Westbrook et al. 2010). It could also be said that as the role of the ADT nurse includes attendance at daily bed management meetings, tracking bed availability and liaising with unit managers (Spiva & Johnson 2012) the need for a supernumerary nurse such as the TL, to coordinate patient flow is lessened.

A potential disadvantage of the ADT role however, is that multiple handovers are necessary. Handover is initially provided by the sending nurse to the ADT nurse, who then provides handover to the receiving nurse (Giangiulio et al. 2008). This may or may not be an issue, considering that 24% of patient moves in this study involved multiple handovers. The use of a transfer checklist or handover form may help to enhance communication between parties (Dalawari et al. 2011; Hindmarsh & Lees 2012; Pesanka et al. 2009). Such a simple, cost effective measure such as the ADT nurse, would lighten clinical nurses' workload, help to improve patient flow and could enhance patient safety.

9.5 Future Research

The study opens up the need for further research. Patients with a length of stay of less than 48hrs and temporary transfers for diagnostic purposes were not examined. (Maben et al. 2015). To more fully determine the impact of moving patients on nurses' workload, further research incorporating these populations and type of transfers is necessary.

Ward design is an important point to consider. Ward design and the number of single rooms can have an impact on nurses' workload, walking distances (Hurst 2008; Maben et al. 2015; Yi & Seo 2012) and as discussed in Section 9.4.1 the need to transfer patients. The site hospital does not currently have any acuity-adaptable rooms and the medical-surgical wards have limited single rooms. Indeed, several (observed) bedspace moves were the result of a need for a single room. To determine the impact of ward design on the rate of transfers and bedspace moves, a multi-site study is recommended.

Finally, following on from preliminary research undertaken by the author (Blay, Donoghue & Mitten-Lewis 2002; Blay, Duffield & Gallagher 2012) the study also opens up the need to explore the impact of transferring patients on length of stay and patient outcomes.

9.6 Limitations

The multiple methods approach is a major strength of this study. This is the first study to calculate the rate of patient movements over a one year period, to identify the nursing activities associated with moving a patient and to design a tool specifically for the observation and timing of nurses' activities during the relocation of a patient. However, there are several limitations associated with this study.

Stage 1

One limitation of Stage 1 of this study is the possibility that not all transfers and bedspace moves made by patients were captured. To ensure that complex clinical information is limited to relevant departments or personnel (Toennies 2012) multiple databases are used to record and track the patient journey (Wong et al. 2014). As each system was designed for a specific purpose, there is a prospect that some transfer data were not included. Furthermore, the possibility of coding and other errors in health administrative datasets must not be overlooked (Atkinson 2012; Queensland Health, Endo & Johnston 2010; Ranmuthugala et al. 2008; Wardle et al. 2012). Extensive data cleansing and cross checking was carried out on the health administrative datasets prior to analyses in order to increase the reliability of the data, even though errors associated with Australian hospital and linkage datasets are reportedly low (McKenzie et al. 2005; Rosman et al. 2002; Sprivulis et al. 2006; Sundararajan et al. 2000). A minimal number of date and time errors were found during this process. For example, some reported transfer dates and/or times were missing or outside the admission and discharge parameters (n=5). It is entirely feasible, that some of the recorded times for patient moves are inaccurate. As the times of patient moves were aggregated and reported in the results by nursing shifts, any inconsistencies are unlikely to effect the reported results.

The number of transfers is potentially much higher than depicted in this thesis as analyses excluded temporary transfers, over-census beds within the ED and short-stay patients. These are important issues as the high turnover of short-stay patients is known to impact on nurses' time and workload (Griffiths 2011; Park et al. 2012; Simon et al. 2011). Temporary transfers such as described by Webster and colleagues (2011) whereby the patient returns to the same ward following the provision of a diagnostic or other health service, were not captured in the administrative dataset at that time. This means that transfers to some diagnostic departments, the physiotherapy gymnasium and outpatient clinics to name a few, were not included in the transfer rate. Hospitals are also being encouraged to perform less urgent diagnostic investigations on the ward instead of in the ED (Maumill et al. 2013) in which case, the frequency of temporary transfers could be considerable.

Stage 2

The observational-timing study conducted in Stage 2 has several limitations. First and foremost, the unpredictable nature of patient transfers meant that nursing staff attended to other ward-based activities (not transfer related) in between attending to the patient transfer. This pattern of work limited the use of continuous timing; the essential method for a time and motion study. Therefore a timing study was performed.

It is likely that some nursing activities were not observed and timed. There are several reasons for this. Many activities particularly communication, lasted for only a few seconds and could be performed simultaneously with another activity. If the observer was recording (writing) on the TTT at that same moment, some rapidly performed activities may not have been observed and captured. Secondly, the observer focussed on the clinical nurse responsible for the patient transfer. It is likely that some activities were not observed, such as those administrative activities performed at the nurse's station. Finally, some activities were performed behind closed curtains for patient privacy and were therefore unable to be observed, and as a consequence, the number of transfer related activities performed by nurses is likely to be greater than that depicted in the results.

A major limitation of the study is that the time spent by nurses attending to patient transfers may have been underestimated. The study focussed on patients staying in hospital for two or more days. Considering the rise in short-stay hospitalisations and the frequency that patients attend other departments for diagnostic and other services, the impact upon nurses' time may be substantially higher than that reported. Results from this study have indicated that the average time to transfer a patient is one hour. However, as some transfers were not able to be observed the duration could be longer. For example, seven transfers were excluded from the analyses due to the transfer not being completed within the period of observation. Excluding these transfers may have positively skewed the data.

9.7 Conclusion

This sequential multiple methods research study has determined that attending to patient transfers and bedspace moves form a major component of nursing work in the modern hospital system. The study has identified that patient moves on medical-surgical wards is in response to an increased demand for healthcare alongside bed shortages. National policies and locally based strategies designed to enhance patient flow have also contributed to the increased rate of patient transfers and bedspace moves. The consequence of frequent patient moves is that nursing workload is adversely affected which may have implications for patient safety.

The results from the second Stage of this study have formally recognised the amount of time that nurses spend moving patients. An average of 25 nursing hours each month spent on the transfer and bedspace move process, means less time remains for other patient care activities. Many of the activities undertaken by nurses in order to move patients could and should be performed by other healthcare workers. The costs of employing additional ancillary staff more than offset the cost of nurses' time.

With the continuing demand for health services and staffing shortages, hospital managers need to consider innovative strategies that reduce unnecessary nursing workload and that have a positive impact on patient flow. The Admission, Discharge and Transfer nurse is one possible solution amongst several others that are recommended.

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Appendix A

Syntaxes for Transfers and Bedspace Moves

A1: Syntax 1 (Transfers)

```
DO IF (ward_identifier.1 = ward_identifier.2).
COMPUTE new_var=0.
ELSE.
COMPUTE new_var=1.
END IF.
```

A2: Syntax 2 (Transfers)

```
DO IF ((TF_type2=5) OR (TF_type2=6)).
/* Move the next real value to the left.
 COMPUTE TFStart.2=TFStart.3.
 COMPUTE ward_identifier.2 = ward_identifier.3.
 COMPUTE unit_type.2 = unit_type.3.
 COMPUTE specialty_code.2 = specialty_code.3.
 COMPUTE local_bed_identifier.2=local_bed_identifier.3.
 COMPUTE TF_type2 = TF_type3.
  /*Set a flag and set the moved value to NULL.
 COMPUTE TFFlag=2.
 COMPUTE TF_type3=0.
END IF.
EXECUTE.
```

A3: Syntax 3 (Bedspace move)

```
COMPUTE new_var=0.
execute.
DO IF (BedID1 = BedID2).
COMPUTE new_var=0.
ELSE.
COMPUTE new_var=1.
END IF.
```

Appendix B

Stage 1 Results

B1: Frequency of Transfers by Sending Specialty

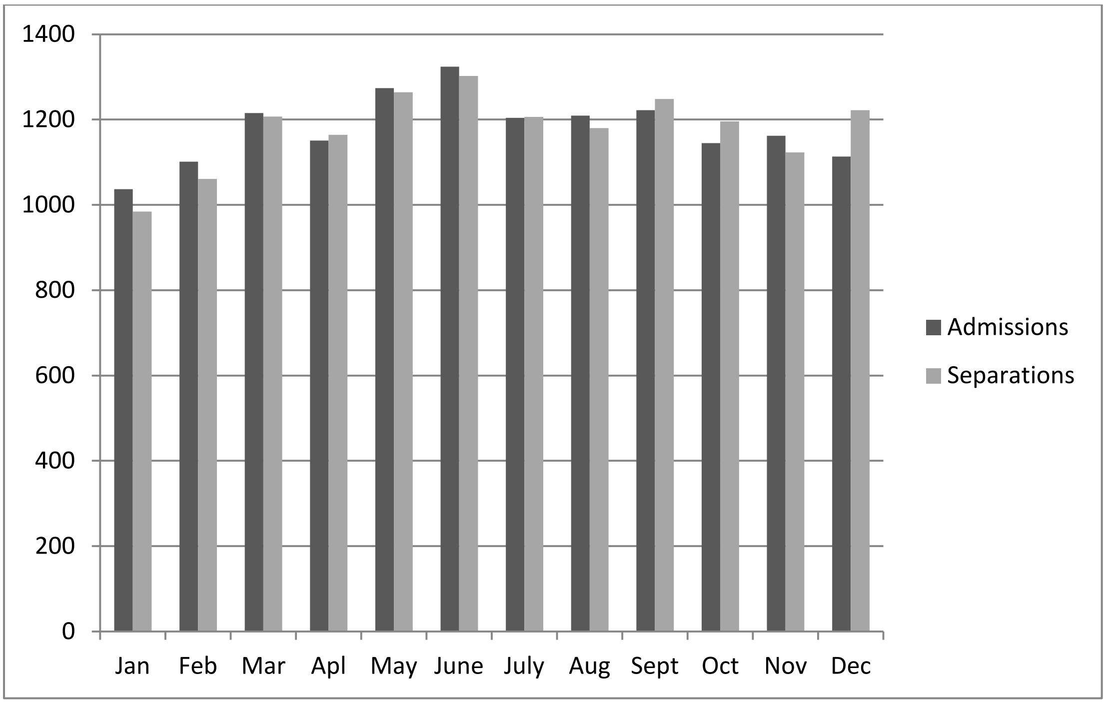
Transfers*	n	%
ED/EMU	11,439	42.1
ICU/CCU/HDU	3480	12.8
Assessment units	2909	10.7
Surgical	2300	8.5
Medical	2204	8.1
Operating theatre	1660	6.1
Day only/short stay	1507	5.6
Dialysis units	514	1.9
Aged care/Rehabilitation	507	1.9
Oncology	391	1.4
Transit lounge	194	0.7
Paediatrics/Maternity	37	0.1
Total	27,142	100%

*Excludes separation unit

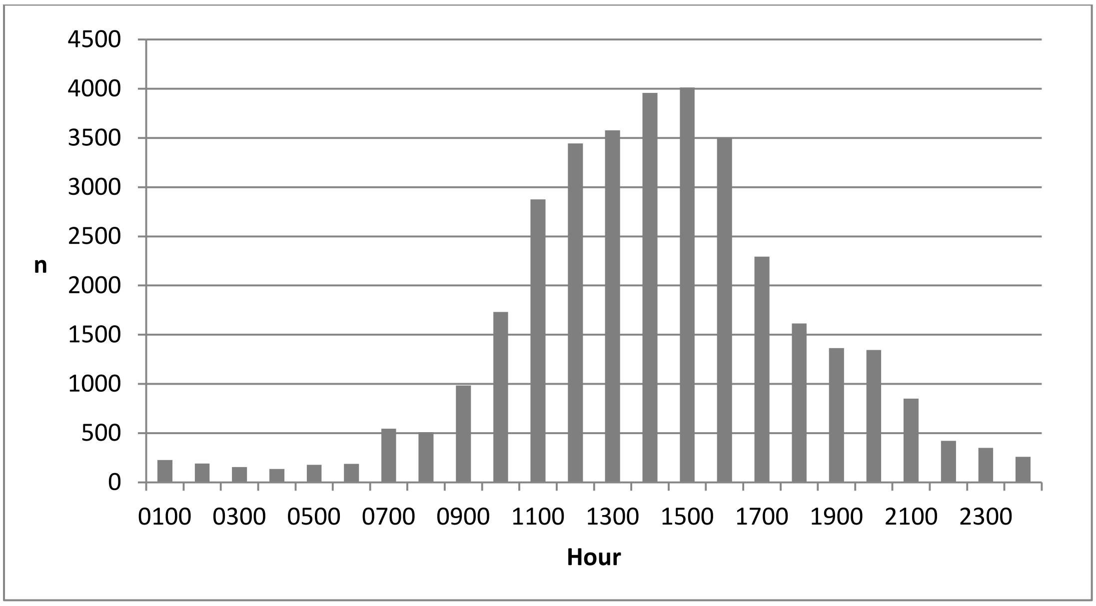
B2: The Destination of Transfers by the Number of Transfers Experienced

Specialty	No of Transfers								
	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	6 n (%)	7 n (%)	8-12 n (%)	Total
Medical	3118 (23.7)	1983 (25.1)	678 (20.5)	268 (18.5)	156 (22.6)	74 (22.2)	45 (26.5)	57 (37.7)	6379
Surgical	2372 (18.0)	1695 (21.5)	896 (27.2)	422 (29.1)	208 (30.1)	106 (31.7)	53 (31.2)	35 (23.1)	5787
ICU/CCU/HDU	1695 (12.0)	1194 (15.1)	543 (16.5)	222 (15.3)	95 (13.7)	42 (12.6)	17 (10.0)	11 (7.2)	3819
Assessment units	2719 (19.2)	399 (2.8)	141 (4.3)	31 (2.1)	11 (1.6)	5 (1.5)	3 (1.8)	-	3309
Aged Care/ Rehabilitation	403 (3.1)	1396 (17.7)	377 (11.4)	168 (11.6)	56 (8.1)	23 (6.9)	9 (5.3)	2 (1.3)	2434
Operating theatre	1310 (10.0)	190 (1.3)	103 (3.1)	35 (2.4)	14 (2.0)	8 (2.4)	3 (1.8)	1 (0.6)	1664
Transit lounge	155 (1.2)	426 (5.4)	345 (10.5)	167 (11.5)	71 (10.3)	18 (5.4)	8 (4.7)	4 (2.6)	1194
Oncology	610 (4.6)	313 (4.0)	120 (3.6)	38 (2.6)	19 (2.7)	9 (2.7)	2 (1.2)	-	1111
ED/EMU	537 (4.1)	49 (0.6)	8 (0.2)	1 (0.1)	-	-	-	-	595
Dialysis units	47 (0.4)	115 (1.5)	68 (2.1)	85 (5.9)	57 (8.2)	48 (14.4)	28 (16.5)	40 (26.4)	488
Day only/ Short stay	162 (1.2)	122 (1.5)	18 (0.5)	12 (0.8)	2 (0.3)	-	2 (1.2)	1 (0.6)	319
Paediatrics/ Maternity	21.(0.2)	13.(0.2)	3.(0.1)	3.(0.2)	2.(0.3)	1.(0.3)	-	-	43
Total	13149 (48.4)	7895 (29.1)	3300 (12.2)	1452 (5.3)	691 (2.5)	334 (1.2)	170 (0.6)	151 (0.6)	27142

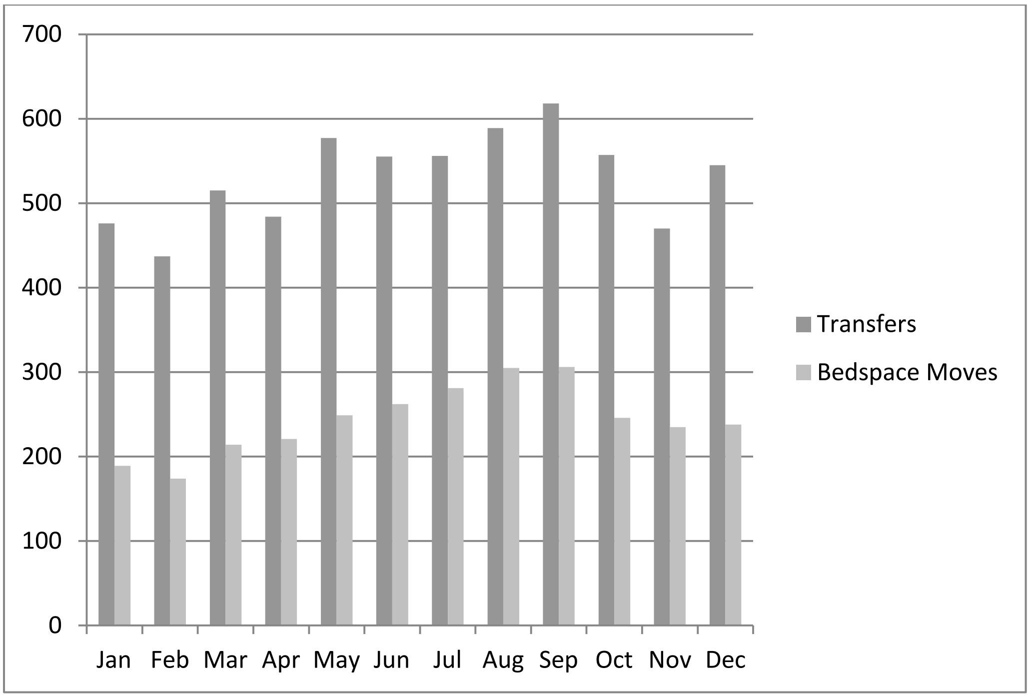
Notes: This table demonstrates that 23.7% of first transfers and 25.1% of second transfers were to medical wards etc.



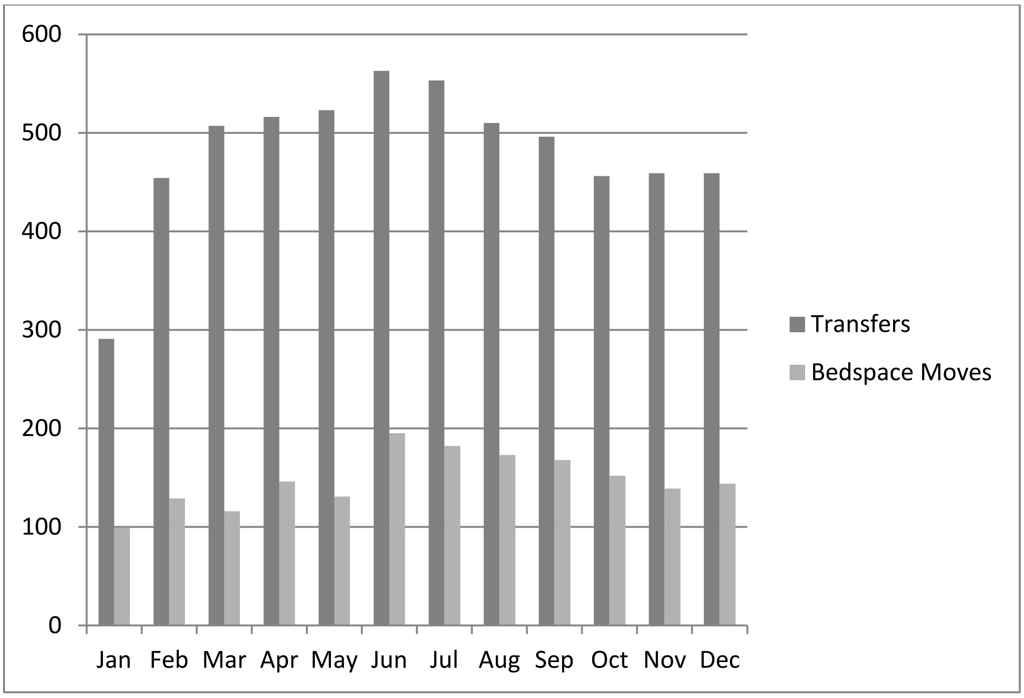
B3: Hospital Admissions and Separations by Month of the Year



B4: Patient Moves by Time of Day



B5: Medical Transfers and Bedspace Moves by Month of the Year



B6: Surgical Transfers and Bedspace Moves by Month of the Year

Appendix C

Research Studies and Patient Transfers

C1: Table Showing Differences between Time and Motion, Work Sampling and Timing Studies

	Time & Motion (n=7*)	Work Sampling (n=9*)	Timing Studies (n=8)
Purpose			
To observe workload/workflow	✓	✓	✓
To observe specific activity or process	✓	x	x
Design			
Independent observation	✓	✓	✓
Self-reporting	✓	✓	✓
Participants: mean (range)	224(10-517)	96(7-382)	67(19-125)
Convenience sampling	✓	x	x
Study duration months: mean (range)	2.1(0.0-5.0)	6.6(0.2-19)	18.4(1.0-41.0)
Activities			
Defined activities	✓	U	U
Defined categories	U	U	U
Pilot observation	✓	✓	✓
Focus groups	✓	✓	✓
Observational Technique			
Continuous observation (defined start and end time)	S	x	ND
Intermittent or random observations	x	✓	S
Timed activities	✓	x	S
Observation blocks (hours) mean (range)	6.3(1.5-12.0)	9.1(2.0-24.0)	4.0(1.0-12.0)
Observation hours mean (range)	177.4(76-372)**	304(126-482)**	197.3(82.5-382.7)
Manual or electronic recording	Manual/electronic	Manual/electronic	Electronic
Observers			
Observer numbers mean (range)	2(1-3)$	15(2-35)$	2(1-3)$
Need for trained observers	✓	✓	✓
Need for inter-rata reliability	✓	✓	✓
Observer-subject ratio	1:1	1:many	ND

Notes: Only studies that used direct observation or self-reporting and included patient transfers, transporting patients or similar terms as an activity were included (refer to Appendix C2).
*One study included TM & work sampling. **Excludes study that used TM & work sampling as total (overall) hours were provided. $n=4
ND: not defined; U: usually; S: sometimes.

C2: Review Summaries for Research Studies Included in Appendix C1

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Farquharson et. al. (2013) U.K.	S-R study using WOMBAT to determine the time spent on direct care activities by medical and surgical nurses.	*Method*: In response to a random alert, nurses recorded their current activity into a PDA. *Subjects:* 67 nurses. *Activity Categories*: Ten broad mutually exclusive categories (Direct care, Indirect care, Medication tasks, Documentation, Professional communication, Ward related activities, In Transit, Supervision, Social, Other). *Transfer Category*: Direct care. *Transfer Activity*: Transporting patient.	*Observers*: S-R. *Training*: Completion of training manual & instruction in use of PDA. *Inter-rater Reliability*: N/A.	*Setting*: Medical and surgical wards with >20 beds. *Data Collection*: Over one year.	*Transfer Outcomes*: ND.
Douglas et al. (2013) U.S.A.	Real-time observation to describe the work of adult and paediatric ICU nurses.	*Method*: Behavioural task analysis used to observe ICU nurses. Continuous observation and recording of tasks performed by one preselected, clinical nurse. Portable tablet computer used to record activities. Software enabled automatic recording of activity start and completion times. Multiple tasks recorded. Pilot study and discussion helped refine data collection tool. *Subjects:* 230 nurses. *Activity Categories*: Four (Direct patient care; Care coordination; Indirect patient care; Non patient care) and 17 tasks. *Transfer Category*: Direct patient care. *Transfer Activity*: Transporting patient.	*Observers*: Two observers (one RN) with human-factors engineering backgrounds. *Training*: Extensive training included data collection tool, site familiarisation and practice sessions. *Inter-rater Reliability:* Approximately 14 hrs of simultaneous observation resulting in 73% agreement within 10 secs.	*Setting*: Two adult & two paediatric ICUs in a 400 bed rural teaching hospital. *Data Collection:* 58 observation periods over three months.	*Transfer Outcomes*: ND.

Author (Year) Country	**Study Design & Purpose**	**Method, Subjects & Activity Categories**	**Observers, Training & Inter-rater Reliability**	**Setting & Data Collection Period**	**Transfer Outcomes**
Abbey, Chaboyer & Mitchell (2012) Australia.	TM to describe and analyse activities performed by ten ICU nurses during the day shift.	*Method*: Direct observation and recording of activity times on a purposefully designed tool Timing procedure ND. *Subjects:* Convenience sample ten ICU nurses. *Activity Categories*: Four major (direct care, indirect care, personal and unit related) and 25 minor categories. *Transfer Category*: Direct Care. *Transfer Activity*: Transporting patient.	*Observers*: Pilot study: n=2 Main study: n=1 (RN/researcher). *Training:* Practice observation. *Inter-rater Reliability:* Three simultaneous observation periods to test tool and inter-rata reliability.	*Setting:* 12 bed ICU in a Queensland private hospital. *Data Collection*: Mon-Fri 0700-1530hrs over 10 days.	*Transfer Outcomes:* 0.4% (19min) of nurse time (n=1).
Webster, Davies, Stankiewicz, et al. (2011) Australia.	TM to quantify nursing activities and time associated with the unoccupied bed.	*Method*: Observation and manual timing of nursing activities associated with unoccupied bed. Timing procedure ND. *Subjects*: Convenience sample of admissions (n=102), transfers (n=277) and discharges (n=138) associated with the unoccupied bed. *Activity Categories*: ND. *Transfer Category*: ND. *Transfer Activity:* Unoccupied bed associated with 'temporary transfer for provision of another health service'.	*Observers*: Two research nurses. *Training*: ND. *Inter-rater Reliability*: ND.	*Setting:* Four units (medical, surgical, oncology & maternity) in a 950 bed Queensland hospital. *Data Collection*: 0700-1900hrs for 9 weeks over 3 mths.	*Transfer Outcomes:* 45% (n=412) of observed activities associated with temporary transfers Mean transfer activities 1.49 mins (SD 1.2, range 1-7). Mean time to complete transfer activities: 8.65 mins (SD 11.75). Mean RI time: 9 mins. Mean nurse escort time: 13.81 mins (SD 9.71

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Ballermann, Shaw, Mayes, et al. (2011) Canada.	Observational study to validate WOMBAT and assess ICU staff activities and workflow.	*Method:* Work Observation Method by Activity Timing (WOMBAT) to record activities performed by Healthcare Providers (HCP). *Subjects*: n= 106 (Nurses n=47, Physicians n=18, Respiratory therapists n=25, Unit clerks n=16). *Activity Categories*: Ten major categories for Nurses, Physicians and Respiratory Therapists and nine categories for Unit clerks. *Transfer Categories:* Direct Care and Administrative. *Transfer Activities:* Escorting a patient and bed allocation.	*Observers*: ND *Training: U*se of PDA for minimum of 12hrs & simultaneous scoring with an experienced observer. *Inter-rater Reliability:* Training continued until minimum 85% accuracy attained.	*Setting:* Two hospitals: 17 bed paediatric ICU & 24 bed general ICU. *Data Collection*: Sept-Nov 2008 & Jan-Feb 2009. 90 min observations at shift change-over on Mondays, Fridays, midweek and weekends.	*Transfer Outcomes*: ND.
Westbrook, Duffield, Li. et. al. (2011) Australia.	Observational study to quantify nurse time per activity and identify changes in nurse activities over time.	*Method:* Independent observation of randomly selected nurses using WOMBAT. Activities entered into PDA with automatic date and time stamp. *Subjects*: 57 med-surg nurses. *Activity Categories:* Ten broad mutually exclusive categories (Direct care, Indirect care, Medication tasks, Documentation, Professional communication, Ward related activities, In Transit, Supervision, Social, Other). *Transfer Category*: Ward Related. *Transfer Activity:* Coordinating beds and staffing.	*Observers*: Experienced nurses and doctors. (Number of observers ND). *Training:* Simultaneous scoring between two observers *Inter-rater Reliability*: High level of accuracy (ND).	*Setting*: Two med-surg wards in a 400 bed public hospital. *Data Collection*: Weekdays 0700-1900hrs during 2005-2006. Repeated in 2008.	*Transfer Outcomes:* Mean 2.5% of nurse time spent on Ward Related activities in 2005-2006, increasing to 3.9% in 2008. Ward Related tasks more frequent on Mondays and Fridays.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Cornell, Riordan, Townsend-Gervis et al. (2011) U.S.A.	Observational study to assess barriers to nurse critical thinking and workflow.	*Method:* Independent observation of randomly selected nurse. Nurse activities recorded in tablet computer every three secs. *Subjects*: 19 nurses across two sites. (Site 1 n=8, site 2 n=11). *Activity Categories:* N/A. Eleven mutually exclusive tasks identified at site 1 and ten tasks at site 2. *Transfer Category:* Discharge and transfer (site 1). *Transfer Activity:* '*G*athering and reviewing information with the patient to prepare them for leaving the unit'.	*Observers*: ND. *Training*: ND. *Inter-rater Reliability*: ND.	*Setting*: Medical-surgical unit in a 339 bed suburban hospital (site 1). Paediatric oncology unit in a 60 bed paediatric hospital (site 2). *Data Collection*: Weekdays.	*Transfer Outcomes:* 1.4% of med-surg nurse time spent on discharge & transfer (site 1). No data site 2.
Cornell, Herrin-Griffith, Keim et al. (Part 1) (2010) U.S.A.	Observational-timing study to record and measure nursing activities and workflow pre implementation of an electronic medication record (EMR) system	*Method*: Observational timing study pre EMR at hosp B. Independent observation of randomly selected nurses. Nurse activity, time and location entered into PDA. *Subjects*: 27 med-surg nurses. *Activity Categories:* N/A. Activities coded according to 29 item list developed by Cornell et al. (2010). *Transfer Category*: N/A *Transfer Activities:* Admission-transfer defined as 'gather information, orienting patient to the unit' and Transporting Patients defined as 'moving patients'	*Observers*: Two (ND). *Training:* Researchers 'IRB trained and certified'. *Inter-rater Reliability*: ND	*Setting:* Two medical-surgical units within one hospital. *Data collection*: Weekdays over 4 weeks from 0700-1900hrs.	*Transfer Outcomes:* Admission-transfer – not observed. Transporting patients (n=2). Duration not reported.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Cornell, Riordan & Herrin-Griffith (Part 2) (2010) U.S.A.	Observational-timing study to record and measure nursing activities pre and post implementation of EMR system	*Method*: Independent observational-timing study pre and post introduction of EMR system at two sites. Random selection of nurse to be observed by Nurse in Charge on the day. Activity, time and location entered directly into PDA. *Subjects*: Hosp A, n=76; Hosp B, n= 49. *Activity Categories:* N/A. Activities coded according to 29 item list (see above). *Transfer Category*: N/A. *Transfer Activities:* Admission-transfer & Transporting Patients.	*Observers*: >1 (ND). *Training:* Training in use of PDA. Inter-rater Reliability: ND	*Setting:* Five medical-surgical units within two hospitals. *Data collection*: Weekdays from 0700-1900hrs over 18 months.	*Transfer Outcomes:* Admission-transfer - Pre & post-EMR mean time (secs): Hosp A: 443.9 (n=7), 102.8 (n=5). Hosp B: n/a (n=0), 187 (n=7). Transporting patients -Pre & post-EMR mean time (secs): Hosp A: 244.5 (n=2), 66.2 (n=26). Hosp B: 13.0 (n=2), 120.3 (n=27).
Gardner, Gardner & Middleton, et al. (2010) Australia.	Descriptive, observational study to determine pattern of practice and service impact of Nurse Practitioners (NP).	*Method:* Independent observation of NPs using work sampling. Ten minute sampling intervals in randomly allocated 2 hr blocks. Retrospective chart review. *Subjects*: Random, stratified sample of 30 NPs. *Activity Categories:* Four major categories and 30 activities, adapted from Pelletier & Duffield (2003). *Transfer Category*: Direct Care *Transfer Activity:* Initiates patient transfers/discharge.	*Observers*: 35 observers employed at multiple sites (ND). *Training:* Interactive computer assisted instruction and observation practice. *Inter-rater Reliability:* 95% accuracy.	*Setting*: NPs working in multiple specialties in metro and non-metro regions across five States/Territories. *Data Collection:* Two wks, randomised over six wks. All shifts, 7 days p/wk. Retrospective chart review over 30	*Transfer Outcomes:* NP initiated transfers represented 1.3% of direct care observations.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
				days.	
Williams, Harris & Turner-Stokes (2009) U.K.	WS to determine nursing activities on workload in a neuro-rehabilitation unit.	*Method:* Independent observation of each nurse on duty. Nurse activity and location recorded. *Subjects*: All nursing staff (n=32) consisting of 13 RNs, 19 Healthcare Assistants (HCA) and two nursing students. *Activity Categories:* Four categories (Direct Care, Indirect care, Unit-related, Personal Time). Transfer Category: Direct Care. *Transfer Activity:* 'Escorting patients to another department as advocate'.	*Observers*: Pilot study n=1, Main study n=2. (ND). *Training:* Codes and procedure. Four hrs of simultaneous observation. *Inter-rater Reliability:* Discussion and collaboration to develop consensus.	*Setting:* 24 bed neuro-rehabilitation unit in North London. *Data Collection*: Weekdays and weekends over a two week period from 0600-23.55hrs.	*Transfer Outcomes:* 118 escorts observed (1.3% total activities) all undertaken by non RNs. Escorting patients 2.1% of non-RN workload and 2.9% of all direct care activities.
Yen, Shane, Pawar et al. (2009) U.S.A.	Observational study to determine the impact of a computerised order-entry system on physician and nurse time.	*Method:* Observational study before and after implementation of an IT system. Labelled TM but more closely fits WS. *Subjects:* Convenience sample of nurses and physicians (ND). *Activity Categories:* Three major categories (Direct Patient Care, Indirect Patient Care, Other) and 17 subcategories. *Transfer Category:* Direct Patient Care. *Transfer Activity:* Transporting patient.	*Observers*: Multiple observers (ND). *Training:* Yes (ND). *Inter-rater Reliability:* Not tested – recognised as a limitation by the authors.	*Setting:* Paediatric ED. *Data Collection:* Convenience sample of seven morning, afternoon and evening shifts in 2004, 2005 and repeated in 2006.	*Transfer Outcomes:* Nurses 27.9% of their time on direct patient care prior to the introduction of IT system decreasing to 26.4% post implementation.

Author (Year) Country	**Study Design & Purpose**	**Method, Subjects & Activity Categories**	**Observers, Training & Inter-rater Reliability**	**Setting & Data Collection Period**	**Transfer Outcomes**
Storfjell, Ohlson, Omoike et al. (2009) U.S.A.	Mixed methods to understand nursing costs associated with value added (VA) and non-value added (NVA) time.	*Method:* Activity-based costing approach using focus groups, interviews, observation and surveys. Focus groups and interviews held with representative sample of nurses from each unit to determine nurse activities, time spent on activities and drivers of VA and NVA time. Timed observations (ND) and surveys support staff responses. *Subjects:* RNs, nursing assistants, secretaries, Nursing unit Managers (ND). *Activity Categories:* Activity Framework based on the Easley-Storfjell Caseload/Workload Classification System (1997) consisting of two macro activity areas (patient care and support) and 'several' micro activities. *Transfer Category*: Coordinate care. *Transfer Activities:* Admission, Transfer, Discharge and Shift and transfer hand-offs.	*Observers*: ND. *Training*: ND. *Inter-rater Reliability*: ND.	*Setting:* 14 med-surg nursing units, two ICUs & two maternity units in three hospitals. *Data Collection*: Component of three year nurse activity study. Observation period: ND.	*Transfer Outcomes:* Admissions, Transfers and Discharges (ATD) and hand-offs found to be high cost processes associated with NVA time. Drivers of NVA time: searching for nurse, medications or equipment, waiting for patient data/orders, repeat calls for transport, housekeeping or bed management & general discussion during hand-offs.
Storfjell, Omoike & Ohlson (2008) U.S.A.	Mixed methods to understand nursing activities and their costs.	*Method*: Nursing activities obtained from focus groups with nurses, followed by interviews and observation. *Subjects:* Experienced staff from each shift (ND). *Activity Categories:* Based on the Easley-Storfjell Caseload/Workload Classification System (1997) consisting of two macro activity areas (patient	*Observers*: ND. *Training*: ND. *Inter-rater Reliability*: ND.	*Setting:* 14 med-surg nursing units in three Mid-Western hospitals. *Data Collection*: Component of three year nurse	*Transfer Outcomes*: As above.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
		care and support) and 'several' micro activities. *Transfer Category:* Coordinate care. *Transfer Activities:* Admission, Transfer, Discharge and shift and transfer hand-offs.		activity study. Observation period: ND.	
Chaboyer, Wallis, Duffield et al. (2008) Australia.	WS to delineate ENs and RNs roles.	*Method:* Independent observational WS. *Subjects:* 114 nurses (RNs n=89, ENs n=25). *Activity Categories:* Four categories (Direct Patient Care, Indirect Care, Unit Related Activities and Personal Activities) and 25 activities based on Duffield et al. (2001). *Transfer Category:* Direct Care Activities. *Transfer Activity:* Transporting patients between departments.	*Observers*: 'Several' nurse research assistants (ND). *Training:* 16hrs of training provided with expert. *Inter-rater Reliability:* Training continued until 95% agreement attained. Spot checks of coding conducted throughout study.	*Setting:* Four medical wards in two Queensland hospitals. Hospital A 580 beds and Hospital B 700 beds. *Data Collection*: Ten days p/ward, over several weeks from 0700-1900 hrs, Mon-Fri during Winter and Spring.	*Transfer Outcomes:* transporting patient (n=80) accounted for 1.4% EN (n=22) and 2% (n=58) of RN direct care activities.
Hendrich, Chow, Skierczynski et al. (2008) U.S.A.	Mixed methods to determine how nurses spend their time, distance and location travelled and nurse energy expenditure and physiologic response to workload and stress.	*Method:* S-R TM, Timing studies, WS and Physiological Assessment applied to four distinct study protocols. Protocol A (S-R TM) to record all documentation related activities. Protocol B (S-R WS) of activity and location in response to random alerts. Protocol C (Timing study) nurses fitted with four radio frequency identification tags to monitor location, time & distance travelled. Protocol D (Physiological Assessment) physiological responses recorded by armband. *Subjects:* 767 nurses. Protocol: A (n=385), B (n=382), C (n=750), D (n=288). *Activity Categories:* Protocol A: eight categories (Admission paperwork, Assessment, Transcribe	*Observers*: N/A *Training*: N/A *Inter-rater Reliability*: N/A	*Setting:* 36 randomly selected med-surg units in 17 healthcare systems across U.S.A. *Data Collection*: Seven days. Protocols A-C all working hours (ND). Protocol B: 23hr period.	*Transfer Outcomes:* Protocol B nurses averaged 2.8% (15.2 mins) of time on unit related activities. When attending to unit-related functions.7.8% (10.2 mins) spent on unit and 5.5% (2.1 mins) off unit

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
		orders, Writing care plan, Medications paperwork, Teaching, Discharge paperwork and Other). Protocol B: Four categories (Waste, Unit-related functions, Nursing practice and Nonclinical) and 12 sub-categories. *Transfer Category:* Unit-related Functions. *Transfer Activity:* Transporting patients between departments.			
Ampt, Westbrook, Creswick & Mallock (2007) Australia.	WS study comparing observational and self-reporting techniques.	*Method:* Two-stage WS study. Pilot of S-R and tool with eight nurses on two other wards. Stage 1: nurse S-R in response to alert device. Stage 2: independent observation of nurse activity in response to alert device. *Subjects*: Nine RNs. *Activity Categories:* Multi-dimensional work task system based on four dimensions (What, Where, How, & Who). *Transfer Category:* Allied health, diet or transport. *Transfer Activity*: Transport.	*Observers*: Four observers with health science backgrounds. *Training:* Extensive. *Inter-rater Reliability*: Simultaneous recording with nurse educator until 85% agreement attained. Mid-stage reliability testing showed agreement levels >89%.	*Setting:* Surgical ward in a Sydney hospital. *Data Collection*: Self-reporting 8.5 weeks direct observation 4.5 weeks. Weekdays from 0800-1700hrs.	*Transfer Outcomes:* ND.
Hendrich & Lee (2005) U.S.A.	Observational TM study to examine efficiency, cost and time of intra-unit transfers.	*Method:* Pilot*:* random observations of patient transfers to identify the process and aid development of the data collection tool. Study: Observation of approximately 200 patient transfers. Transfers 'tracked' from time of transfer order to patient assessment in new location. Timing methods ND. *Subjects:* '> 200' transfers. *Activity Categories:* Transfer related tasks divided into Pre-Transport, Transport Patient and Post-Transport Events.	*Observers*: Three RNs. *Training:* 'Trained as research assistants' and in the use of the tool. *Inter-rater Reliability*: ND.	*Setting:* 750 bed tertiary care organisation. *Data Collection*: Variety of days and nursing shifts (ND) over five mths.	*Transfer Outcomes:* Mean transfer 60 mins. Patient preparation 22 mins, Transport event 7 mins and post transport 31 mins. 87% of transfer process considered

Author (Year) Country	**Study Design & Purpose**	**Method, Subjects & Activity Categories**	**Observers, Training & Inter-rater Reliability**	**Setting & Data Collection Period**	**Transfer Outcomes**
		Transfer Category: As above. *Transfer Activity*: N/A.			inefficient.
Capuano, Bokovoy, Halkins et al. (2004) U.S.A.	Mixed methods to assess impact of changes to work environment on staff roles.	*Method:* Staff survey identified need to redesign nursing work to eliminate non-value added time. Observational WS at timed intervals pre and post the work redesign process. Focus groups to validate observations and provide subjective information. *Subjects:* All clinical roles including RNs, Technical partner (TP), Administrative partner and Support partners (SP). (ND). *Activity Categories:* Five major categories (Direct Care, Indirect Care, Unit Related, Personal and Documentation) and 17 activities. *Transfer Category*: Direct Care. *Transfer Activity:* Transporting patient.	*Observers*: Ten advanced practice nurses (Baseline). Two 'observers with clinical knowledge' (Post redesign). *Training:* Yes (ND). *Inter-rater Reliability*: Practice run to ensure activities recorded in same manner. Baseline >90% reliability. Post-redesign 85% agreement.	*Setting:* 30 bed, neuro-science med-surg unit in a 650 bed hospital. *Data Collection*: Baseline measurement over 12 days on all shifts (1999). Post redesign (2002) encompassing a similar distribution of days and shifts (ND) as the baseline period.	*Transfer Outcomes:* transporting patient (baseline) undertaken by SP 68% (n=86), TP 26% (n=33) and RN 7% (n=9). Focus groups identified limited SP availability due to transporting role. Redesign process included centralised transporting role.
Duffield & Wise (2003) Australia	Discussion paper on the use of WS to investigate nursing work.	*Method:* Results from WS study support the discussion. *Subjects:* Nursing staff including agency and casual nurses (ND). *Activity Categories:* Four major categories (Direct Care, Indirect Care, Unit-related and Personal Time) and 25 activities *Transfer Category*: Direct Care. *Transfer Activity:* Transporting patient.	*Observers*: 19 hospital employees (ND). *Training:* provided by university staff (ND). *Inter-rater Reliability*: Yes (ND).	*Setting:* All wards (ND) and ICU in a private, not-for-profit hospital. *Data Collection*: Two weeks p/ward, randomised over 8 wks, Mon-Fri 0700-1900hrs.	*Transfer Outcomes:* Transporting patient accounted for over 2% of direct care activities and approximately 1.8% of RNs direct care time.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Wong, Gallegos, Weinger, et al. (2003) U.S.A.	Observational TM study to assess nurse time, pre and post implementation of an ICU information system.	*Method:* Independent observation and TM analysis of the predominant task performed by each ICU nurse. Tasks entered into a laptop computer and automatically date and time stamped. *Subjects:* Ten ICU nurses. *Activity Categories:* Five nursing categories (Direct Nursing Care, Indirect Nursing Care, Documentation Activities, Administrative Activities and Housekeeping) and 70 distinct tasks. *Transfer Categories:* Direct Care and Administrative Activities. *Transfer Activities:* Transport patient, without equipment. Transport patient with more than one piece of equipment and continuous monitoring.	*Observers*: One ICU Clinical Nurse Specialist. *Training*: Yes (ND). *Inter-rater Reliability*: N/A	*Setting:* 10 bed ICU in a Veterans Affairs Medical Centre. Data Collection: All shifts.	*Transfer Outcomes*: ND.
Hoffman, Tasota, Scharfenberg et al. (2003) U.S.A.	WS to compare work practice between acute care nurse practitioner (NP) and physicians.	*Method: O*bservational WS. *Subjects:* One acute care NP and six physicians in training. *Activity Categories:* Three major categories (Routine management of patients, Coordination of care and Non unit activities), nine subcategories and 42 activities. *Transfer Category:* Non unit activities. *Transfer Activity:* Transporting patients.	*Observers*: Four (two graduate nursing students and two researchers). *Training*: ND *Inter-rater Reliability*: Testing of data collection tool between two observers attained 95% reliability.	*Setting:* Step-down medical ICU with six beds. *Data Collection*: Three periods over 19 mths on weekdays for 'several weeks'.	*Transfer Outcomes:* NP observed transporting patients on one occasion.

Author (Year) Country	Study Design & Purpose	Method, Subjects & Activity Categories	Observers, Training & Inter-rater Reliability	Setting & Data Collection Period	Transfer Outcomes
Harrison & Nixon (2002) U.K.	Descriptive WS study to categorise and quantify ICU nurse activities.	*Method:* Nurse S-R (manual diary log) of performed activities. *Subjects*: All nursing staff (40.85 FTE), Unit secretary and Healthcare Assistant. *Activity Category:* Six broad categories (Direct Nursing Care, Clerical Nursing Duties, Patient Assessment, Time-Out Patient Focussed Activity, Non-nursing Duties and Timeout Personal Activity) and 45 activities. *Transfer Categories:* Direct Care, Clerical Nursing Duties (completing transfer documentation) and Time-out Patient Focussed Activity (arranging transfers). *Transfer Activities:* Transferring a patient to other hospitals, wards, scan or theatre. Completing patient documentation and arranging a transfer.	*Observers*: N/A *Training:* Pilot study enabled nursing staff to become familiar with data collection tool. *Inter-rater Reliability*: N/A.	*Setting:* General seven bed ICU. *Data Collection*: One week data collection over all days and shifts.	*Transfer Outcomes* Seven patient transfers reported. Time-out patient focussed activity accounted for 6% of nurse time.

Notes: WOMBAT: Work Observation Method by Activity Timing. ND not defined; N/A not applicable; ICU(s): Intensive care unit(s); PDA: Personal Digital Assistant; S-R: self-reported; TM: Time and Motion; WS: work sampling
Secs: seconds; Min(s): minute(s); Hr(s): hour(s)

C3: Summary of Descriptive Elements for Studies Included in Appendix C2

Author (Year)	Continuous, Fixed or Random Interval Observation	Observation Blocks	Observation Hours	Total Observations*	Total Activities	Recording Tool
Farquharson et. al. (2013)	Random at 90 ± 15 min intervals	12 hr day and night shifts	ND	ND	961 (S-R)	Electronic
Douglas et al. (2013)	Continuous (Observation suspended when subject behind closed curtains & during personal time).	1.5-3 hrs	147	N/A	ND	Electronic
Abbey, Chaboyer & Mitchell (2012)	ND	8.5 hrs	76	N/A	3081	Manual
Webster, Davies, Stankiewicz, et al. (2011)	ND	12 hrs (0700-1900 hrs)	ND	N/A	916	Manual
Ballermann, Shaw, Mayes, et al. (2011)	ND (Observation suspended when subject off-unit and during personal time).	1.5 hrs	232	ND	14,928	Electronic
Westbrook, Duffield, Li. et. al. (2011)	ND	1 hr (mean)	191.3	ND	13,830	Electronic
Cornell, Riordan, Townsend-Gervis et al. (2011)	Fixed three second intervals.	1-4 hrs	85.2	ND	4243	Electronic
Cornell, Herrin-Griffith, Keim et al. (Part 1) (2010)	Continuous.	3-4 hrs	98.2	N/A	8621	ND
Cornell, Riordan & Herrin-Griffith (Part 2) (2010)	Onset of each observed activity recorded.	1-4 hrs	Hosp A: total 197 hrs Hosp B: 185.7hrs	Hosp A: 98 Hosp B: 63	Hosp A: 19,251 Hosp B: 19,060	Electronic

Author (Year)	Continuous, Fixed or Random Interval Observation	Observation Blocks	Observation Hours	Total Observations*	Total Activities	Recording Tool
Gardner, Gardner & Middleton, et al. (2010)	Fixed 10 min intervals.	2 hrs	Maximum of 80 hrs for complete datasets	12,189	11,032	Electronic
Williams, Harris & Turner-Stokes (2009)	Fixed 5 min intervals.	8.5-9.5 hrs	126	8883	8883	Manual
Yen, Shane, Pawar et al. (2009)	Fixed 30 second intervals for one min. (Beginning and end of shifts and some meal breaks excluded).	3 hrs per observer over 5-6 hr shift	372	ND	ND	Manual
Storfjell, Ohlson, Omoike et al. (2009)	ND	ND	ND	ND	ND	ND
Storfjell, Omoike & Ohlson (2008)	ND	ND	ND	ND	ND	ND
Chaboyer, Wallis, Duffield et al. (2008)	Fixed 10 min intervals.	Randomised two hr periods	482	ND	14,528	Manual
Hendrich, Chow, Skierczynski et al. (2008)	Protocol A – ND Protocol B – 25 random alerts every 13 hrs.	24 hrs	21,882 (S-R))	ND	ND	Electronic
Ampt, Westbrook, Creswick & Mallock (2007)	Random interval: 4 alerts p/hr during S-R and 32 alerts p/hr during direct observation.	2-4 hrs	ND	3910 (data points)	3910	Electronic
Hendrich & Lee (2005)	ND	ND	114.75 (observed event times)	N/A	ND	Electronic
Capuano, Bokovoy, Halkins et al. (2004)	Fixed interval (duration not specified).	ND	ND	8519	ND	ND
Duffield & Wise (2003)	Fixed 10 min intervals.	Randomised 2-4 hr periods	ND	53,240	ND	ND

Author (Year)	Continuous, Fixed or Random Interval Observation	Observation Blocks	Observation Hours	Total Observations*	Total Activities	Recording Tool
Wong, Gallegos, Weinger, et al. (2003)	ND	Four hrs	ND	N/A	ND	Electronic
Hoffman, Tasota, Scharfenberg et al. (2003)	Initially fixed 10 min intervals, later five min intervals.	Randomised two hr blocks with a maximum two blocks p/day	ND	760 (data points)	ND	Manual
Harrison & Nixon (2002)	Fixed five min intervals.	24 hrs (S-R).	ND	ND	ND	Manual

Notes: *Total observations recommended for work sampling & self-reported studies;
ND not defined; N/A not applicable; S-R: self-reported; Min(s): minute(s); Hr(s): hour(s)

Appendix D

Transfer Timing Tool (TTT)

D1: Publications and Grey Literature that Influenced the Development of the TTT (sending transfers)

Citation (Year) Country	Request Wardsperson/ Porter	Redirect Services	Compile MR & Charts	Arrange Bed Cleaning	Communicate with Bed Management	Communication with Health Professionals,	Communicate with Patient or family	Telephone Handover	Patient Preparation	Perform vital signs, Medications, Dressings	Documentation	Prepare Equipment	Nurse Escort	Pack Belongings
James, Quirke & McBride-Henry (2013) New Zealand.						✓	✓							
Lees (2013) U.K.												✓	✓	✓
Jeffs et al. (2013) Canada.								✓	✓	✓	✓			
Chan, Jones & Wong (2013) Hong Kong.						✓							✓	
Nakayama et al. (2012) U.S.A.											✓			
Clarke et al. (2012) Canada.							✓				✓			
Hindmarsh & Lees (2012) U.K.							✓	✓			✓		✓	
Ballermann et al. (2011) Canada.		✓				✓				✓			✓	
Westbrook et al. (2011) Australia.										✓				
Kibler & Lee (2011) U.S.A.	✓			✓	✓			✓						
Wang, Hailey & Yu (2011) Australia.											✓			
Kim et al. (2011) U.S.A.											✓			✓
Shimizu et al. (2011) Japan.	✓				✓				✓			✓	✓	

Citation (Year) Country	Request Wardsperson/ Porter	Redirect Services	Compile MR & Charts	Arrange Bed Cleaning	Communicate with Bed Management	Communication with Health Professionals,	Communicate with Patient or family	Telephone Handover	Patient Preparation	Perform Vital signs, Medications, Dressings	Documentation	Prepare Equipment	Nurse Escort	Pack Belongings
Goulding et al. (2011) U.K.						✓								
Abraham & Reddy (2010) U.S.A.	✓				✓			✓						
Collins et al. (2010) Australia.	✓					✓	✓				✓	✓	✓	
Ong & Coiera (2010) Australia.	✓								✓				✓	
Pesanka et al. (2009) U.S.A.											✓		✓	
Storfjell et al. (2009) U.S.A.						✓								
Hanne, Melo & Nickel (2009) Germany.	✓													
Williams, Harris & Turner-Stokes (2009) U.K.										✓	✓		✓	
Pennsylvania Patient Safety Authority (2009) U.S.A.						✓					✓	✓	✓	
Abraham & Reddy (2008) U.S.A.	✓				✓									
Wong, Yee & Turner (2008) Tasmania.								✓						
Esmail et al. (2006) Canada.	✓											✓		
Hendrich & Lee (2005) U.S.A.				✓				✓	✓		✓			

Citation (Year) Country	Request Wardsperson/ Porter	Redirect Services	Compile MR & Charts	Arrange Bed Cleaning	Communicate with Bed Management	Communication with Health Professionals,	Communicate with Patient or family	Telephone Handover	Patient Preparation	Perform Vital signs, Medications, Dressings	Documentation	Prepare Equipment	Nurse Escort	Pack Belongings
Pennsylvania Patient Safety Authority (2005) U.S.A.												✓		
Warren et al. (2004) U.S.A.						✓					✓	✓	✓	
Helleso, Lorensen & Sorensen (2004) Norway.											✓			
Wong et al. (2003) U.S.A.				✓	✓							✓		
Pope (2003) U.S.A.						✓			✓			✓	✓	
Hospital Bed Safety Workgroup (2003) U.S.A.												✓		
Duffield et al. (2003) Australia.							✓			✓				
Harrison & Nixon (2002) U.K.				✓						✓	✓		✓	
						Transfer Policies & Role Descriptions								
SESLHD (2013) Ward clerk - renal dialysis, Australia.	✓		✓											
SESLHD (2013) Ward clerk – surgical, Australia.	✓	✓	✓											
Portsmouth Hospitals NHS Trust (2012) U.K.	✓		✓					✓					✓	

Citation (Year) Country	**Request Wardsperson/ Porter**	**Redirect Services**	**Compile MR & Charts**	**Arrange Bed Cleaning**	**Communicate with Bed Management**	**Communication with Health Professionals,**	**Communicate with Patient or family**	**Telephone Handover**	**Patient Preparation**	**Perform Vital signs, Medications, Dressings**	**Documentation**	**Prepare Equipment**	**Nurse Escort**	**Pack Belongings**
East Cheshire NHS Trust (2012) U.K.	✓				✓				✓				✓	
Derby Hospitals NHS Foundation Trust (2011) U.K.	✓				✓								✓	
Kettering General Hospital NHS Foundation Trust (2011) U.K.													✓	
University Hospitals of Leicester NHS Trust (2011) U.K.									✓				✓	
NSCCAHS (2010) Australia.			✓		✓			✓	✓		✓		✓	✓
University of Kentucky & UK HealthCare (2008) U.S.A.			✓											

D2: Publications and Grey Literature that Influenced the Development of the TTT (receiving transfers)

Citation (Year) Country	Staffing & Bed Allocations	Update Information Systems	Communicate with Bed Management	Communicate with Patient or family	Direct Handover	Settle & Orientate Patient	Disconnect & Reconnect Equipment	Patient Assessment	Perform Vital signs, Medications, Dressings	Documentation	Unpack Belongings
Lees (2013) U.K.					✓	✓					✓
Jeffs et al. (2013) Canada.					✓	✓				✓	
Stevenson et al. (2011) Australia.		✓									
Wang, Hailey & Yu (2011) Australia.										✓	
Westbrook et al. (2011) Australia.	✓				✓				✓	✓	
Kibler & Lee (2011) U.S.A.		✓									
Abraham & Reddy (2010) U.S.A.					✓						
Collins et al. (2010) Australia.							✓				
Ong & Coiera (2010) Australia							✓				
Manser et al. (2010) U.K.					✓						
Campos (2009) U.S.A.						✓		✓			
Chaboyer et al. (2009) Australia.		✓									
Wong, Yee & Turner (2008) Tasmania.					✓						

Citation (Year) Country	Staffing & Bed Allocations	Update Information Systems	Communicate with Bed Management	Communicate with Patient or family	Direct Handover	Settle & Orientate Patient	Disconnect & Reconnect Equipment	Patient Assessment	Perform Vital signs, Medications, Dressings	Documentation	Unpack Belongings
Monarch (2007) U.S.A.										✓	
Esmail et al. (2006) Canada.							✓	✓			
Hendrich & Lee (2005) U.S.A.				✓		✓		✓	✓	✓	
Pennsylvania Patient Safety Authority (2005) U.S.A.					✓		✓				
Wong et al. (2003) U.S.A.							✓				
Duffield et al. (2003) Australia.					✓			✓	✓		
Harrison & Nixon (2002) U.K.										✓	
Transfer Policies & Role Descriptions											
SESLHD (2013) Ward clerk -renal dialysis. Australia.		✓									
SESLHD (2013) Ward clerk -surgical, Australia.		✓									
Portsmouth Hospitals NHS Trust (2012) U.K.					✓	✓		✓			✓
East Cheshire NHS Trust (2012) U.K.								✓			✓
Derby Hospitals NHS Foundation Trust (2011) U.K.								✓			✓

Citation (Year) Country	Staffing & Bed Allocations	Update Information Systems	Communicate with Bed Management	Communicate with Patient or family	Direct Handover	Settle & Orientate Patient	Disconnect & Reconnect Equipment	Patient Assessment	Perform Vital signs, Medications, Dressings	Documentation	Unpack Belongings
University Hospitals of Leicester NHS Trust (2011) U.K.							✓				✓
SESIAHS (2010) Australia.					✓						
NSCCAHS (2010) Australia.					✓			✓			✓
University of Kentucky & UK HealthCare (2008) U.S.A.								✓			

D3: Transfer Timing Tool

Day ______ Date ______________________ Med ☐ TF ☐ Clinical ☐ Gender (bdsp) ☐ No. RNs ☐ ID ______

TF time ______________________________ Surg ☐ Bdsp ☐ Non-clinical ☐ Pt request ☐

	Category	Activity	Code/Nurse	Time	Code/Nurse	Time	Code/Nurse	Time	Code/Nurse	Time	Code/Nurse	Time
SENDING TRANSFERS	Administration	Request wardsperson/porter										
		Redirect services e.g. diet, pharmacy										
		Compile medical record/charts										
		Environmental services										
	Communication	Bed Management										
		Health professionals										
		Patient/family/carer										
		Nurse handover (telephone)										
	Direct Care	Patient preparation										
		Perform vital signs, administer medications, dressings, procedures										
		Disconnect and prepare equipment for transfer										
		Nurse escort										
	Documentation	Medical Record, EMR, charts, care plan, written handover										
	Indirect Care	Pack patient belongings										
		Move bedside locker/table										
	Other											
RECEIVING TRANSFERS	Administration	Staffing/beds										
		Compile medical record/charts										
		Update iPM, unit board, Adm bk										
	Communication	Bed Management										
		Patient/family/carer										
		Health professionals										
		Nurse handover (telephone)										
		Nurse handover (face-face)										
	Direct Care	Settle and orientate patient										
		Disconnect/reconnect										
		Patient assessment										
		Perform vital signs, administer medications, dressings,										
	Documentation	MR/EMR/Charts/Care Plan										
	Indirect Care	Unpack patient belongings										
		Move bedside locker/table										
	Other											

Timing Codes

Interrupted I (I^1, I^2, I^3)

Multi-tasked M (M^1, M^2, M^3)

Field Notes ....

Timing instructions: One sheet per transfer/bedspace move. Insert time (24hr) observed activity commenced and was either completed or interrupted (I). A maximum of three interruptions and simultaneously performed activities to be recorded

D4: Reference Listing for Publications that Influenced the Development of the TTT

Abraham, J. & Reddy, M. 2008, 'Moving Patients Around: A Field Study of Coordination between Clinical and Non-Clinical Staff in Hospitals', *CSCW: 2008 ACM Conference on Computer Supported Cooperative Work*, vol. Conference Proceedings 225-228, ACM, San Diego, CA, pp. 225-8.

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Appendix E

Stage 2 Results

E1: Frequency of Transfer and Bedspace Activities by Nurse Designation

Activity	NUM n (%)	CNC/NE n (%)	TL n (%)	RN n (%)	EN n (%)	Student n (%)	Total (n)
Communication pt/family/carer.	5 (15.6)	1 (4.5)	6 (10.0)	106 (15.9)	19 (21.1)	3 (15.8)	140
Documentation MR, EMR, charts, care plan.	1 (3.1)	0 (0.0)	6 (10.0)	89 (13.4)	7 (7.8)	7 (36.8)	110
Perform vital signs, medications, dressings, procedures.	2 (6.3)	1 (4.5)	1 (1.7)	75 (11.3)	14 (15.6)	8 (42.1)	101
Communicate with health professional.	6 (18,8)	5 (22.7)	6 (10.0)	78 (11.7)	2 (2.2)	0 (0.0)	97*
Disconnect and/or reconnect and prepare equipment.	3 (9.4)	6 (27.3)	2 (3.3)	49 (7.4)	9 (10.0)	0 (0.0)	69
Compile medical record/charts.	2 (6.3)	1 (4.5)	4 (6.7)	43 (6.5)	5 (5.6)	0 (0.0)	55
Nurse handover (face-face).	1 (3.1)	0 (0.0)	0 (0.0)	46 (6.9)	5 (5.6)	0 (0.0)	52
Patient assessment.	0 (0.0)	1 (4.5)	1 (1.7)	38 (5.7)	8 (8.9)	0 (0.0)	48
Settle and orientate patient.	1 (3.1)	2 (9.1)	2 (3.3)	26 (3.9)	1 (1.1)	0 (0.0)	32
Move bedside locker/table.	0(0.0)	2 (9.1)	10 (16.7)	13 (2.0)	4 (4.4)	0 (0.0)	29
Move bed and/or equipment.	0 (0.0)	1 (4.5)	7 (11.7)	18 (2.7)	3 (3.3)	0 (0.0)	29
Nurse handover (telephone).	2 (6.3)	0 (0.0)	4 (6.7)	11 (1.7)	2 (2.2)	0 (0.0)	19
Nurse escort.	1 (3.1)	1 (4.5)	1 (1.7)	11 (1.7)	3 (3.3)	0 (0.0)	17
Pack/unpack patient belongings.	0 (0.0)	0 (0.0)	0 (0.0)	13 (2.0)	1 (1.1)	0 (0.0)	14
Prepare (make) bed.	1 (3.1)	1 (4.5)	2 (3.3)	10 (1.5)	0 (0.0)	0 (0.0)	14
Request wardsperson/porter.	2 (6.3)	0 (0.0)	0 (0.0)	10 (1.5)	0 (0.0)	0 (0.0)	12
Patient preparation.	0 (0.0)	0 (0.0)	1 (1.7)	7 (1.1)	2 (2.2)	0 (0.0)	11
Tidy or clean bedspace, room or equipment.	0 (0.0)	0 (0.0)	1 (1.7)	6 (0.9)	3 (3.3)	0 (0.0)	10
Communication: bed management.	4 (12.5)	0 (0.0)	4 (6.7)	1 (0.2)	0 (0.0)	0 (0.0)	9
Update iPM, unit board or admission-discharge book.	0 (0.0)	0 (0.0)	2 (3.3)	7 (1.1)	0 (0.0)	0 (0.0)	9
Page health professional (excludes orderly).	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.5)	0 (0.0)	0 (0.0)	3*

Activity	NUM n (%)	CNC/NE n (%)	TL n (%)	RN n (%)	EN n (%)	Student n (%)	Total (n)
Search for /collect items.	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.5)	0 (0.0)	0 (0.0)	3
Lift/walk patient to bed.	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	1 (1.1)	0 (0.0)	2
Redirect services.	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	1
Drug calculation.	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)	1
Don protective clothing (for transfer).	1 (3.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1
Deliver food tray to transferred patient (on receiving ward).	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	1
Total	32 (100)	22 (100)	60 (100)	666 (100)	90 (100)	19 (100)	889

*Missing data (designation) (n=2)

E2: Range and Accumulated Time (minutes) Spent on each Nursing Activity

Activity	Range	Total*
Nurse escort.	3.3-77.7	320.3
Documentation: MR, EMR, charts, care plan.	0.1-61.3	184.4
Perform vital signs, medications, dressings, procedures.	0.1-21.5	163.8
Compile medical record/charts.	0.1-33.8	140.6
Nurse handover (face-face).	0.2-7.8	118.9
Patient preparation.	0.1-60.3	73.0
Communication: with patient/family/carer.**	0.0-3.1	61.4
Nurse handover (telephone).	0.3-7.5	61.0
Patient assessment.	0.1-11.0	53.3
Communicate with health professional.**	0.0-3.3	52.5
Move bed and/or equipment.**	0.0-20.5	43.3
Disconnect and/or reconnect and prepare equipment.**	0.0-1.7	35.2
Pack/unpack patient belongings.	0.1-10.4	35.1
Settle and orientate patient.**	0.0-3.4	27.8
Prepare (make) bed.	0.3-5.3	24.7
Move bedside locker/table.	0.2-2.7	23.0
Communication with bed management.	0.2-6.5	11.9
Request wardsperson/porter.**	0.0-1.6	9.4
Update iPM, unit board or admission-discharge book.	0.1-1.9	7.7
Tidy or clean bedspace, room or equipment.	0.3-1.1	6.2
Search for /collect items.	0.5-2.3	4.7
Deliver food tray to transferred patient.	-	3.3
Drug calculation.	-	2.3
Page health professional (excludes orderly).	0.2-0.6	1.5
Lift/walk patient to bed.	0.5-1.0	1.5
Don protective clothing (for transfer).	-	0.6
Redirect services.	-	0.3
Total		1467.7

*Sum of minutes spent on activity
** Some activities <=2 seconds in duration.

E3: Mean Activity Times

Activity	Mean	SD
Nurse escort (n=17)	18.8	16.52
Patient preparation (n=11)	6.6	17.83
Nurse handover (telephone) (n=19)	3.2	2.13
Pack/unpack patient belongings (n=13)	2.7	3.00
Compile medical record/charts (n=54)	2.6	6.07
Nurse handover (face-face) (n=52)	2.3	1.72
Documentation: MR, EMR, charts, care plan (n=106)	1.7	1.37
Perform vital signs, medications, dressings, procedures (n=99)	1.7	2.42
Prepare (make) bed.4 (n=14)	1.7	1.35
Search for /collect items (n=3)	1.6	0.96
Move bed and/or equipment (n=29)	1.5	3.70
Communication with bed management (n=8)	1.5	2.07
Patient assessment (n=47)	1.1	1.69
Settle and orientate patient (n=32)	0.9	0.68
Update iPM, unit board or admission-discharge book (n=9)	0.9	0.60
Move bedside locker/table (n=29)	0.8	0.64
Request wardsperson/porter (n=12)	0.8	0.50
Lift/walk patient to bed (n=2)	0.7	0.00
Communicate with health professional (n=94)	0.6	0.60
Tidy or clean bedspace, room or equipment (n=10)	0.6	0.30
Communication with patient/family/carer (n=133)	0.5	0.57
Disconnect and/or reconnect and prepare equipment (n=67)	0.5	0.40
Page health professional (excludes orderly) (n=4)	0.4	0.15
Deliver food tray to transferred patient (n=1)	3.3	-
Drug calculation (n=1)	2.3	-
Don protective clothing (for transfer) (n=1)	0.6	-
Redirect services (n=1)	0.3	-

E4: Determining the Time taken to Move Medical-Surgical Patients using Stage 1 and 2 Results

	Moves p/annum			Moves p/month (mean)				Nurse time p/move (mins)			Total nurse time p/month		
	Sending Transfer*	Receiving Transfer	Bedspace moves	Sending Transfer	Receiving Transfer	Bedspace moves	All moves	Sending Transfer	Receiving Transfer	Bedspace moves	Mins	Hours	Days
Stage 1 results: rates of patient moves													
Medical wards (n=6)	2204	6379	2920	183.7	531.6	243.3	958.6						
Surgical wards (n=6)	2300	5787	1774	191.7	482.3	147.8	821.8						
Total Moves	4504	12166	4694	375.4	1013.9	391.1	1780.4						
Stage 2 results: nurse time per move													
Nurse time (mean)								17.7	24.6	11.3			
Calculated nurse time spent on patient moves per month													
Medical nurse time								3250.9	13077.0	2749.7	19077.5	318.0	13.2
Surgical nurse time								3392.5	11863.4	1670.5	16926.4	282.1	11.8
Total time								6643.4	24940.3	4420.2	36003.9	600.1	25.0

*Refer to Appendix B1

Appendix F

Stage 3: Field Notes

F1: Field Notes

FN	Move	Date(s)*	Ward(s)	Comments
Bedspace Moves				
1.1	Bdsp	30/5/13	M5	Bed, bedside tables & lockers moved to corridor from destination room. Bed and patient moved to corridor or direct to new location followed by lockers & tables. Procedure same on both wards.
1.2	Bdsp	29/5/13	M5	Three bedspace moves performed simultaneously.
1.3	Bdsp	3/6/13	S2	Two bedspace moves performed simultaneously
1.4	Bdsp	5/6/13	M5	Multiple bedspace moves
1.5	Bdsp	14/6/13	S2	Team Leaders frequently move bedside lockers & tables (bdsp moves)
1.6	Bdsp	14/6/13	S2	Infection - patient moved to single room
1.7	Bdsp	14/6/13	M5	From over census bed to patient room
1.8	Bdsp	18/6/13	M5	Several simultaneous moves - mix up with bedside tables. Handover needed but RN unable to leave patient room (falls risk). CNC assisted with move.
1.9	Bdsp	17/7/13	S2	Bedsp move - room needed for direct admission
1.10	Bdsp	31/7/13	M5	Bdsp move to accommodate new admission
1.11	Bdsp	2/8/13	M5	Bedsp move as ASU bed required for HDU patient
1.12	Bdsp	12/8/13	M5	Very busy morning: seizure, cardiac arrest & TF from ED following t-PA. Bedspace moves x3: need to accommodate ED pt & relocate patient following seizure. TL absent.
1.13	Bdsp	14/8/13	M5	Confused patient – risk of falling. Moved to aid nursing observation. Another patient moved to accommodate confused patient i.e. two bedspace moves.
Bedspace Moves: gender specific rooms/patient preference				
2.1		14/8/13	S2	Surgical ward attempt to maintain gender-specific rms. NUM stated that the ward receives complaints about mixed gender rooms.
2.2			M5	Medical ward mixed gender rooms due to Acute Stroke Unit (ASU). On leaving ASU pts placed in room 8 (mixed gender, high falls risk room). Most rooms are mixed gender.
2.3	Bdsp	15/8/13	S2	Bdsp move x2. Patient moved from single room to 4

FN	Move	Date(s)*	Ward(s)	Comments
				bedded room to accommodate new patient. Male patient moved from female room.
2.4	Bdsp	16/8/13	S2	Male patient moved from female room (to accommodate female patient).
2.5	Bdsp	23/7/13	S2	Patient preferred to have bed by window.
2.6	Bdsp	6/8/13	S2	Patient requested to be moved to adjacent bedspace (window)
Bedspace Move Delays: waiting for wardsperson/orderly				
3.1	Bdsp	6/8/13	S2	Nurses moved bed
3.2	Bdsp	12/8/13	M5	Urgent bdsp move to accommodate new patient into ASU, nurses moved bed.
3.3	Bdsp	14/8/13	M5	Nurses moved bed
3.4	Bdsp	15/8/13	S2	Nurses moved bed
Bedspace Move Delays: waiting for bed cleaning				
4.1	Bdsp	14/6/13	S2	Bdsp move due to patient's infectious status. Wait for bed cleaning delayed move. Nurse cleaned sphygmanometer with alcohol.
Transfer Delays: waiting for wardsperson/orderly				
5.1	Send	19/6/13	M5	Transfer delay – waiting for wardsperson.
5.2	Rcv	21/6/13	S2	RN to escort patient from Post Anaesthetic Care Unit to ward. Delays waiting for theatre wardsperson.
5.4	Rcv	16/7/13	S2	Delay waiting for radiology orderly.
5.5	Send	1/8/13	M5	TF delays: RMO completing D/C summary & orderly availability. Prior to arrival of orderly, NUM was going to escort patient - new admission waiting for bed.
5.6	Rcv	2/8/13	M5	CNC waiting to escort pt from ED (resus room) as thrombolysis agent administered. TF delayed as ED orderly called away to another emergency.
5.7	Send	9/8/13	M5	To medical ward. Delay with orderly.
5.8	Send	14/8/13	M5	Outlier. TF as bed required for HDU patient. Long delays waiting for orderly. Escorted by family & orderly
Transfer Delays: waiting for bed cleaning				
6.1	Bdsp	14/6/13	S2	Infection- patient moved to single room. Delay with bed cleaning. Patient walked to room. Handover given at report time.

FN	Move	Date(s)*	Ward(s)	Comments
6.2	Send	23/7/13	S2	TF delays: long delay from handover to when patient arrived on ward. Initial delay with bed cleaning then patient attended radiology on route to Rcv ward
Transfer Delays: other				
7.1		23/7/13	S2	TF delays: waiting for room to be checked by nuclear radiology
7.2		16/7/13	S2	TF delays: waiting for available lift (two lifts out of order)
7.3	Rcv	19/7/13	S2	TF delays: Rcv RN busy with another patient. TF patient unattended for 20 mins.
7.4	Rcv	23/7/13	S2	TF delays: long delay from handover to when patient arrived on ward. Initial delay with bed cleaning then patient attended radiology on route to Rcv ward.
7.5		1/8/13	M5	TF delays: waiting for RMO to complete documentation
Bed Management				
8.1	Bdsp	29/5/13	M5	Over census bed frequently in operation in medical ward.
8.2	Bdsp	18/6/13	M5	Over census
8.3	Rcv	4/6/13	M5	5 beds vacant in S2: saved for gastro-surgical patients. Surgical patient admitted postoperatively to medical ward
8.4		11-14/6/13		Major bed block across hospital following public holiday on Monday. Few discharges and therefore few moves. Five moves observed over four days (Tues-Fri).
8.5	Rcv	17/7/13	M5	Ward staff can receive urgent calls for beds, necessitating much coordination/bed preparation/bdsp moves. Despite 'urgency' patient arrival can be 2-3 hours later.
8.6	Rcv	9/8/13	M5	Patient arrived from ED almost 3hrs after call for bed.
8.7	Rcv	14/8/13	M5	Over census
8.8	Rcv			NUMs attend daily bed mgmt meeting: informed number of patients in ED & outliers needing beds. Team Leaders coordinate patient admissions, discharges, TF & Bdsp moves.
No Movements/Cancelled transfers				
9.1		17/6/13	M5/S2	No movements
9.2		16/7/13	M5	One empty bed, no TF expected.
9.3		17/7/13	M5	No movements
9.4		22-	M5	No movements

FN	Move	Date(s)*	Ward(s)	Comments
		24/7/13		
9.5		29/7/13	M5	No movements
9.6		8-9/8/13	S2	No movements
9.7	Send	16/7/13	S2	Patient to be TF to Patient Discharge Unit (formerly Transit Lounge). TF cancelled as relatives already on way to hospital to collect patient.
9.8	Send	1-2/8/13	M5	Patient to be transferred to another ward. TF activity observed and timed (1/8/13). Patient discharge (rcvg ward) cancelled and therefore TF unable to proceed at that time. Patient TF following day when bed became available.
9.9	Send	7/8/13	M5	1000hrs: RN called transit lounge to give handover but no vacant chairs. 1200hrs transit lounge called to indicate that they could now receive patient. As patient was now ready for discharge, he remained on the ward.
Nursing Activities: Handovers				
10.1	Bdsp			*Handover delays:* Handover following bdsp move can be delayed until shift handover.
10.2	Bdsp	5/6/13	M2	*Handover delays:* Nurse must remain in Acute Stroke Unit (ASU) and room 8 (high falls risk) at all times. This means that handover may not be conducted at the time patient is TF from ASU to room 8. Nurses must wait for relief staff to enable handover to occur. Continuity of care compromised.
10.3	Send	12/6/13	S2	*Handover delays:* Patient transferring to Patient Discharge Unit (PDU) (formerly Transit Lounge). TL made several attempts to telephone PDU to give handover (no answer).
10.4	Rcv	14/6/13	M5	*Handover delays:* Handovers often delayed due to staff working shorter shifts.
10.5	Bdsp	18/6/13	M5	*Handover delays:* Handover needed but RN unable to leave patient room (falls risk). CNC assisted with move.
10.6	Rcv	2/8/13	M5	*No patient handover*: ED patient TF to ward via MRI. Ward nurse required to escort patient from radiology. No admission (ED) handover received. Very brief radiology related handover.

FN	Move	Date(s)*	Ward(s)	Comments
10.7	Rcv	7/8/13	M5	*No patient handover*: Respiratory outlier (single room required) arrived from ED via radiology, with orderly escort. No telephone or direct handover provided by ED to Rcv RN. RN given scrap of paper with brief hand written notes.
10.8	Rcv	4/6/13	S2	*Multiple handovers.* Telephone handover provided to Team leader (TL) who provides handover to RN.
10.9	Rcv	18/6/13	S2	*Multiple handovers:* From ED. No escort with patient. Telephone handover to TL, then handover from TL to RN.
10.10	Rcv	15/8/13	S2	*Multiple handovers:* Patient arrived, RN off ward escorting another patient. Handover taken by EEN.
10.11	Rcv	20/6/13	S2	Face-face handover for patient from HDU. Rcv RN required to sign HDU form following handover.
10.12	Bdsp	14/6/13	S2	Following bdsp move, RN to RN handover in Dirty Utility room.
Nursing Activities: Nurse Escort				
11.1	Rcv	18/6/13	S2	Policy regarding need for nurse escort unclear. Nurse escort not always provided for TF from ED.
11.2	Rcv	16/7/13	S2	EEN (responsible for four patients) required to collect patient from radiography with PCA in situ. Casual RN (float nurse) not permitted to escort pt due to PCA.
11.3	Rcv	16/7/13	S2	Two empty beds: expecting patient from HDU & another from ED. Observation of both transfers were missed as orderly not available and nurse escorted patient (shadowing nurse during escort).
11.4	Rcv	16/7/13	S2	Escort delays waiting for vacant lift
11.5	Rcv	24/7/13	S2	Nurses strike. Ward RN on tea break. NUM collected (escorted) patient [from angiography].
11.6	Send	25/7/13	M5	Confused patient: orderly escort.
Nursing Activities: Other Roles				
12.1	Rcv	11/6/13	S2	Despite presence of ward clerk (WC), nurses may compile patient notes, ? to aid documentation.
12.2		19/7/13	M5	Nurses compiling notes, WC stated that nurses usually hand her files with notes already sorted.
12.3	Rcv	19/7/13	S2	Ward clerk away & TL on break. NUM undertaking clerical

FN	Move	Date(s)*	Ward(s)	Comments
				duties & coordinating TF. NUM contacted sending ward to arrange TF time & took telephone handover.
Nursing Activities: Patient Belongings				
13.1	Send		S2/M5	For the most part belongings were packed by pt/carer. When nurses were observed packing belongings, this simply involved adding belongings to a pink bag. A patient label was sometimes adhered to the bag. Nurses were not observed completing an itemised list of belongings. The pink bag was either placed on the bed or given to the patient to hold if being transferred in a wheelchair.
13.2	Rcv		S2/M5	Unpacking belongings by the nurse generally involved removing patient's medications from the pink bag and placing them in the medication drawer in the bedside locker. Personal items were usually left in the pink bag.
Quality& Safety				
14.1	Rcv	12/6/12	M5	Unforseen problems: mechanical problems with equipment.
14.2	Rcv	20/6/13	S2	RN went to collect patient from PACU. Patient 'wasn't there' & returned to ward. TL checked with Day Surgery Unit & endoscopy. Patient later bought up from PACU.
14.3	Rcv	19/7/13	M5	Patient's carer assisted Rcv nurse with making bed.
14.4	Rcv	19/7/13	M5	Rcv RN completed care plan from medical records even though patient's carer present
14.5	Rcv	24/7/13	S2	*Nurses strike*: surgical ward required to take two HDU patients due to skeleton staff in HDU. Angiography RMO escorting patients due to lack of orderlies.
14.6	Send	24/7/13	S2	*Nurses strike*: Bed urgently required for HDU pt (skeleton staff - nurses strike). Nurse escort not required (see FN 14.5).
14.7	Rcv	24/7/13	S2	*Nurses strike*. Ward RN on tea-break. NUM collected (escorted) pt.
14.8	Send	25/7/13	M5	Sending nurse settled patient into chair on rcv ward. No Rcv nurse.
14.9	Rcv		S2	Theatre orderlies observed on many occasions disconnecting O_2 tubing from portable cylinder,

FN	Move	Date(s)*	Ward(s)	Comments
				connecting to wall O_2 outlet & setting flow rate. Flow rate not checked by RN.
14.10	Send	8/8/13	M5	Bed available on receiving ward but patient unable to be transferred as all (six) patient lifts out of order. Long queues for two service lifts. Patient meals delayed.
14.11	Send	16/8/13	M5	Equipment problems – BP. Nurse checked BP several times. No nurse escort.
Miscellaneous				
15.1		8/8/13	M5	TL received notification of potential TF by pager.
15.2	Send	9/8/13	M5	Receiving ward sent orderly to collect patient.
15.3		15/8/13	S2	RN asked me to accompany her on an escort. Keen to contribute to the data because I hadn't yet shadowed her with a TF. Unfortunately, I had already started timing another TF process. No evidence of the Hawthorne effect!
15.4	Rcv	12/6/13	M5	Neurological & pain assessments coded under 'Patient Assessment' although both involve communication e.g. 'What year/month/day is it?' 'What is your pain level on a scale from 0-10?'
15.5	Rcv	23/7/13	S2	A/A
15.6				Patient may arrive on ward on bed or trolley

Bdsp: bedspace move; Rcv: receiving transfer' TF transfer(red); EEN: Endorsed Enrolled Nurse; RMO: Registered medical officer; t-PA: tissue Plasminogen Activator; PCA: percutaneous continuous analgesia; MRI: magnetic resonance imaging

*Includes field notes taken during pilot study.

Appendix G

HREC Documentation

G1: Participant Information Sheet & Consent Form

Health
South Eastern Sydney
Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

Centre for Health Services Management
PO Box 123, Broadway, NSW 2007

Patient Transfers, Bedspace Moves and Nurse Workload

Participant Information Sheet

Dear Colleague,

I am a PhD student undertaking a research project with Professor Christine Duffield, A/Professor Robyn Gallagher and Dr Michael Roche. The project aims to examine the impact of transferring a patient to and from one ward or unit to another (patient transfer) and from one bedspace to another (bedspace move) on nursing workload. Previous research from overseas has indicated that patient transfers are increasing and that transferring a patient can be workload intensive. The impact of attending to patient transfers and bedspace moves on nurse workload has not been studied in Australia.

To measure the impact of patient transfers and bedspace moves on nursing workload, I am going to conduct a timing study. This will involve observing nurses and timing activities necessary for patient transfers and bedspaces moves. The purpose of the timing study is to measure the time taken by nurses to transfer a patient from one ward, unit or bed to another. At no time will individuals' organisational skills (time management) or quality of work be assessed.

Observation periods will be conducted in four hour time blocks, randomly allocated on weekdays, in one medical and one surgical ward. Your ward has been selected for this purpose as data indicates that patients are frequently transferred to or from this ward. Only activities associated with patient transfers or bedspace moves will be timed and included in the study (examples of activities to be timed are shown overleaf). If during the observation period, you are not involved in co-ordinating or preparing a patient for transfer or bedspace move, or involved with receiving a transferred patient, you will not be timed.

No nurse or patient personal details will be collected and recorded. Individual timing results will not be able to be linked to an individual nurse. All timing results will be aggregated, and average times reported. Aggregated results will be published in a thesis and a peer-reviewed journal. Individual timing results will not be examined, published or provided to your employer.

Participating in this research study is voluntary. Participation in the study will require that you sign a consent form. The decision not to participate will not affect your relationship with your employer of UTS in any way.

The research project has been approved by SESLHD Human Research Ethics Committee, (HREC) Southern Sector and UTS HREC and will be carried out according to the National Health and Medical Council of Australia's ethical and scientific principles. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact SESLHD Research Support Office on (02) 9113 2481, email CentralEthicss@sesiahs.health.nsw.gov.au or contact the UTS Research Ethics Officer on (02) 9514 9772. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Thank you for your time in reading this information sheet. If you have any further questions please do not hesitate to contact myself on: 0412 699 111 or Professor Christine Duffield on (02) 9514 4834.

With regards,

Nicole Blay

Participant Info Sheet_Transfer v2
Page 1 of 1

November 2012

Health
South Eastern Sydney
Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

Centre for Health Services Management
PO Box 123, Broadway, NSW 2007

Patient Transfers, Bedspace Moves and Nurse Workload

Consent Form

Prof. Christine Duffield, Nicole Blay, A/Prof. Robyn Gallagher & Dr Michael Roche

I, ____ [name]
(please print)

give consent to my participation in the research project titled: Patient Transfers, Bedspace Moves and Nurse Workload

In giving my consent I understand that:

1. The project aims to measure the impact on nurses' time when transferring a patient between wards, units and/or bedspaces.
2. I *may* be observed by a nurse researcher and any nursing activities that I perform as part of the patient transfer process or bedspace move *may* be timed (timing study).
3. The researcher will not be assessing my organisational skills or the quality of my work in any way.
4. Any activities that I perform that are *not* related to the patient transfer process or bedspace move, will *not* be timed.
5. My personal details will not be recorded and I cannot be identified or linked to the timing results in any way.
6. The results of all timings will be aggregated and may be published at a later date. Individual timing results will not be published or provided to my employer.
7. I may withdraw from the study at any time and that my refusal to take part in the study will not affect my relationship with my employer or UTS.
8. The study will be carried out as described in the attached information sheet and I acknowledge that I have read and understood the information sheet about the study which was provided to me before I signed this consent. I have received a copy of the information sheet.
9. I understand that the study will be conducted in a manner conforming with ethical and scientific principles set out by the National Health and Medical Council of Australia;
10. I understand that if I have any complaints or concerns about the research, I may contact the Research Support Office as detailed below.

NAME: ____

SIGNATURE: ______________________ DATE: ______________________

WITNESS: ____

NOTE: This study has been approved by the SESLHD Human Research Ethics Committee, (HREC) Southern Sector and UTS HREC. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact SESLHD Research Support Office on (02) 9113 2481, email CentralEthicss@sesiahs.health.nsw.gov.au or UTS Research Ethics Officer on (02) 9514 9772.
Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

G2: HREC Stage 1 Approval

From: [redacted]
Sent: Monday, 14 December 2009 18:14
To: Nicole Blay
Subject: Ethics Approval - Ref HREC/09/STG/174

14 December 2009
Professor Christine Duffield
Director
Centre for Health Services Management
University of Technology
P.O. Box 123
BROADWAY 2007

Dear Professor Duffield,

HREC reference number: HREC/09/STG/174

Project title: Investigating the impact of patient transfers on patient outcomes.

I refer to your letter dated 6 November 2009. Thank you for submitting the above project, which was first considered by the SESIAHS HREC - Central Network at its meeting held on 8 December 2009. This HREC is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Research Involving Humans* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Committee has granted ethical approval of this research project. The documents reviewed and approved include:

Document	*Version*	*Date*
Application		
	24 September 2009	
Protocol		
	9 November 2009	
Privacy Addition		

You are reminded that this letter constitutes ethical approval only. You must not commence this research project at any site until you have submitted a Site Specific Assessment Form to the Research Governance Officer and received separate authorisation from the Chief Executive or delegate of that site.

The HREC requires annual reports from the date of this approval letter. These reports should include the following minimum information:

(a) progress to date or outcome in the case of completed research;
(b) maintenance and security of records;
(c) compliance with the approved protocol;
(d) compliance with any conditions of approval; and
(e) be accompanied by abstracts of any articles or publication (if any) arising out of the study

A report giving reasons should also be immediately provided to the HREC if the research is discontinued before the expected completion date.

The Investigator should also report immediately to the Ethics Committee anything which might affect the ethical acceptance of the protocol including:

- Immediate reporting of serious or unexpected adverse events on subjects
- Proposed changes in the protocol
- Unforeseen events that might affect continued acceptability of the project

Approval for you to conduct this study is granted up to January 2014 at the St. George Public Hospital. If your study is not completed by this date, you will need to apply for an extension along with your final progress report. Failure to do so may result in withdrawal of the Committee's approval for this study after this date.

The HREC wishes you every success in your research.

Yours sincerely
Dr. Winston Liauw
Chairperson
South Eastern Sydney and Illawarra Area Health Service
Human Research Ethics Committee – *Central Network*

G3: HREC Stage 2 Approval

HUMAN RESEARCH ETHICS COMMITTEE
Room G71 East Wing
Edmund Blacket Building
Prince of Wales Hospital
RANDWICK NSW 2031
Tel: 02 9382 3587 Fax: 02 9382 2813
http://www.seslhd.health.nsw.gov.au/POWH/researchsupport/default.asp

6 December 2012

Professor Christine Duffield
Associate Dean (Research)
Centre for Health Services Management, Faculty of Health
University of Technology, Sydney
PO Box 123
Broadway NSW 2007
Attention: Ms Nicole Blay

Dear Professor Duffield

HREC ref no: 12/268 (LNR/12/POWH/500)
Project title: Exploring the Impact of Patient Transfers and Bedspace Moves on Nurse Workload

Thank you for submitting the above Low/Negligible Risk Application for review by the Human Research Ethics Committee (HREC). Based on the information you have provided and in accordance with the NHMRC guidelines [National Statement 2007 – Section 5 Institutional Responsibilities and "*When does quality assurance in health care require independent ethical review?*" (2003)], this project has been assessed as low risk and is therefore exempt from full HREC review.

I am pleased to advise that the Executive Committee on 5 December 2012 granted ethical approval for this single – centre project to be conducted at:

- The St George Hospital

The following documentation has been approved:

- Protocol, version 2, dated November 2012
- Low/negligible risk application, submission code AU/6/8720111, dated 22 November 2012
- Participant Information Sheet, version 2, dated November 2012
- Consent Form, version 1, dated October 2012

Conditions of approval

1. This approval is valid for 5 years from the date of this letter.
2. Annual reports must be provided on the anniversary of approval.
3. A final report must be provided at the completion of the project.

Prince of Wales Hospital
Community Health Services
Barker Street
Randwick NSW 2031

4. Proposed changes to the research protocol, conduct of the research, or length of approval will be provided to the Committee.

5. The Principal Investigator will immediately report matters which might warrant review of ethical approval, including unforeseen events which might affect the ethical acceptability of the project and any complaints made by study participants.

For NSW Public Health sites only: You are reminded that this letter constitutes ethical approval only. You must not commence this research project until you have submitted your Site Specific Assessment (SSA) to the Research Governance Officer of the appropriate institution and have received a letter of authorisation from them.

Should you have any queries, please contact the Research Support Office on (02) 9382 3587. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Research Support Office website:
http://www.seslhd.health.nsw.gov.au/POWH/researchsupport/default.asp.

Please quote **HREC ref no: 12/268 (LNR/12/POWH/500)** in all correspondence.

We wish you every success in your research.

Yours sincerely

Production Note:
Signature removed prior to publication.

Deborah Adrian
Executive Officer, Human Research Ethics Committee

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*, NHMRC and Universities Australia *Australian Code for the Responsible Conduct of Research (2007)* and the *CPMP/ICH Note for Guidance on Good Clinical Practice.*