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Evaluation of the 'Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix'

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Section 1

1.1 Executive Summary

1.1.1 Background

Determining safe and appropriate nurse staffing levels can be challenging and, for many years, decisions on nurse staffing in the Irish healthcare system were based on historical need and legacy issues rather than using a systematic, evidence based approach. Previous research has identified that failings in care and poor nurse staffing can result in adverse patient outcomes including mortality and failure to rescue as well as outcomes affecting nursing staff such as increased staff turnover and decreased job satisfaction. To address these issues, the Department of Health published the *Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Adult Hospitals in Ireland* (Department of Health 2016) (henceforth referred to as the *Framework)*. This report set out for the first time in Ireland an evidenced based approach to determining safe nurse staffing and skill mix levels across general and specialist medical and surgical in-patient care settings in acute hospitals. The recommendations in the *Framework* included: the Clinical Nurse Manager (CNM) - grade 2 role is fully 100% supervisory (that is, they carry no patient caseload), and 'that a systematic…evidence based approach to determine nurse staffing and skill mix requirements is applied' (Department of Health 2016: 9). Furthermore, it was recommended that 80% of nurse staffing in medical and surgical wards is provided by registered nurses (RNs). A key recommendation of the report was to implement a pilot testing of the recommendations from the *Framework* across a range of acute hospitals of varying size and complexity.

The objectives outlined in the *Framework* were to:

- Develop a staffing (Registered Nurse (RN)) and Health Care Assistant (HCA)) and skill mix ranges framework related to general and specialist medical and surgical care settings in acute adult hospitals based on best available international evidence;
- Set out clearly the assumptions upon which the staffing and skill mix ranges are determined;
- Make recommendations around implementation and monitoring of the *Framework* including the necessary education, training, and guidance required.

This report outlines the methods and results of the programme of research that has evaluated the implementation of the *Framework* in three pilot sites. It builds on two previous reports of research that evaluated the pilot between July 2016 and June 2017: *Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix – Report 1* (Drennan *et al.* 2017a) and, *Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix – Report 2* (Drennan *et al.* 2017b). This report further evaluates the implementation of the

recommendations in the *Framework* in six pilot wards from July 2017 to October 2017.

1.1.2 Aims and Objectives

The aim of this research was to measure the impact of implementing the recommendations of the *Framework for Safe Nurse Staffing and Skill Mix* on nurse-sensitive patient outcome measures, staffing outcomes and organisational factors in three pilot sites. In addition, the evaluation measured the economic impact of implementing the *Framework* and provides an evidence-based assessment of the adoption and implementation of the initiative in practice to guide future national roll-out decisions. The objectives of the evaluation were to: examine the extent to which nurse sensitive patient outcome measures changed over time as a consequence of the introduction of the recommendations in the *Framework*; explore the impact of the intervention on adverse patient outcomes and care left undone events; examine the extent to which the *Framework* impacted on staff and patient experiences and; to measure the impact of the implementation of the *Framework* on organisational factors.

1.1.3 Methods

The methods used in this evaluation were based on a number of previous studies including those used to evaluate the introduction of Nursing Hours Per Patient Day (NHPPD) in Western Australia (Twigg & Duffield 2009, Twigg *et al.* 2012), a report on the association between nurse staffing and skill-mix and patient outcomes (Duffield *et al.* 2007) and the methods used in the RN4CAST study (Sermeus *et al.* 2011).

The setting for the research was six wards in three pilot hospitals. The sample in this section of the report consisted of all multi-day patients and all patient days over the duration of the study from six pilot wards within three hospitals chosen to take part in the implementation of the *Framework*. In addition, all nurses and healthcare assistants involved in the provision of direct patient care on the selected wards were included. A number of approaches were used in the research, including the collection of administrative and cross-sectional data. Administrative data were collected prior to (Time 1) and following (Time 2) the introduction of the recommendations from the *Framework.* Data reported here covers the timeframe June 2016 to October 2017. Data at ward level was collected through the *TrendCare system* as well as accessing data available through the *Hospital In-Patient Enquiry (HIPE)* system. Administrative data was used to measure the association between the introduction of the recommendations from the *Framework* and nursing sensitive outcome indicators (mortality, urinary tract infections, skin pressure ulcers, hospital acquired pneumonia, deep vein thrombosis/pulmonary embolism, upper gastro-intestinal bleeding, central nervous system complications, sepsis and shock/cardiac arrest, wound infection, pulmonary failure, metabolic derangement and length of stay). The cross-sectional component of the study measured the association between key elements of the *Framework* and nursing work, nurse satisfaction, staff burnout, patient satisfaction, environmental complexity

and care left undone (missed care). In total, four domains were measured by administrative and cross-sectional data: nurse staffing, nursing workload, working environment and patient outcomes.

1.1.4 Results

The results are reported according to the timeframes in which the data was collected. Administrative data reports on Time 1 (prior to the introduction of the recommendations in the *Framework*) and Time 2, following the implementation of the recommendations. Cross-sectional data is reported at three time-points: Time 1 (prior to the introduction of the recommendations in the *Framework*), Transition (during the implementation of the recommendations) and Time 2 (following the implementation of the recommendations).[1]

Nursing Hours per patient Day, Agency Usage and Sickness Absence

- As a consequence of measuring patient acuity and dependency and introducing a systematic evidence based approach (Nursing Hours per patient Day (NHPPD)) as the method for identifying appropriate nurse staffing, there was an increase in whole time equivalent (WTE) staff between Time 1 and Time 2 in those wards where a negative variance between NHPPD required and available was identified. The effect of the introduction of this systematic approach to determining RN and HCA staffing has been to stabilise the nursing workforce in these wards; this stabilisation has resulted in a number of improved patient, staff and organisational outcomes including a reduction in nursing sensitive outcomes, a reduction in missed care, a reduction in agency use, an increase in staff levels of job satisfaction and a general increase in staff perceptions that wards are adequately staffed and resourced.

- The results show that the amount of time the CNM2 is spending in a supervisory role increased in Time 2, in line with the recommendations of the *Framework*. In many cases, due to the stabilisation of nursing staff in each of the sites, there is now the potential for CNM2s to undertake 100% of their role as supervisory. This increase in the supervisory role of the CNM2 has resulted in improvements in staff perceptions of the quality of care delivered as well as a relative increase, following the introduction of the recommendations in the *Framework,* in staff perceptions of the support they receive from nursing leadership.

- A further recommendation in the *Framework* was that the RN to HCA ratio should approximate 80% RN to 20% HCA. The skill mix, overall, has now stabilised to an approximately 80% RN to 20% HCA skill mix on the total staffing model. The result of this change, in connection with the other recommendations in the *Framework*, was associated with a number of outcomes including reduction in levels of missed care and nursing sensitive outcome measures and an increase in overall job satisfaction. In particular, as

[1] The programme of research is on-going over a three-year period (2017 to 2020). Further outcomes will be reported over this timeframe.

the nursing complement was put in place following a systematic review of staffing requirements, the use of agency staff, predominantly provided by HCAs, reduced as did the overall requirements for one-to-one specialling.

- One of the most significant results following implementation of the recommendations in the *Framework* was the reduction in agency usage on the majority of wards that implemented the recommendations in the *Framework*. In some cases there were substantial reductions with up to 95% fall in the use of agency staff to provide nursing care reported; this was particularly the case in wards that received targeted staffing changes. It is of note that, in wards that did not receive changes in staffing but implemented the recommendations in the *Framework*, there was also a reduction in levels of agency usage when both Time 1 and Time 2 of the study are compared. This outcome was associated with all wards in the pilot using a systematic approach to determining nurse staffing and using the data collected in this approach to make informed decisions regarding the staffing resource. Another notable result was that, over the course of the research, the reductions in the number of hours provided by agency have not only reduced, but have been sustained. This points to greater ward stability and the potential for longer lasting stabilisation of the workforce as the vast majority of care is now provided by ward based staff.

- In Time 1 of the study the research identified that a relatively high proportion of nursing hours were provided by one-to-one specialling. Overall, in the pilot wards that received targeted changes to staffing, the requirement of one-to-one specialling for patients reduced substantially with percentage decreases ranging from approximately 74% to 88%. The identification of the relatively extensive use of one-to-one specialling prior to the introduction of the recommendations in the *Framework*, has resulted in the implementation of a programme to actively manage the care of patients who require one-to-one care.

- Absenteeism, in particular sickness absence, may be an indicator of increased workloads or a poor working environment. Overall absenteeism decreased from Time 1 through to Time 2 in the majority of wards included in the implementation of the recommendations in the *Framework*. The majority of wards in Time 2 reported sickness absence rates below the national average of 5% (HSE 2016). However, there was some variability related to seasonal factors and further research is on-going in this area.

- Bed occupancy rates in the pilot wards ranged from 89.73% to 101.11% in Time 1 and from 87.8% to 105.3% in Time 2; these rates were all above the OECD average for acute bed occupancy at 77.3% with a number of wards above the national average bed occupancy rate of 93.8% (OECD 2016). These high bed occupancy rates have implications for nursing work and

occupancy data is beneficial in planning the nursing resource required to care for patients on wards that have high levels of patient turnover.

Overall, comparisons of the data between Time 1 and Time 2 of the study indicate that the staffing levels in the wards are stabilising. The implementation of the recommendations in the *Framework* has, to date, resulted in an increase in staffing numbers in Time 2 in those wards where a negative variance between NHPPD required and available was identified in Time 1 (i.e. before the introduction of the recommendations); in addition, the implementation of the recommendations from the *Framework* have resulted in the stabilisation of skill mix (generally a higher proportion of RNs providing care), an increase in the proportion of time allocated to the CNM2 as supervisory, an overall reduction in agency use, an associated reduction in the need for one-to-one specialling and, a relatively general reduction in reported staff sickness absence.

Nursing Sensitive Patient Outcome Measures

- A number of patient outcomes sensitive to nursing care were measured through an analysis of data from the Hospital In-Patient Enquiry (HIPE) system. The time series analysis shows that counts of a nursing sensitive patient outcome **(**NSO) increased per day by 0.66% in Time 1 (prior to the introduction of the recommendations in the *Framework*) but decreased by 0.88% in Time 2 (following the introduction of the recommendations in the *Framework*). This reduction in adverse events to date has both economic and patient care outcomes.

- The analysis showed that the odds of developing an NSO began to decline in Time 2, which was also apparent after adjusting for case-mix.

- Data on nursing sensitive outcome measures, at this time, needs to be treated with caution. Further data collection and analysis is on-going as part of the longitudinal programme of research.

Nursing Work

- The research also undertook, to date, three cross-sectional surveys of nursing staff: Time 1 - before the introduction of the recommendations in the *framework*; Transition phase - during the implementation of the recommendations and; Time 3 - following the implementation of the recommendations.

- Measures of the nursing work environment generally improved following the introduction of the recommendations in the *Framework*; this was particularly the case in wards that received alterations in staffing. Overall, there were increases in the following areas of the nursing work environment: staff perceptions of collegiality between doctors and nurses, nurse manager ability, leadership and support, nurse participation in hospital affairs and the ability to apply nursing foundations for the quality of care. In particular, in those wards that received alterations in staffing, there were significant increases in respondents' positive ratings of staffing and resource adequacy. Overall, this

outcome generally increased across all the sites that implemented the recommendations in the *Framework*.

- There were overall improvements in the respondents' perceptions of the quality of care delivered to patients, with the majority of staff reporting that they had adequate time to provide care following the implementation of the recommendations in the *Framework.*

- Another area measured as part of the research were care left undone events or missed care, referred to as Safety CLUEs. Prior to the introduction of the recommendations in the *Framework*, 75.6% of nurses reported that at least one necessary item of care was left undone due to lack of time on their last shift; this dropped to 31.8% following the introduction of the recommendations in the *Framework*. Similarly, the mean number of items left undone also dropped substantially over the time period with an average of 2.51 care activities reported left undone per shift in Time 1 falling to 0.75 reported undone at Time 2.

- Care delayed was also measured. In comparison to care left undone, care delayed showed less of a decline; however, overall, the trend was downwards. Prior to the introduction of the recommendations in the *Framework*, 93.3% of staff reported at least one care task was delayed on their last shift whereas 84.1% reported one or more tasks delayed in following the introduction of the recommendations in the *Framework*. The mean number of care items delayed per shift also fell in Time 2 (4.92) compared to Time 1 (5.43).

- Missed meal breaks for staff fell proportionally over the two time periods, with 50.0% of RNs reporting a missed meal break per shift in Time 1 (prior); this reduced to 22.7% in Time 2 (following the introduction of the recommendations).

- Job satisfaction and intention to leave remained relatively similar at the overall level but demonstrated differences at ward level when the two timeframes were compared. Generally, the prevalence of intention to leave was lower and job satisfaction higher at Transition and Time 2 time-points (i.e. following the introduction of the recommendations in the *Framework*) when compared to Time 1. In one site, which received the majority of the alterations in staffing, overall levels of job satisfaction increased from 56.3% in Time 1 to 86.1% in Time 2.

- This phase of the research also measured burnout; however, as this measure was not included in the original pilot, comparisons are not available at this stage. Overall, in the pilot wards, staff scored relatively low on emotional exhaustion and depersonalisation and relatively high on personal accomplishment. Higher scores on the emotional exhaustion and depersonalisation subscales indicate negative outcomes; higher scores on the personal accomplishment subscale indicate better outcomes.

Patient Experience[2]

- Overall, patients were reported that they were highly satisfied with nursing care in both Time 1 and the Transition phase of the research.

- Patients, overall, highly rated, levels of communication, nurse responsiveness, and pain management.

- The majority of patients surveyed that they would recommend the hospital to family and friends; however, would like to have received more information on discharge.

Economic Analysis

- The economic costs of implementing the recommendations in the *Framework* were measured through the collection of data on the following: cost of the staffing changes (where required); cost of agency staff usage and; costs associated with nursing sensitive outcome measures.

- Overall, the monthly cost of implementing the required changes to staffing (€79,574) was less than the agency savings realised (€82,480). Therefore, in implementing the recommendations of the *Framework* to date, there was a net monthly saving (€2,905) to the Department of Health across the six pilot wards. The reduction in agency spend following the implementation of the recommendations was, on average, €82,480 per month.

- The economic impact of a patient experiencing an NSO were estimated using data on Diagnostic Related Groups and presence of an NSO collected from the six pilot wards. Controlling for age, gender, admission type, complexity, length of stay and time period, the presence of a nurse sensitive outcome increased the average in-patient case-mix cost per case by €2,397 (p=0.001) holding all else constant. This estimated impact of nurse sensitive outcomes on inpatient case-mix cost per case can be used to estimate the cost of nursing sensitive outcomes avoided[3].

1.1.5 Overall Conclusions

This section concludes the results from the research and compares them to the Local and Regional Framework Recommendations outlined in the *Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Adult Hospitals in Ireland* (Department of Health 2016).

Implementing a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements

[2] Patient experience data is being collected as part of the longitudinal programme of research into safe nurse staffing and skill-mix.
[3] The measurement of costs associated with nursing sensitive outcome measures is on-going in the longitudinal programme of research.

The results of this research demonstrated that Local and Regional Framework Recommendations 1 (a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements is applied consistently at ward, hospital and hospital group level) and 2 (the choice of systematic evidence based methods takes account of the multiple factors outlined in the framework) resulted in a number of outcomes when applied in the pilot sites. The research found that patient care needs differ and nurse staffing numbers, profile and skill-mix are key to ensuring safe, high quality care for patients. Furthermore, it was found that putting into place a systematic evidence based approach to determining nurse staffing and skill-mix (in this case NHPPD), resulted in the stabilisation of the nursing workforce over the period of the research. The use of this approach enabled, in association with clinical judgement, an informed decision-making process to be put in place. The evaluation also identified that NHPPD measured in the pilot study broadly matched the NHPPD ranges outlined in the *Framework* and resulted in a number of positive outcomes, including a reduction in agency use by wards (in a number of areas, this was substantial), a reduction in care left undone events, and a reduction in adverse patient outcomes. In a number of sites, there were also substantial increases in staff perceptions that the wards were adequately staffed and resourced following the implementation of the recommendations in the *Framework.*

Conclusion: It is therefore concluded the introduction of a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements when applied consistently at ward, hospital and hospital group level for determining nurse staffing and skill-mix needs in medical, surgical and specialist settings resulted in a number of positive outcomes at ward level; not least in increased perceptions that wards were adequately staffed and resourced and a substantial fall in agency use and care left undone events.

Governance and Oversight

The *Framework* recommended that: 'the process of setting and maintaining safe nurse staffing levels is collaborative and involves Clinical Nurse Managers, Senior Nurse Managers and Directors of Nursing with support from Human Resources Management, Quality and Safety, and Finance.' To ensure that this recommendation was fulfilled, each of the Pilot Sites put in place a Local Pilot Planning and Implementation Team. The research found that these structures were central to ensuring that the reallocation of staff and the staffing resources were put in place as the recommendations from the *Framework* were implemented.

Conclusion: The research concluded that the Local Pilot Implementation Teams introduced in the clinical sites as a result of recommendation 10 in the *Framework*, supported the successful implementation of the recommendations in the *Framework* at local and group levels. The partnership approach ensured that on-going monitoring and feedback was communicated to all key stakeholders involved in the implementation and that the interventions were enacted as outlined in the *Framework* document.

Enhanced Care

The research identified a larger than expected prevalence of one-to-one specialling across all three pilot sites when data was collected at Time 1 (baseline). However, as the workforce stabilised the requirement for one-to-one specialling reduced substantially. One-to-one specialling was reflective of different levels of patient dependency and the profile of the wards across all sites. It is acknowledged, in some cases, the prevalence of one-to-one specialling matched the NHPPD range for specialist wards; however, the extent of one-to-one specialling identified in non-specialist wards required extensive resources to match demand. Previous research suggests that many acute hospitals are not equipped with the skills and resources to provide quality one-to-one specialling to patients who require this level of care. To address this, active assessment and management of one-to-one care through a process of enhanced care should be considered.

Conclusion: The research concluded that a set of high-level key principles for enhanced care should be developed to facilitate the active management of patients that require specialling. To explicitly reflect this point; a more structured, patient-centred approach (enhanced care) to one-to-one specialling would significantly reduce costs, as well as improving the quality of care patients receive and enhance the patient experience. For these to be effective, high-level key principles need be put in place at an organisational level, taking local processes into account, whereby the roles and responsibilities of all staff engaged in one-to-one specialling be clearly identified. The research therefore concludes that consideration be given to amending the *Framework* to include these principles.

Supervisory Status of the CNM2

The *Taskforce* recommended that 100% of the CNM2 role and function should be allocated to a supervisory capacity. It further recommended that organisations invest in appropriate resource of CNM1s to support the role and function of the CNM2 and provide effective succession planning. The extent to which the CNM2s in the pilot sites reached the target of being 100% supervisory increased over the phases of the research. The research found that having these senior posts at supervisory level has had a number of positive outcomes for staff; in some sites, as the supervisory status of CNM2s increased, staff perceptions of the extent to which they were supported by nursing leadership also increased over time; however, there was variability in responses. In addition, as CNM2s are responsible for overseeing the overall quality of care delivered at ward level, the research found that there were overall improvements in the perceptions of staff of the quality of care delivered to patients. It is acknowledged that further research is required to measure the on-going impact of the supervisory status of the CNM2 role; this role is central in the provision of leadership at ward level.

Conclusion: The research identified that the recommendation in the *Framework* that 100% of the CNM2 role and function is in a supervisory capacity has a number of positive benefits and should continue to be implemented in the next stage of implementation of the recommendations in the *Framework*. In addition, the research team will continue to work closely with the CNM2 in interpreting the data collected as well as facilitating the use of this data for decision making at ward level.

Organisational Culture and Ward Environment

Assumption 3 in the *Framework* stated that the organisational environment, where patients receive and staff deliver care, has an impact on the ability to deliver safe effective care. The *Framework* also recommended (Recommendation 3) that the elements influencing a positive organisational culture and ward climate form an integral part of the approach to safe nurse staffing decisions. A number of issues related to the ward environment were identified in the evaluation; these included quality of care delivered, nurse participation in hospital affairs, nurse manager ability, leadership and support and staffing resources. Although, there was some variation, the implementation of the recommendations in the *Framework,* resulted in improvement in a number of measures related to the ward environment, including, an increase in respondents' perceptions of staffing resources and adequacy, collegial nurse-doctor relations, nurse manager leadership and support, nurse participation in hospital affairs and nursing foundations for quality of care. In a number of wards, there were increases in staff ratings of the quality of care delivered following the implementation of the recommendations in the *Framework*.

Conclusion: The research identified that in a number of wards the introduction of the recommendations in the *Framework* has had a positive impact on the ward environment. This was particularly seen in a number of wards where, as a consequence of the implementation of the recommendations, there were reported increases in time available to deliver care and the quality of care delivered as well as improvements in perceptions that wards were staffed and resourced adequately. There are areas were further improvements can be made, therefore consideration should be given to introducing organisational practices similar to that recognised by the Magnet programme (Aiken *et al.* 2000); these would include active involvement in identifying and measuring nurse sensitive outcome indicators, active programmes of quality assurance and structures to actively promote the involvement of clinical nurses in the setting of hospital policies and governance.

Workforce Planning and Workload Management System

The introduction on a trial basis of a workforce planning and workload management system (*TrendCare*) for nursing was central in ensuring that a systematic approach to measure patient acuity and dependency and required nursing hours per patient day was used. This workforce planning and workload management system allowed the nursing resource to be calculated according to patient need rather than relying on a nurse to patient ratio estimates or historical staffing complements. The data collected through the *Trendcare* system was instrumental in facilitating decision making from both an operational and research perspective. In particular, it enabled decisions to be made on the staffing resource based on patient acuity and dependency as measured through the required NHPPD.

Conclusion: The implementation of a workforce planning and workload management system was key to measuring the variance between actual and required staffing and was instrumental in using a systematic approach to determining the nursing and HCA complement at ward level. The system used was capable of capturing all components of the recommendations in the *Framework* including: patient acuity measures, skill mix measures, workload management and patient

allocation, calculation of NHPPD (required, actual and variance), agency use, one-to-one specialling, overtime and absenteeism. It was also key that the system integrated with organisational level patient information management systems; this will further enable the development of nursing intensity weight based costing relative to patient Diagnostic Related Groups.

Nurse Sensitive Outcomes/Tipping Points

The *Framework* recommended that patient safety *Tipping Points* at ward level be monitored and determined locally. The *Framework* further recommended that 'ward and organisation wide mechanisms be put in place, to measure and monitor, at a minimum, nurse sensitive outcome key performance indicators on patient falls, pressure ulcers, staff and patient experience.' While, in theory, it was identified that this data would have utility in exploring the relationship between nurse staffing and adverse outcomes such as slips, trips and falls, in practice this was difficult to achieve due to the variability in the quality of NIMS data received from the three sites. Issues identified included a lack of information relating to the time and date of the incident and contextual information associated with the cause of the adverse event. However, HIPE data was identified as being of utility in measuring the association between nurse staffing and nursing sensitive outcomes. Nationally the Office of the Nursing and Midwifery Services Director is implementing the Nursing & Midwifery Quality Care-Metrics to provide a systematic approach to the capture of nursing process key performance indicators known also a nursing metrics. The development of these will have utility in monitoring the association between nurse staffing and outcomes as they are incorporated at ward level.

Conclusion: HIPE data was central in measuring adverse events associated with nurse staffing. In addition, further work is on-going in relation to key performance indicators on patient falls, pressure ulcers and staff and patient experience; these can be monitored at ward level. They are currently measured as processes; however, the research team are developing approaches to measure these indicators as outcomes. In addition, staff turnover and absenteeism rates can also be used as indicators of the impact of the safe nurse staffing policy as highlighted in the *Framework*. This will allow decision making on nurse staffing to be based on a systematic approach that takes into consideration high quality data collected at ward level.

Care Left Undone Events (CLUEs)

The *Framework* recommended that a process to assess, escalate and respond to missed care events (referred to as "Safety CLUEs") is put in place at ward and organisational level to indicate the adequacy of the nurse staffing resource. This recommendation was implemented through incorporating the safety CLUES into the *TrendCare* system. Safety CLUEs are important in exploring the association between nurse staffing and missed or delayed care. The research found substantial reductions in both the proportion of staff reporting that they had missed one or more items of care on their last shift and the number of items of missed care following the implementation of the recommendations outlined in the *Framework*. This outcome

indicated that staff had more time available to complete episodes of care resulting in a reduction of shifts where items of care were left undone.

Conclusion: The ability to measure missed care on a shift-by-shift basis allows for a process to be put in place that can assess, escalate and respond to missed care events; this will have the benefit of monitoring the association between the staffing resource and the level of missed care occurring at ward level. The integration of measures of missed care into software based workload planning or workload systems at ward level will facilitate the monitoring and assessment of safety CLUEs as an indicator of the adequacy of the nursing resource.

Skill-Mix

The Framework recommended that 'that subject to a review of the education, role and function of nursing healthcare support worker roles, the nurse/healthcare assistant grade mix is 80%/20%, once a safe nurse staffing level exists.' The implementation of the recommendations in the *Framework*, resulted in the rostered workforce on the Pilot wards approximating a skill-mix of 80% RN to 20% HCA. Although, it is difficult to disaggregate the outcomes identified from this particular recommendation from the implementation of the other recommendations, previous research has shown that a skill-mix with a higher proportion of RNs results in enhanced patient, staff and organisational outcomes. This recommendation, when taken into consideration with the others that were implemented as part of the Pilot was associated with a number of outcomes including reduction in levels of missed care and nursing sensitive outcome measures and an increase in overall job satisfaction. In particular, as the nursing complement was put in place following a systematic review of staffing requirements, the use of agency staff, predominantly provided by HCAs, reduced as did the overall requirements for one-to-one specialling.

Conclusion: The recommended skill-mix was, when implemented with the other recommendations in the *Framework*, associated with a number of positive outcomes. The results from this study, in general, matched that of other research undertaken internationally that identified that a skill-mix with a higher proportion of RNs is associated with better patient and staff outcomes. It is of note that the recommendation related to skill-mix in the *Framework* should be subject to on-going review as roles and specialities develop.

Patient Experience

Assumption 4 in the *Framework* stated that 'positive patient … outcomes are important indicators of the safety and quality of nursing care.' As well as undertaking a number of proxy measures of patient care, a key approach in the study was the measurement of the patient experience. there are a number of ethical and practical issues related to this approach; however, results identified that across the phases of the study there were high levels of patient satisfaction with nursing care. During transition, as the recommendations were being implemented, there were relative gains in patients' perceptions of the quality of communication, pain management and information on medication. The introduction of a National Patient Experience Survey

(NPES) in Ireland provides the opportunity for research at a national level of the association between nurse staffing and the patient experience.

Conclusion: Although there are ethical and methodological complexities, as outlined in the *Framework,* monitoring patient experience at ward and hospital level can indicate areas for improvement (for example, provision of information on discharge) as well as reporting on patients' highly positive experiences of nursing care as identified in this research. The introduction of the National Patient Experience Survey also provides the opportunity to assess the quality of the patient experience at hospital level and further work is ongoing to measure the association between the patient experience and nurse staffing.

National Roll Out

The results of the research identified that the introduction of the recommendations in the *Framework* were suggestive of a number of positive outcomes at patient, nurse and organisational levels. The overall impact of the implementation of the *Framework* was to stabilise the nursing workforce in the pilot sites; this stabilisation subsequently impacted positively on a number of outcomes as highlighted in this report. This stabilisation, through the introduction of an evidence-based approach for determining nurse staffing and skill-mix, will, it is suggested on the results to date, have positive implications for the future recruitment and retention of the nursing workforce. In addition, the introduction of a systematic approach to determining safe staffing levels and the required skill-mix, backed up by a workload management system, will also facilitate the goal of stabilising the nursing workforce and enable the provision of high quality care, improvements in the economic value to patient care as costs associated with nursing sensitive outcomes and agency use are reduced.

Conclusion: The introduction of the recommendations in the *Framework* in a number of pilot sites resulted in the introduction, for the first time in Ireland, of a systematic evidenced based approach to determining nurse staffing and skill-mix. The overall outcomes from this research can be used to inform decisions relating to the further development and national roll-out of the recommendations outlined in the *Framework.*

Section 2
Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix

2.1 Introduction

To meet the challenge of identifying safe and effective staffing and in response to issues highlighted in recently published reports that identify the adverse events that can occur when staffing levels are not at a level to meet patient need (Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry 2013), the Department of Health published and launched the *Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Adult Hospitals in Ireland* (Department of Health 2016) (henceforth referred to as the *Framework)*. This report set out for the first time in Ireland, an evidenced based approach to determine safe nurse staffing and skill mix levels across general and specialist medical and surgical in-patient care settings in acute hospitals.

The *Framework* was developed following consultation with key stakeholders in the healthcare system and included national and international experts. The consultation resulted in a number of recommendations, including: the Clinical Nurse Manager (CNM) - grade 2 role is fully 100% supervisory (that is, they carry no patient caseload), and 'that a systematic…evidence based approach to determine nurse staffing and skill mix requirements is applied' (Department of Health 2016: 9). Furthermore, it was recommended that 80% of nurse staffing in medical and surgical wards is provided by registered nurses (RNs). The *Framework* also recommended the undertaking of quality research on the association between nurse staffing and patient outcomes.

This research report outlines the methods and results of the programme of research that has further evaluated the implementation of the recommendations in *Framework* in three pilot sites (Model 4 hospital (670 beds), Model 3 hospital (235 beds) and, a Model 2 Hospital (109 beds)). It builds on two previous reports of research: *Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix – Report 1* (Drennan *et al.* 2017a) and, *Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix – Report 2* (Drennan *et al.* 2017b). The *Evaluation of the Pilot Implementation of the Framework for Safe Nurse Staffing and Skill-Mix – Report 2* (Drennan *et al.* 2017b) identified a number of positive emerging patient, staff and organisational outcomes over a relatively short period of time within six wards spread across three hospitals. At the time of the report, the research team recommended that further research with a larger sample and over a longer period of time was required to explore if these outcomes identified are sustained. This report builds on that recommendation and adds further data over a longer timeframe to that outlined in the report published in June 2017.

2.1.2 Aims and Objectives

The aim of this research was to measure the impact of implementing the recommendations of the *Framework for Safe Nurse Staffing and Skill Mix* on nurse-sensitive patient outcome measures, staffing outcomes and organisational factors in three pilot sites. In addition, the research measured the economic impact of implementing the recommendations in *Framework* and provides an evidence-based assessment of the adoption and implementation of the initiative in practice to guide future national roll-out decisions.

2.1.2 Objectives

1. Examine the extent to which nurse sensitive patient outcome measures changed over time as a consequence of the introduction of the recommendations in the *Framework*;

2. Examine the impact of introduction of the recommendations in the *Framework* on adverse patient outcomes and safety CLUEs (Care Left Undone Events);

3. Examine the impact of the pilot introduction of the recommendations in the *Framework* on patient experience;

4. Determine the impact of the recommendations in the *Framework* on nurse outcomes (job satisfaction, intention to stay, burnout);

5. Determine the impact of the introduction of the recommendations in the *Framework* on organisational/ward environment factors (ward climate, impact of Clinical Nurse Manager 2 post, leadership, quality of care);

6. Determine the cost implications arising from the introduction of the recommendations in the *Framework* and the resources required to deliver national rollout and to maintain the *Framework*;

7. Examine implementation processes/measures in the context of recommendations for future national rollout.

2.1.3 Methods

The methods used in this evaluation were based on a number of previous studies including those used to evaluate the introduction of Nursing Hours Per Patient Day (NHPPD) in Western Australia (Twigg & Duffield 2009, Twigg *et al.* 2012), a report on the association between nurse staffing and skill-mix and patient outcomes (Duffield *et al.* 2007) and the methods used in the RN4CAST study (Sermeus et al. 2011).

The sample in this section of the report consisted of all multi-day patients and all patient days over the duration of the study from the six pilot wards (Model 4 hospital

- 3 wards, Model 3 hospital - 2 wards) and, Model 2 Hospital - 1 ward) within three hospitals chosen to take part in the implementation of the *Framework.* In addition, all nurses and healthcare assistants involved in the provision of direct patient care on the selected wards were included. A number of approaches were used in the research, including the collection of administrative and cross-sectional data. Administrative data were collected at ward level through the *TrendCare system* as well as accessing data available through the *Hospital In-Patient Enquiry (HIPE)* system. Administrative data was used to measure the association between NHPPD and nursing sensitive outcome indicators (mortality, urinary tract infections, skin pressure ulcers, hospital acquired pneumonia, deep vein thrombosis/pulmonary embolism, upper gastro-intestinal bleeding, central nervous system complications, sepsis and shock/cardiac arrest, wound infection, pulmonary failure, metabolic derangement and length of stay). The cross-sectional component of the study measured the association between key elements of the *Framework* and nursing work, nurse satisfaction, staff burnout, patient satisfaction, environmental complexity and care left undone (missed care). In total four domains were measured by administrative and cross-sectional data: nurse staffing, nursing workload, working environment and patient outcomes[4].

[4] Refer to Drennan *et al.* (2017) *Framework for Safe Nurse Staffing and Skill-Mix – Report 2* for a detailed explanation of the methods used.

Section 3
Results from the Pilot Wards

3.1 Introduction

This report outlines the results to date from the research for the pilot wards included in the programme of research into safe nurse staffing and skill-mix. The results are outlined in a number of sections and present a comprehensive picture of the variables associated with nurse staffing; both secondary and cross-sectional data were collected. Secondary data, collected from administrative systems, included the calculation of nursing hours per patient day (NHPPD) (required, actual and variance), shift variance, skill mix, agency use, one-to-one specialling, overtime and absenteeism (collected from *TrendCare*[5]) and nurse sensitive outcomes (collected from HIPE data). Cross-sectional data was collected from nursing staff working on the six pilot wards. Nursing staff provided data on nursing work, job satisfaction and intention to leave as well as care left undone events. Fuller reporting on the patient experience will be available in subsequent reports. The majority of the results, in particular those reporting administrative data, compare two time periods: prior to the implementation of the recommendations in the *Framework* (Time 1) and following the introduction of the recommendations (Time 2), in particular the introduction of NHPPD[6]. Data from staff (RNs and HCAs) is reported over three periods of time. Table 3.1.1 presents data on the calculation of the staffing intervention (uplift and skill mix shift) required in each of the pilot wards compared with the staffing intervention that was in place at the time of the evaluation. As outlined, Wards 1, 2 and 3 in Hospital 1 all required an uplift of staff as a consequence of measuring patient acuity and dependency and subsequent required NHPPD. According to the data collected in Time 1, Hospital 2 did not require an uplift with Hospital 3 requiring an uplift of 2.5 WTE along with an alteration of skill mix. It should also be noted that the uplifts in all wards did not occur simultaneously with the majority being put into place at the mid-point of the timeframe of the evaluation (Time 2).

Table 3.1.1 Uplift and Skill Mix Required as a Consequence of NHPPD Compared to Uplift and Skill Mix in Place and the Time of Research

	Uplift required			Total ward establishment post uplift		Current uplift received	
Ward 1	RN	HCA	Total	CNM2	1.0	Total WTE recruited	8.0
DH funded	4.5	2.5	7.0	RN	26.5	Total WTE leavers	0.0
Agency conversion	0	2.0	2.0	HCA	6.5		
	4.5	4.5	9.0	Total	34	Net WTE uplift	**8.0**
						Awaiting 1 WTE to be	

[5] *Trendcare*, is a commercial workforce planning management system (http://www.trendcare.com.au). The *Trendcare* system provides data on patient acuity and dependency measures, skill-mix and patient allocation.

[6] Please note, for anonymity purposes, hospitals and wards will be referred to by numbers. Hospital 1 (Model 4) – Wards 1,2, and 3; Hospital 2 (Model 3) – Wards 22 and 23; Hospital 3 (Model 2) – Ward 31.

						recruited (0.5 RN, 0.5 HCA)
Ward 2	RN	HCA	Total	CNM2	1.0	Total WTE recruited 10.0
DH funded	8.0	0.0	8.0	RN	35.5	Total WTE leavers -4.0
Agency conversion	4.3	0.0	4.3	HCA	9.0	
Conversion (to RN)	0.0	0.4	0.4	Total	45.5	Net WTE uplift **6.0**
	12.3	0.0	12.7			
						Of 6.0 WTE, 1 on maternity leave; 2 on adaptation – short 3 WTE
Ward 3	RN	HCA	Total	CNM2	1.0	Total WTE recruited 10.7
DH funded	4.5	2.5	7.0	RN	28.0	Total WTE leavers -2.0
Agency conversion	0	2.0	2.0	HCA	6.7	Awaiting WTE -0.4
	4.5	4.5	9.0	Total	35.7	Internal Transfer +3.0
						Net WTE **11.3**
Ward 22	-	-		-	-	- -
Ward 23	-	-		-	-	- -
Ward 31	RN	HCA	Total	CNM2	1.0	Total WTE recruited 3.5
DH funded	0.0	1.5	1.5	RN	23.0	Total WTE leavers 1.0
Agency conversion	0.0	2.0	2.0	HCA	5.5	
	0.0	3.5	3.5	Total	29.5	Net WTE uplift **2.5**

3.2 TrendCare System Administrative Data – Pilot Wards

The data for this section of the report was collected through the *TrendCare* workforce planning and workload management system. This system provided data in the following domains:

- Patient acuity measures
- Skill mix measures
- Workload management and patient allocation

Data was collected from all six wards; the period of data collection in each of the wards is outlined in table 3.2.1. The following data is reported below:

- Nursing Hours per Patient Day (NHPPD) (required, actual and variance)
- Shift variance
- Skill mix
- Agency use
- One-to-one specialling
- Overtime
- Absenteeism

Table 3.2.1: Data collection periods for Time 1 (Time 1) and Time 2 (Time 2)

	Ward Code	Time 1	Time 2	Beds
Hospital 1	Ward 1	15/07/2016 – 28/08/2016	09/01/2017 – 01/10/2017	35
	Ward 2	15/07/2016 – 28/08/2016	09/01/2017 – 01/10/2017	34
	Ward 3	15/07/2016 – 02/10/2016	09/01/2017 – 01/10/2017	24
Hospital 2	Ward 22	31/10/2016 – 11/12/2016	09/01/2017 – 01/10/2017	26
	Ward 23	31/10/2016 - 11/12/2016	09/01/2017 – 01/10/2017	20
Hospital 3*	Ward 31	15/07/2016 – 28/08/2016	09/01/2017 – 01/10/2017	29

*Please note, data from Ward 31 has not reached the required 95% validation in time period 2; therefore, results need to be treated, at this stage with caution throughout.

3.2.1 Nursing Hours per Patient Day

Table 3.2.1.1 identifies the nursing hours required per patient day by acuity for all patient types, the clinical nursing hours per patient day available, the total HPPD available and the variance between the required and clinically available HPPD for Time 1 and Time 2. The wards in Hospital 1 and the one ward in Hospital 3 showed a deficit in HPPD during Time 1 (before the implementation of the recommendations) (Table 3.2.1.1 below). Both wards in Hospital 2 had a positive variance of HPPD during Time 1. The HPPD put in place for Time 2 for wards that required a staffing uplift was based on the required HPPD calculated in Time 1. Therefore, while the required and available HPPD can be compared in Time 2, it is more accurate to compare the required HPPD of Time 1 with the actual HPPD of Time 2 in order to measure the extent to which staffing levels have changed. This is represented in the final columns in Table 3.2.1.2 below. It is important to note when interpreting the data, that both clinically available and total available should be examined. Due to the introduction of new staff as a consequence of the calculated HPPD from Time 1, there is an increase in supervised practice hours; that is, staff are spending more time supervising new staff in Time 2 than in Time 1. This will be highlighted through the comparison of total available hours between Time 1 and Time 2.

In Hospital 1, while the variance in Ward 1 remained negative at Time 2, the variance between required at Time 1 and available at Time 2 reduced by 0.45. However, as the number of nursing hours required increased for this ward in Time 2, this necessitates a further staff uplift to match the required staffing complement based on the change in patient acuity and dependency over this period of time. This result demonstrates that calculating HPPD based on patient acuity and dependency requires an iterative and continuous process of measurement. Ward 2 also had a positive decrease in the variance of HPPD; however, it was much more substantial at reducing the variance at Time 2 to -0.19. As outlined in figure 3.2.1.1 depicting HPPD, this ward's staffing profile is beginning to stabilise. The variance in Ward 3 also decreased and is positive in Time 2, the profile in this ward is also showing stability at Time 2 (see figures 3.2.1 and 3.2.2).

Both Wards in Hospital 2 in Time 1 had a greater number of HPPD than was required; this resulted in no up-lift in Time 2; this indicates that they have the required staffing complement to meet their nursing needs at the time of this report.

Ward 31 of Hospital 3 was relatively well staffed during Time 1 and the variance had a positive decrease in Time 2, with a difference of 0.76 HPPD. However, the required HPPD in Time 2 has since increased and thus this ward is now running on a relatively small deficit of HPPD (Figure 3.2.1). Again, this occurred due to a change in patient acuity and dependency over the time period of the study and reinforces the need to measure staffing requirements on an ongoing basis[7].

[7] Please note, data from Ward 31 has not reached the required 95% validation in time period 2; decisions on staffing need to be made once validation has been reached.

Table 3.2.1.2: Nursing hours per patient day

Hospital	Ward	Time 1 HPPD Required	Time 1 HPPD Clinically available	Time 1 HPPD Total available	Time 1 HPPD Clinical variance	Time 2 HPPD Required	Time 2 HPPD Clinically available	Time 2 HPPD Total available	Time 2 HPPD Clinical variance	Clinical variance between Time 1 and 2	Total variance between Time 1 and Time 2
1	1	4.13	3.20	3.85	-0.93	5.16	3.65	4.3	-1.51	-0.48	0.45
	2	5.82	4.31	4.72	-1.51	4.77	4.58	5.28	-0.19	-1.24	0.56
	3	6.33	5.75	6.46	-0.58	5.29	5.33	6.42	0.04	-1.00	-0.04
2	22	6.50	6.58	7.04	0.08	5.98	6.79	7.57	0.81	0.29	0.53
	23	6.60	6.98	7.57	0.38	6.15	6.55	7.56	0.4	-0.05	-0.01
3*	31	4.42	4.25	4.77	-0.17	5.79	5.01	5.61	-0.78	0.59	0.84

Please note, data from Ward 31 has not reached the required 95% validation in time period 2; therefore, results need to be treated, at this stage with caution.

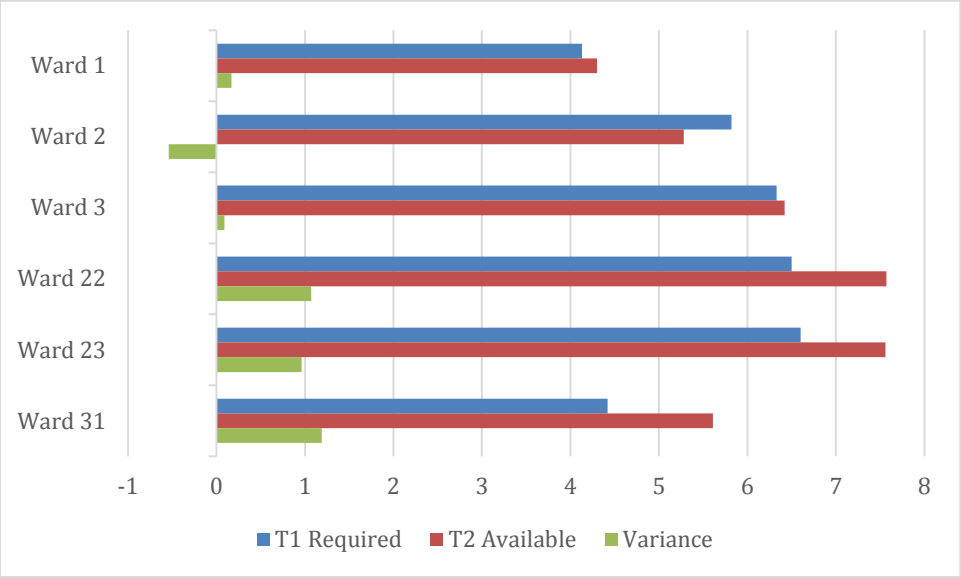

Figure 3.2.1: Difference between required HPPD at Time 1 and total available HPPD at Time 2, including the variance between both.

Figure 3.2.2: Required and total available HPPD at Time 2.

The Framework laid out ranges of required HPPD by patient acuity with descriptions of the types of wards that would fall within these ranges. This section shows the overall required HPPD for each ward for the entire duration of the study period and categorised the study wards into the ranges given in the Framework. Of note, wards 1, 22, 23 and 31 HPPD were calculated without 1:1 specialling. Ward 2 and 3 HPPD include 1:1 specialling as both of these wards have a high dependency unit and therefore require the inclusion of 1:1 specialling due to the increased acuity and dependency of their patient cohort.

Table 3.2.1.4: Description of types of wards based on patient acuity for duration of Time 2

Hospital	Ward	Required HPPD	Category	Range	Clinical Setting Description
1	1	5.16	C	5.0 – 5.4	Moderate - High Complexity Care Moderate - High intervention level Acute Ward/Unit Increasing complex medical/surgical care e.g. post complex urological surgery (prostatectomy) Typically Model 4 Hospital Care Setting
	2	4.77	C	5.0 – 5.4	Moderate - High Complexity Care Moderate - High intervention level Acute Ward/Unit Increasing complex medical/surgical care e.g. post complex urological surgery (prostatectomy) Typically Model 4 Hospital Care Setting
	3	5.29	B	5.5 - 5.9	High Complexity High intervention level Special Unit/Ward (e.g. high observation unit within a ward) Model 4 Hospital Care Setting
2	22	4.86	D	4.5 – 4.9	Moderate Complexity Care Moderate intervention level Acute Ward/Unit General medical/surgical e.g. general respiratory, gynaecological surgery, elective and emergency admission Typically Model 3 Hospital Care Setting
	23	5.15	C	5.0 – 5.4	Moderate - High Complexity Care Moderate - High intervention level Acute Ward/Unit Increasing complex medical/surgical care e.g. post complex urological surgery (prostatectomy) Typically Model 4 Hospital Care Setting
3*	31	4.40	D	4.5 – 4.9	Moderate Complexity Care Moderate intervention level Acute Ward/Unit General medical/surgical e.g. general respiratory, gynaecological surgery, elective and emergency admission Typically Model 3 Hospital Care Setting

**Please note, data from Ward 31 has not reached the required 95% validation in time period 2; therefore, results need to be treated, at this stage with caution.

3.2.2 Clinical Administration

The *Framework* recommended that 100% of the CNM2 role and function should be in a supervisory capacity. In *TrendCare*, this aspect is represented in the data related to the amount of HPPD dedicated to clinical administrative duties (table 3.2.2.1). It is of note, that the staffing establishment for each of the wards in time 2, provided for 100% supervisory status for the CNM. The table below shows that there was an increase in the percentage of time that the CNM2 spent as supervisory in each of the wards, with Wards 1, 3 and 23 demonstrating that supervisory status

was at 80% or above (this is based on 0.2 HPPD being approximately equivalent to 1 WTE). Wards 2 and 22 had lower levels but demonstrated an increase in supernumerary status by 30% and 20% respectively. Ward 23 had a 125% supernumerary CNM2 status in Time 1 rising to 135% in Time 2. This may have occurred as a consequence of supervisory status being allocated to both CNMs (grades 1 and 2) in the ward. Overall, the trend in achieving 100% supervisory status for the CNM2 grade is upwards in all pilot wards, except Ward 1 which remained stable at 80%. It is of note that *TrendCare* enables the direct input from CNM grades the percentage of supervision time versus the clinical time as a proportion of the overall time they have available. Therefore, based on the NHPPD available, wards 2, 3, and 22 have the potential for 100% of the CNM 2 role available for supervisory support; that is, total hours available demonstrates that the CNM2 role is available for 100% supervisory support. Although this requires further exploration, the result may be that CNM2s are choosing to allocate part of their role to clinical work.

Table 3.2.2.1: HPPD for clinical administration for Time 1 and Time 2 with difference and percentage increase

	Time 1		Time 2		Difference	% Increase
	HPPD	% WTE		% WTE		
Ward 1	0.16	80.00%	0.16	80.00%	0	0.00%
Ward 2	0.06	30.00%	0.12	60.00%	0.06	30.00%
Ward 3	0.17	85.00%	0.19	95.00%	0.02	10.00%
Ward 22	0.11	55.00%	0.15	75.00%	0.04	20.00%
Ward 23*	0.25	125.00%	0.27	135.00%	0.02	10.00%
Ward 31	0.15	75.00%	0.16	80.00%	0.01	5.00%

3.2.3 Shift Variance

This section outlines the variance in clinical hours available and clinical hours required by shift between Time 1 and Time 2 (Table 3.2.3.1); overall the variance improved in Wards 2, 3, 22 and 23 in Time 2 compared to Time 1. Time 2 saw an upward trend in the hours available in Wards 1, 2 and 3, while Ward 22 and 23 had a decrease in the hours available; however, this decrease did not result in a negative variance. Ward 31[8] also had a decrease in hours available, however this decrease did result in a greater negative variance at Time 2. Irrespective of time period, the night shift generally has the best possible variance for all six wards.

[8] *Please note, data from Ward 31 has not reached the required 95% validation in time period 2; therefore, results need to be treated, at this stage with caution.

Table 3.2.3.1: Shift variance for Time 1 and Time 2

	Time 1				Time 2			
	No. Patients	Hours available	Hours required	Variance	No. Patients	Hours available	Hours required	Variance
Ward 1								
Day	35.64	46.19	66.42	-20.22	35.98	53.23	79.54	-26.31
Evening	35.11	35.69	49.86	-14.18	35.20	44.38	63.33	-18.95
Night	34.58	30.46	28.72	1.74	34.61	31.08	39.04	-7.96
Total	35.11*	112.33	145.00	-32.66	35.26	128.70	181.91	-53.22
Ward 2								
Day	34.20	61.93	81.40	-19.46	35.58	68.56	73.41	-4.85
Evening	35.11	47.67	67.22	-19.55	36.70	55.68	59.73	-4.05
Night	33.82	38.36	51.50	-13.14	35.21	39.72	37.86	1.87
Total	34.38*	147.96	200.11	-52.16	35.83	163.96	171.00	-7.04
Ward 3								
Day	23.09	49.28	58.81	-9.53	23.27	48.50	51.95	-3.46
Evening	23.96	45.38	51.01	-5.62	24.53	42.14	44.65	-2.51
Night	23.01	39.58	38.11	1.48	23.14	35.48	28.50	6.98
Total	23.35*	134.25	147.93	-13.68	23.65	126.12	125.11	1.01
Ward 22								
Day	25.98	72.16	70.45	1.71	25.41	68.40	64.10	4.30
Evening	25.93	53.86	57.46	-3.60	25.50	46.39	51.81	-5.41
Night	25.69	43.83	40.20	3.63	25.14	39.09	35.79	3.30
Total	25.87*	169.86	168.12	1.74	25.35	153.89	151.70	2.19
Ward 23								
Day	20.24	56.76	55.13	1.62	19.55	57.53	53.25	4.28
Evening	20.38	46.52	46.04	0.48	19.78	42.30	42.43	-0.13
Night	19.90	37.47	31.97	5.51	19.40	36.27	29.86	6.41
Total	20.17*	140.75	133.14	7.61	19.58	136.10	125.53	10.56
Ward 31								
Day	25.96	49.41	50.57	-1.16	25.31	54.58	62.06	-7.48
Evening	26.53	35.11	41.30	-6.19	25.84	42.33	52.14	-9.81
Night	25.58	26.18	23.25	2.93	25.21	30.67	33.22	-2.55
Total	26.02*	110.70	115.11	-4.42	25.45	127.59	147.42	-19.84

* Number of patients averaged across the three shifts

3.2.4 Skill Mix

The *Framework* outlined recommendations for skill-mix [9] (that is, proportion of NHPPD provided by RNs and HCA), with the recommended ratio as 80% RN to 20% HCA based on the total ward establishment.

Skill-mix was measured by examining the proportion of RNs and HCAs rostered on each of the pilot wards (see Table 3.2.4.1). This shows that the majority of wards exceeded, or are close to, the *Framework's* recommended 80:20 split.

Table 3.2.4.1: Skill-mix based on ward establishment

	Time 1				Time 2			
	CNM WTE	RN WTE	HCA WTE	Skill-mix ratio	CNM WTE	RN WTE	HCA WTE	Skill-mix ratio
Ward 1	1	21	4	84:16	1	28	5	85:15
Ward 2	1	25	10	72:28	1	34	10	78:22
Ward 3	1	21	3	87:13	1	24	7	78:22
Ward 22	1	21.8	7.4	75:25	1	23.5	6.5	79:21
Ward 23	1	20.5	7	75:25	1	20.5	8	72:28
Ward 31	1	22	3	88:12	1	23	7	77:23

The Trendcare system, also measures the clinically available skill-mix, which can vary on a shift-by-shift basis. Hospital 1, Ward 1 had a noticeable reduction in skill-mix, reducing from a ratio of 73%:27% in Time 1 to 59%:41% in Time 2. Wards 2 and 3 both improved their RN:HCA ratio from Time 1 with Ward 2 increasing from a ratio of approximately 61:39 to 71:29 and Ward 3 increasing from 57:43 to 70:30; in both wards RN capacity increased by approximately 10% and 13% respectively. In Hospital 2, the ratios for Ward 22 and 23 remained relatively stable, which was expected, as there was no adjustment of staffing in these wards. In Hospital 3, the ratio for Ward 31 decreased for Time 2; however, this was planned as this ward had a very rich skill-mix in Time 1 (91:9) reducing to a desired level of 78:22 in Time 2.

Table 3.2.4.: Skill mix ratio for each shift across the wards for Time 1 and Time 2

	Time 1 Total Hours	RN Hours	HCA Hours	Ratio	Time 2 Total Hours	RN Hours	HCA Hours	Ratio
Ward 1								
Day	46.19	30.55	15.64	66:34	53.23	30.53	22.71	57:43
Evening	35.69	27.19	8.50	76:24	44.38	25.05	19.33	56:44
Night	30.46	24.00	6.46	79:21	31.08	20.72	10.36	67:33
Total	112.33	81.74	30.59	73:27	128.70	76.30	52.39	59:41
Ward 2								
Day	61.93	37.48	24.46	61:39	68.56	49.49	19.06	72:28
Evening	47.67	29.88	17.79	63:37	55.68	39.45	16.23	71:29
Night	38.36	23.62	14.73	62:38	39.72	27.99	11.73	70:30
Total	147.96	90.98	56.98	61:39	163.96	116.94	47.02	71:29
Ward 3								
Day	49.28	29.23	20.06	59:41	48.50	33.19	15.31	68:32
Evening	45.38	25.64	19.75	56:44	42.14	30.23	11.92	72:28

[9] All ratios reported are RN to HCA

Night	39.58	22.25	17.33	56:44	35.48	25.21	10.27	71:29
Total	134.25	77.12	57.13	57:43	126.12	88.63	37.50	70:30
Ward 22								
Day	72.16	45.85	26.31	64:36	68.40	47.07	21.32	69:31
Evening	53.86	30.06	23.80	56:44	46.39	29.07	17.33	63:37
Night	43.83	24.00	19.83	55:45	39.09	24.50	14.59	63:37
Total	169.86	99.91	69.94	59:41	153.89	100.64	53.24	56:35
Ward 23								
Day	56.76	38.79	17.97	68:32	57.53	39.57	17.96	69:31
Evening	46.52	27.14	19.39	58:42	42.30	26.69	15.61	63:37
Night	37.47	16.00	21.47	43:57	36.27	16.42	19.84	45:55
Total	140.75	81.92	58.83	58:42	136.10	82.68	53.41	61:39
Ward 31								
Day	49.41	43.26	6.14	88:12	54.58	41.89	12.70	77:23
Evening	35.11	32.07	3.04	91:09	42.33	32.09	10.24	76:24
Night	26.18	25.81	0.37	99:01	30.67	25.47	5.20	83:17
Total	110.70	101.14	9.56	91:09	127.59	99.44	28.14	78:22

In comparing the two measures (shift and rosters), it is of note that the clinical skill-mix is currently being affected by the number of hours being provided to clinical supervision of new staff. At present 0.24 of clinical supervision is being provided to new staff which accounts for 5.46% of the total nursing hours; this accounts, to an extent, for the mismatch between the two measures. As the workforce further stabilises and new staff become integrated, it is expected that the variation in skill-mix between the measurements at rostered and shift-level will reduce over time.

3.2.5 Agency Use

In many wards, there was a substantial reduction in the use of agency staff as a consequence of the implementation of the recommendations in the *Framework*. In all wards in Hospital 1 that received amended staffing as a result of the introduction of NHPPD there was a reduction in the proportion of nursing hours provided by agency staff. In Hospital 1, there were substantial reductions with agency hours decreasing from 4.30% of total HPPD to 0.23% in Ward 1, 11.6% of total HPPD to 0.61% in Ward 2 and 28.5% of total HPPD to 3.68% in Ward 3. In Hospital 3, Ward 31, there was a relatively small increase in agency hours from 2.2% (Time 1) of total HPPD to 5.1% (Time 2). This was likely due to the change in the patient profile of the ward with increasing patient acuity and dependency, which required a slight increase in 1:1 specialling (see Table 3.2.9); this was mainly provided by HCAs. In Hospital 2 (wards 22 and 23), agency usage remained relatively high but has decreased by 6.8% and 8.2% respectively as a consequence of the introduction of the recommendations in the *Framework.*

Table 3.2.5.1: Hours and percentage of hours provided by agency for Time 1 and Time 2.

	Time 1 Agency hours	Total hours	Percentage of hours	Time 2 Agency hours	Total hours	Percentage of hours
Ward 1						
RN	2.90	81.74	3.55	0.18	76.30	0.23
HCA	1.93	30.59	6.31	0.11	52.39	0.22
Total	4.83	112.33	4.3	0.29	128.70	0.23
Ward 2						
RN	1.82	90.98	2.0	0.24	116.94	0.21
HCA	15.33	56.98	26.91	0.76	15.67	4.87
Total	17.16	147.96	11.6	1.00	163.96	0.61
Ward 3						
RN	1.98	77.12	2.56	1.19	88.63	1.34
HCA	36.35	57.13	63.62	3.46	37.50	9.22
Total	38.33	134.25	28.55	4.64	126.12	3.68
Ward 22						
RN	7.06	99.91	7.07	8.36	100.64	8.30
HCA	32.85	69.94	46.97	17.29	53.24	32.47
Total	39.91	169.86	23.5	25.64	153.89	16.66
Ward 23						
RN	1.86	81.92	2.27	3.03	82.68	3.67
HCA	29.88	58.83	50.8	16.45	53.41	30.79
Total	31.74	140.75	22.55	19.48	136.10	14.31
Ward 31*						
RN	1.58	100.25	1.57	0.94	99.44	0.95
HCA	0.83	9.56	8.72	5.55	28.14	19.72
Total	2.41	110.70	2.18	6.49	127.59	5.09

3.2.6 One-to-one Specialling

Table 3.2.6.1 below outlines the hours and proportion of hours allocated to one-to-one specialling between Time 1 and Time 2. In particular, wards 2 and 3 in Hospital 1 reported a substantial decrease in the amount of hours spent on one-to-one specialling. In Ward 2 there was a percentage decrease of 87.5% and in Ward 3 a percentage decrease of 74.3%. The proportion of hours spent on one-to-one specialling in Ward 1 remained relatively stable over the two time periods; however, it should be noted that this was from a relatively low base to begin with and is similar or below the other pilot wards in Hospital 1 at Time 2. One-to-one specialling increased from 0.8% in time 1 to 17.45% in Ward 31. The increase in Ward 31 has led to the increase in agency hours on this ward (see table 3.2.5.1 above) and the increase in negative variance in hours of care (see Table 3.2.5.1 above) as additional 1:1 specialling requires more hours of care; this occurred as a result of the change in the patient profile on this ward. The two remaining wards, 22 and 23, had relatively high levels of one-to-one specialling in Time 1: 31.47% and 23.72% respectively. While Ward 22 had a decrease to 25.25% in Time 2, the proportion remains quite high, and Ward 23 had a relatively similar proportion of 24.12% in Time 2. It is evident that the provision of a staffing uplift has led to a reduction in 1:1 specialling in Hospital 1; that is, wards that are better staffed, regardless of patient acuity and dependency, require fewer hours dedicated to one-to-one specialling as staff have increased time available for patient surveillance.

Table 3.2.6.1: The total hours and proportion of hours spent on 1:1 specialling in Time 1 and Time 2.

	Time 1					Time 2				
	Shifts	Patients	Total 1:1 hours	Total hours	% Total Hours	Shifts	Patients	Total 1:1 hours	Total hours	% Total Hours
Ward 1	0.91	0.29	4.31	112.33	3.84	1.08	0.37	4.80	128.70	3.73
Ward 2	1.07	0.84	35.62	147.96	24.08	0.95	0.30	4.92	163.96	3.00
Ward 3	2.48	0.25	41.96	134.25	31.26	1.73	0.04	10.13	126.12	8.03
Ward 22	6.10	0.45	53.45	169.86	31.47	4.99	0.32	38.86	153.89	25.25
Ward 23	4.45	0.52	33.38	140.75	23.72	3.99	0.31	32.83	136.10	24.12
Ward 31	0.18	0.11	0.89	110.70	0.8	2.89	0.18	22.27	127.59	17.45

3.2.7 Overtime

The section shows the percentage of paid overtime carried out in each of the wards in Time 1 and Time 2. In Ward 3 there was no overtime in Time 1 which remained the same for Time 2. Wards 1, 2, 22 and 23 had a reduction of 0.90%, 0.21%, 0.13% and 1.74% respectively. Ward 31 had an increase in overtime of 0.59%. Overall levels of overtime across both time-periods were relatively low.

Table 3.2.7.1: Total hours and proportion of overtime hours.

	Time 1			Time 2		
	Total overtime	Total hours	% overtime	Total overtime	Total hours	% overtime
Ward 1	1.51	112.33	1.35	0.30	128.70	0.23
Ward 2	0.41	147.96	0.28	0.12	163.96	0.07
Ward 3	0.00	134.25	0	0.00	126.12	0.00
Ward 22	1.14	169.86	0.67	0.83	153.89	0.54
Ward 23	3.76	140.75	2.67	1.26	136.10	0.93
Ward 31	1.71	110.70	1.55	2.73	127.59	2.14

3.2.8 Absenteeism

Absenteeism, in particular sick absence, may be an indicator of increased workloads or a poor working environment. Overall, absenteeism (family, maternity, compassionate leave and sickness absence) decreased in Wards 1, 2, 3, 22 and 31, with only Ward 23 showing an increase. In Hospital 1, Ward 1's sick leave decreased from 7.99% in Time 1 to 4.23% in Time 2, a decrease of 3.23%. Ward 2 increased in sick leave from 4.79% to 6.13% whereas Ward 3, had a slight increase (Time 1 = 2.71% Vs. Time 2 = 2.90%). In Hospital 2, Ward 22 had a relatively small reduction in sick leave (Time 1 = 5.22% Vs. Time 2 = 4.58%) whereas Ward 23 had an increase both in overall absenteeism and in sick leave, with sick leave rising from a relatively low 0.81% to 4.76%. Finally, while overall absenteeism decreased in Ward 31, sick leave increased between Time 1 (2.21%) and Time 2 (4.74%).

Table 3.2.8.1: Absenteeism

	Time 1 Hours absent	Total Hours	% absent	Time 2 Hours absent	Total Hours	% absent
Ward 1						
Family						
Maternity				0.62		0.48
Compassionate				0.04		0.03
Bereavement						
Prenatal						
Sick	8.97		7.99	5.48		4.26
Total Leave	8.97	112.33	7.99	6.13	128.70	4.76
Ward 2						
Family	3.56		2.40	2.37		1.45
Maternity	9.36		6.33	7.80		4.76
Compassionate				0.11		0.06
Bereavement						
Prenatal	0.62		0.42	0.66		0.40
Sick	7.08		4.79	10.04		6.13
Total Leave	20.62	147.96	13.94	20.98	163.96	12.79
Ward 3						
Family				1.31		1.04
Maternity						
Compassionate				0.09		0.07
Bereavement				0.05		0.04
Prenatal						
Sick	3.64		2.71	2.76		2.19
Total Leave	3.64	134.25	2.71	4.21	126.12	3.34
Ward 22						
Family	4.58		2.70	2.87		1.86
Maternity	8.90		5.24	3.73		2.42
Compassionate						0.00
Bereavement						0.00
Prenatal						0.00
Sick	8.87		5.22	7.04		4.58
Total Leave	22.36	169.86	13.16	13.64	153.89	8.86
Ward 23						
Family				0.30		0.22
Maternity	3.34		2.37	5.72		4.20
Compassionate				0.03		0.02
Bereavement						0.00
Prenatal				0.05		0.03
Sick	1.14		0.81	6.47		4.76
Total Leave	4.49	140.75	3.19	12.57	136.10	9.24
Ward 31						
Family				0.16		0.13
Maternity	5.37		4.85			0.00
Compassionate	0.52		0.47			0.00
Bereavement	0.35		0.31			0.00
Prenatal				0.29		0.23
Sick	2.47		2.21	6.00		4.71
Total Leave	8.71	110.70	7.87	6.46	127.59	5.06

3.2.9 Bed Occupancy

As can be seen in Table 3.2.9.1 below, each of the pilot wards reported high rates of bed occupancy, ranging from 89.73% to 101.11% in Time 1. Of the six wards, three (1, 2 and 23) were functioning at over 100% bed occupancy in Time 1. Both wards, 1 and 2, remained above 100%, with increases of 0.42% and 4.24% respectively. However, Ward 23 dropped to below 100% in Time 2, with a decrease of 2.95%. Ward 22 had an increase of 1.23% in Time 2 while Ward 31 had a 1.97% decrease in Time 2. Bed occupancy decreased between Phases 1 and 2 in Wards 1, 22, 23 and 31 by between 1.99% and 4.41%. However, bed occupancy in Ward 2 increased by 2.99% and there was also an increase in Ward 3 but it was much less substantial at 0.54%. It is of note that staffing does not impact on bed occupancy; however, high bed occupancy is an indicator of higher nursing workloads. All wards were above the OECD bed occupancy average of 85%.

Table 3.2.9.1: Average bed occupancy per day for Time 1 and Time 2

	Time 1			Time 2		
	No. Beds	No. Patients	Percent occupancy	No. Beds	No. Patients	Percent occupancy
Ward 1	35	35.11	100.32	35	35.26	100.74
Ward 2	34	34.38	101.11	34	35.82	105.35
Ward 3	24	23.34	97.31	24	23.65	98.54
Ward 22	26	25.87	99.50	26	25.35	97.50
Ward 23	20	20.17	100.85	20	19.58	97.90
Ward 31	29	26.02	89.73	29	25.45	87.76

3.2.10 Conclusion

Overall, the variance in HPPD and hours worked during the various shifts are stabilising in Time 2 of the study following the implementation of the recommendations of the *Framework* being put in place. The results also show that the amount of time the CNM2 is spending in a supervisory role has increased in Time 2; this is in line with the recommendations of the *Framework*. In many cases, there is now the potential for CNM2s to undertake 100% of their role as supervisory. Rostered skill-mix, that is the core complement of staff, demonstrated that skill-mix exceeded or is close to the 80% RN to 20% HCA ratio recommended in the *Framework*. Clinical skill-mix, while variable, generally increased over the timeframe of the study; it is envisaged that, as new staff integrate into the wards, the skill-mix on a shift-by-shift basis will match that outlined in the roster; that is hours currently allocated to the supervision of new staff, which are impacting on the skill-mix will become available for clinical care.

Overall, comparisons of the data in Time 1 and Time 2 of the study indicate that the staffing levels in the wards are stabilising which may be related to the positive outcomes observed such as an increase in staffing numbers in those wards where a negative variance between NHPPD required and available was identified in Time 1 (i.e. before the uplift), a richer skill mix (higher proportion of RNs providing care), an increase in the proportion of time allocated to the CNM2 as supervisory, a reduction in agency use and a general reduction in reported staff sickness absence.

3.3 Hospital In-patient Enquiry System

3.3.1 Nursing Sensitive Patient Outcome Measures

Needleman et al. (2002) conducted a review of published and unpublished literature to identify nurse sensitive patient outcomes in hospitals. The list was further refined through consulting with experts in the field and 14 outcomes sensitive to nurse staffing and coded on hospital discharge database were identified. These included:

- Length of stay (LOS)
- Metabolic derangement
- Urinary tract infection (UTI)
- Hospital-acquired pneumonia
- Hospital-acquired sepsis
- Pulmonary failure
- Pressure ulcers
- Deep venous thrombosis (DVT)
- Upper gastrointestinal (GI) bleeding
- Shock or cardiac arrest
- Central nervous system (CNS) complications
- Wound infection
- Failure to rescue (death with: sepsis; pneumonia; upper gastrointestinal bleeding; shock or cardiac arrest; deep venous thrombosis)
- Mortality

The Hospital Inpatient Enquiry (HIPE) system is Ireland's current method for collecting data on in-patients discharged from acute hospitals and includes details of mortality, morbidity, LOS and diagnoses within the hospital setting (O'Loughlin et al. 2005). From initial examination, the nurse sensitive outcomes outlined above can be identified from the HIPE data collected as part of this research.

3.3.2 Patient Demographics

This section outlines the patient profile collected across the duration of the study. The rationale is to demonstrate the variation in patient profiles among the three sites as well as identifying the key variables that were used in case-mix applied to the HIPE data. As will be seen from the data, the cohort of patients cared for in the three sites have varying lengths of stay and admission profiles. The demographic data reflects the profile of the hospitals, moving from higher to lower complexity (Level 4 – Hospital 1; Level 3 –Hospital 2; Level 2 – Hospital 3).

The table below shows the period that the HIPE data that is available in each time-point (Time 1 and Time 2) of the study. Note that some patients admitted during Time 1 may have continued their stay during Time 2 and for the purposes of this analysis they will be included in the time point in which they were admitted. As such,

there may be a slight overestimation of NSOs in Time 1 and a slight underestimation in Time 2.

Table 3.3.2.1: HIPE data reporting timeframes for Time 1 and Time 2

		Available dates Time 1	Available dates Time 2
Hospital 1	Ward 1	15/07/2016 – 09/01/2016	10/01/2017 – 30/05/2017
	Ward 2	15/07/2016 – 09/01/2016	10/01/2017 – 30/05/2017
	Ward 3	15/07/2016 – 09/01/2016	10/01/2017 – 30/05/2017
Hospital 2	Ward 22	31/10/2016 – 09/01/2016	10/01/2017 – 30/05/2017
	Ward 23	31/10/2016 – 09/01/2016	10/01/2017 – 30/05/2017
Hospital 3	Ward 31	15/07/2016 – 09/01/2016	10/01/2017 – 30/05/2017

During Time 1 of the study, a total of 2,062 patients were admitted to one of the six wards: Hospital 1 (n = 1,569), Hospital 2 (n = 217), and Hospital 3 (n =276). Within Hospital 1, Ward 1 had the greatest number of admissions followed by Wards 2 and 3, while Ward 22, in Hospital 2 had a greater number than Ward 23. There was only one ward in Hospital 3 and so no comparisons were made. Time 2 of the study had a total of 1979 patient admissions (Hospital 1, n = 1407; Hospital 2, n = 431; Hospital 3, n = 141). This is a smaller sample size than Time 1 due to the relatively shorter time frame. However, the data regarding number of admissions to each of the wards follows the same pattern as that in Time 1.

In Time 1 of the 2054 patients admitted, 1064 (51.6%) were male. In Hospital 1 there were slightly more males than females, while Hospitals 2 and 3 had slightly more females, however, overall the gender split is relatively equal. In individual wards, Wards 1 and 23 had more males (~60%) while each of the other wards had slightly more females but were more equal (50-58%). In Time 2, the gender split was similar with 49% males overall. Hospital 1 had more males that females (51.5%) while Hospitals 2 and 3 had more females (56.56% and 60.3%). Ward 1 had more males (56.5%) while Ward 3 had an equal gender split (50.1%) and the four remaining wards (2, 22, 23 and 31) had between 53.9% and 60.3% females.

In both Time 1 and Time 2 of the study, most admissions to hospital were emergency: ~83%. Hospital 1 had the lowest emergency admissions: 79% (Time 1) and 78% (Time 2), while emergency admissions accounted for over 90% in both time points for Hospitals 2 and 3. Emergency admissions had a range of 63-98% during Time 1 in the wards in Hospital 1, comparable to the range of 62-98% in Time 2. Wards 22 and 23 of Hospital 2 had similarly high percentages of emergency admissions between Time 1 and Time 2 (both >90%) and Ward 31 also had high percentages of emergency admissions for Time 1 and Time 2: 91% and 93% respectively. Therefore, the trends in admission for both time points of the study were relatively similar.

The mean overall age of patients during Time 1 was 62.41 years, similarly the means age in Time 2 was 62.35 years. The youngest profile was seen in Hospital 1 at both Phases (Time 1, mean = 58.85; Time 2, mean = 58.60), followed by Hospital 2 (Time 1, mean = 71.48; Time 2, mean = 69.20) and the oldest profile in Hospital 3 (Time 1, mean = 75.51; Time 2, mean = 78.5). Within the Hospital 1, the age ranged from the youngest in Ward 3 (Time 1, mean = 52.8; Time 2, mean = 50.6) to the oldest in Ward 2 (Time 1, mean = 65.1; Time 2, mean = 64.0). Within Hospital 2, the ages were very similar between Ward 22 and 23 in Time 1 - 71.49 and 71.53 respectively. However, there was more of a difference in Time 2, 67.7 and 72.80.

The patients in Ward 31 had similar ages between Time 1 and 2: 75.51 and 78.5 respectively.

The overall mean length of stay (LOS) for the 2054 patients in Time 1 was 10.64 days compared to 10.12 days in Time 2. Both time points show the pattern whereby the longest LOS is seen in Hospital 3 (Time 1, mean = 18.1 days; Time 2, mean = 24.7 days), followed by Hospital 1 (Time 1, mean = 10.4 days; Time 2, mean = 9.3 days) with Hospital 2 having the shortest LOS (Time 1, mean = 9.4 days; Time 2, mean = 9.7 days). Within Hospital 1, patients in Ward 1 had the shortest LOS (Time 1, mean = 8.3, Time 2, mean = 9.3) followed by Ward 3 (Time 1, mean = 10.5, Time 2, mean = 9.6) and Ward 2 had the longest LOS (Time 1, mean = 13.7, Time 2, mean = 10.6). The patients on Ward 23 in Hospital 2 had a mean LOS of 12.2 days in Time 1 and 12.4 days in Time 2, while patients in Ward 22 had mean LOS of 8.0 days and 8.5 days for Time 1 and Time 2 respectively.

Table 3.3.2.2: Demographic profile of patients admitted to each of the pilot wards during Time 1

	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1 n = 749	Ward 2 n = 477	Ward 3 n = 343	Total n = 1569	Ward 22 n = 142	Ward 23 n = 75	Total n = 217	Ward 31 n = 276	n = 2062
Gender, n (%)									
Male	451 (60.2)	210 (44.0)	160 (46.6)	821 (52.30)	60 (42.3)	46 (61.3)	106 (48.8)	137 (49.6)	1064 (51.60)
Female	298 (39.8)	267 (56.0)	183 (53.4)	748 (47.70)	82 (57.7)	29 (38.7)	111 (51.2)	139 (50.4)	998 (48.40)
Admission type, n (%)									
Elective	191 (25.5)	8 (1.7)	126 (36.7)	325 (20.7)	5 (3.5)	4 (5.3)	9 (4.1)	25 (9.1)	359 (17.40)
Emergency	558 (74.5)	467 (98.3)	217 (63.3)	1244 (79.3)	137 (96.5)	71 (94.7)	208 (95.9)	251 (90.9)	1703 (82.6)
Age									
Mean (SD)	57.7 (19.2)	65.1 (18.9)	52.8 (16.7)	58.85 (19.1)	71.5 (18.1)	71.5 (14.9)	71.48 (17.0)	75.5 (13.1)	62.41 (19.32)
Length of stay									
Mean (SD)	8.3 (13.9)	13.7 (18.2)	10.5 (13.6)	10.4 (15.5)	8.0 (8.0)	12.2 (14.2)	9.4 (10.7)	12.9 (18.1)	10.64 (15.44)

Table 3.3.2.3: Demographic profile of patients admitted to each of the pilot wards during Time 2

	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1 n = 596	Ward 2 n = 462	Ward 3 n = 349	Total n = 1407	Ward 22 n = 142	Ward 23 n = 128	Total n = 431	Ward 31 n = 141	n = 1979
Gender, n (%)									
Male	337 (56.5)	213 (46.1)	175 (50.1)	725 (51.5)	131 (43.2)	56 (43.8)	187 (43.4)	56 (39.7)	968 (48.9)
Female	259 (43.5)	249 (53.9)	174 (49.9)	682 (48.5)	172 (56.8)	72 (56.3)	244 (56.6)	85 (60.3)	1011 (51.1)
Admission type, n (%)									
Elective	165 (27.7)	16 (1.7)	132 (36.7)	305 (21.7)	17 (5.6)	8 (6.30)	25 (5.8)	10 (7.1)	340 (17.20)
Emergency	431 (72.3)	454 (98.3)	217 (62.2)	1102 (78.3)	286 (94.4)	120 (93.8)	406 (94.2)	131 (92.9)	1639 (82.80)
Age									
Mean (SD)	59.2 (19.4)	64.0 (19.0)	50.6 (17.2)	58.6 (19.4)	67.7 (17.3)	72.8 (16.0)	69.2 (17.1)	78.5 (19.4)	62.35 (19.46)
Length of stay									
Mean (SD)	8.2 (9.8)	10.6 (11.7)	9.6 (12.6)	9.3 (11.2)	8.5 (11.1)	12.4 (15.3)	9.7 (12.6)	19.4 (24.7)	10.12 (13.17)

3.3.3 Nursing Sensitive Patient Outcome Measures

As highlighted, nurses play a central role in ensuring patient safety and in-patient surveillance. Previous research has demonstrated a relationship between nurse staffing, skill-mix and nursing sensitive patient outcome measures including mortality, failure to rescue, urinary tract infections, pneumonia, thromboembolism, metabolic derangement, sepsis, ulcer/gastritis/upper gastrointestinal bleed shock/cardiac arrest, and average length of stay. These nursing sensitive outcome measures are central to the evaluation and, as seen in previous research, can be used to measure an association between nurse staffing and patient outcomes.

3.3.3.1 Hospital 1

In total, 39 patients (2.5%) died during their stay in the pilot wards in Hospital 1 and 51.3% (20/39) of these were over the age of 80 years in Time 1. Time 2 saw a drop in the proportion of deaths (23/1407; 1.6%) in Hospital 1 and 12 of these patients (52.2%) were over the age of 80 years. Of the 39 deaths that occurred in Hospital 1 during Time 1, 23.0% occurred in Ward 1, 12.82% in Ward 3 and the remaining (64.10%) in Ward 2. In total, ten patients were identified that could be associated with the failure to rescue criteria in Time 1. These included four cases of pneumonia, five cases of sepsis and one case of upper GI bleeding. During Time 2, 26% of the deaths occurred in Ward 1, while the remaining 69.6% were in Ward 2 and only 4.4% occurred in Ward 3 during Time 2. Of these deaths, 10 case may be considered for the failure to rescue criteria with three cases of sepsis, two cases of pneumonia, one case of DVT, one case of upper GI bleeding and three cases with multiple criteria (pneumonia + sepsis; shock/cardiac arrest + upper GI bleeding + pneumonia) as the cause for inclusion. However, it should be noted that for both time points (Time 1 and Time 2) further work is required on the association between nurse staffing and failure to rescue; in effect, this would require a much larger sample size over a longer period of time. The research team will continue to collect this data over the three years of the study.

Excluding mortality, 184 patients (11.70%) in Hospital 1 had a diagnosis related to a nurse sensitive outcome (NSO) in Time 1, while this was stable in Time 2 11.6%. Time 2 saw a dramatic drop in NSOs in Ward 1 (1.3% drop) but a slight increase in Wards 2 and 3: 0.3% and 0.4% increase respectively. Of all the patients identified in the data with NSOs, 35 (19.02%) of these had multiple NSOs in Time 1 and 38 (23.3%) had multiple NSOs in Time 2. Table 3.3.4 includes the breakdown of NSOs in the three wards.

Table 3.3.3.1: Breakdown of nurse sensitive patient outcomes in Hospital 1 for Time 1 and Time 2

	Time 1				Time 2			
	Ward 1 n = 749 n (%)	Ward 2 n = 477 n (%)	Ward 3 n = 343 n (%)	Hospital 1 n = 1569 n (%)	Ward 1 n = 596 n (%)	Ward 2 n = 462 n (%)	Ward 3 n = 349 n (%)	Hospital 1 n = 1407 n (%)
Any NSO (excl. mortality)	51 (6.8)	107 (22.4)	26 (7.6)	184 (11.7)	33 (5.5)	102 (22.1)	28 (8.0)	163 (11.6)
Metabolic derangement	17 (2.3)	38 (8.0)	12 (3.5)	67 (4.3)	12 (2.0)	39 (8.4)	13 (3.7)	64 (4.5)
Urinary tract infection	3 (0.4)	18 (3.8)	6 (1.7)	27 (1.7)	2 (0.3)	9 (1.9)	2 (0.6)	13 (0.9)
Pneumonia	10 (1.3)	21 (4.4)	8 (2.3)	39 (2.5)	4 (0.7)	19 (4.1)	12 (3.4)	35 (2.5)
Sepsis	8 (1.1)	18 (3.8)	1 (0.3)	27 (1.7)	9 (1.5)	27 (5.8)	1 (0.3)	37 (2.6)
Pulmonary failure	5 (0.7)	13 (2.7)	1 (0.3)	19 (1.2)	2 (0.3)	14 (3.0)	1 (0.3)	17 (1.2)
Pressure ulcers	4 (0.5)	2 (0.4)	0 (0.0)	6 (0.4)	1 (0.2)	5 (1.1)	0 (0.0)	6 (0.4)
Deep vein thrombosis	3 (0.4)	3 (0.6)	4 (1.2)	10 (0.6)	4 (0.7)	3 (0.9)	3 (0.9)	10 (0.7)
Upper GI bleeding	3 (0.4)	3 (0.6)	0 (0.0)	6 (0.4)	2 (0.3)	5 (1.1)	0 (0.0)	7 (0.5)
Shock/ cardiac arrest	1 (0.1)	4 (0.8)	0 (0.0)	5 (0.3)	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.1)
CNS complications	9 (1.2)	5 (1.0)	0 (0.0)	14 (0.9)	6 (1.0)	4 (0.9)	2 (0.6)	12 (0.9)
Wound infection	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Failure to rescue	2 (0.3)	6 (1.3)	2 (0.6)	10 (0.6)	1 (0.2)	9 (1.9)	0 (0.0)	10 (0.7)
Mortality	9 (1.2)	25 (5.2)	5 (1.5)	39 (2.5)	6 (1.0)	16 (3.5)	1 (0.3)	23 (1.6)

Overall, the most frequent NSO in Hospital 1 during Time 1 was metabolic derangement at 4.30% followed by pneumonia at 2.50%. Each of the other NSOs remained at or below 1.7% with no patients developing reported wound infections. For Time 2, metabolic derangement remained the most frequent NSO at 4.5%%. The second most frequent NSO in Time 2 was sepsis which increased to 2.6%. Overall mortality rates in the three wards fell from 2.5% in Time 1 to 1.6% in Time 2. The remaining NSOs all remained relatively equal to or below the rates identified in Time 1; however, the pattern is that they are decreasing over time.

3.3.3.2 Hospital 2

In total, 11 patients (5.1%) died during their hospital stay in Time 1, with 45.5% occurring in Ward 22. However, this is over a relatively short period of time and in a small sample; therefore mortality rates need to be treated with caution and further statistical analysis is required, including the calculation of standardised mortality rates. Of note, seven of the 11 patients (63.64%) were over 80 years of age. In Time 2 there were 29 deaths (6.7%), with 62.1% of these over the age of 80 years. Of these, 72.4% occurred in Ward 22 while, 27.6% occurred in Ward 23. Of the 11 deaths in Time 1, four of these may have reached the criteria for failure to rescue, with all four related to pneumonia. During Time 2 there were 10 cases which may have reached the failure to rescue criteria: four due to pneumonia, two as sepsis, two upper GI bleeding, one DVT and one related to shock or cardiac arrest. Again, these results need to be treated with caution until further analysis is conducted over a longer time period.

Of the 217 patients in Time 1, 74 (34.1%) had an adverse outcome(s) in hospital excluding those whom had died during their stay: 66.2% (49/74) occurred on Ward 22 and 33.8% (25/74) occurred on Ward 23. The proportion of NSOs in Time 2 was very similar to Time 1 although there was a slight decrease of 3.7%. The majority of these occurred on Ward 22 (70.9%) compared to Ward 23 (29.1%). Of all the patients identified with NSOs, 21 (14.69%) had more than one NSO in Time 1 and 49 (16.33%) had more than one in Time 2 (Table 3.3.5: Breakdown of nurse sensitive patient outcomes for patients admitted to Hospital 2 for Time 1 and Time 2).

Table 3.3.3.2: Breakdown of nurse sensitive patient outcomes in Hospital 2 for Time 1 and Time 2

	Time 1			Time 2		
	Ward 22 n = 142 n (%)	Ward 23 n = 75 n (%)	Hospital 2 n = 217 n (%)	Ward 22 n = 303 n (%)	Ward 23 n = 128 n (%)	Hospital 2 n = 431 n (%)
Any NSO (excl. mortality)	49 (34.5)	25 (33.3)	74 (34.1)	93 (30.7)	38 (29.7)	131 (30.4)
Metabolic derangement	15 (10.6)	9 (12.0)	24 (11.1)	31 (10.2)	14 (10.9)	45 (10.4)
Urinary tract infection	12 (8.5)	6 (8.0)	18 (8.3)	28 (9.2)	18 (14.1)	46 (10.7)
Pneumonia	15 (10.6)	6 (8.0)	21 (9.7)	26 (8.6)	8 (6.3)	34 (7.9)
Sepsis	5 (3.5)	1 (1.3)	6 (2.8)	8 (2.6)	2 (1.6)	10 (2.3)
Pulmonary failure	1 (0.7)	1 (1.3)	2 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)
Pressure ulcers	9 (6.3)	1 (1.3)	10 (4.6)	15 (5.0)	4 (3.1)	19 (4.4)
Deep vein thrombosis	1 (0.7)	0 (0.0)	1 (0.5)	1 (0.3)	0 (0.0)	1 (0.2)
Upper GI bleeding	2 (1.4)	1 (1.3)	3 (1.4)	4 (1.3)	4 (3.1)	8 (1.9)
Shock/ cardiac arrest	1 (0.7)	1 (1.3)	2 (0.9)	1 (0.3)	3 (0.0)	1 (0.2)
CNS complications	5 (3.5)	3 (4.0)	8 (3.7)	13 (2.3)	3 (2.3)	16 (3.7)
Wound infection	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Failure to rescue	1 (0.7)	3 (4.0)	4 (1.8)	7 (2.3)	3 (2.3)	10 (2.3)
Mortality	5 (3.5)	6 (8.0)	11 (5.1)	21 (6.9)	8 (6.3)	29 (6.7)

The most frequent NSO in Time 1 was metabolic derangement (11.1%) followed by pneumonia (8.3%) and urinary tract infections (8.3%). These NSOs were also the three most frequent in Time 2, with metabolic derangement and pneumonia decreasing slightly by 1.3% and 1.8% respectively while UTIs increased slightly to 10.7% in Time 2 compared to 8.3% in Time 1. Upper GI bleeding also increased in Time 2 by 0.5% while each of the remaining NSOs remained the same or decreased in Time 2. The addition of data at a later stage will determine whether or not this pattern remains.

3.3.3.3 Hospital 3

Of the 276 patients admitted to the ward in Hospital 3 during Time 1, five (1.81%) died during their stay, while in Time 2, 5 patients (3.5%) died during their hospital stay and of note nine of the ten patients were over the age of 80 years, with the remaining patient aged 78. In Time 1, two patients may have reached the criteria for failure to rescue, while one patient may have in Time 2. For Time 1, the additional diagnoses were pneumonia, while the additional diagnosis was sepsis in Time 2.

During Time 1, 31 of the 276 patients (11.2%) admitted to the ward had a nurse sensitive outcome excluding death in comparison to 28/141 (19.9%) during Time 2. Of the 31 patients in Time 1 with NSOs eight patients had multiple NSOs identified and two patients in Time 2 had multiple NSOs. Table 3.3.6 details the breakdown of NSOs for the ward in Hospital 3.

Table 3.3.3.3: Breakdown of nurse related patient outcomes for patients admitted to pilot ward in Hospital 3 1 for Time 1 and Time 2

	Time 1 Ward 31; Hospital 3 n = 276 n (%)	Time 2 Ward 31; Hospital 3 n = 141 n (%)
Any NSO (excl. mortality)	31 (11.2)	28 (19.9)
Metabolic derangement	8 (2.9)	11 (7.8)
Urinary tract infection	15 (5.4)	8 (5.7)
Pneumonia	7 (2.5)	2 (1.4)
Sepsis	3 (1.1)	2 (1.4)
Pulmonary failure	0 (0.0)	0 (0.0)
Pressure ulcers	0 (0.0)	1 (0.7)
Deep vein thrombosis	1 (0.4)	2 (1.4)
Upper GI bleeding	1 (0.4)	2 (1.4)
Shock/ cardiac arrest	0 (0.0)	0 (0.0)
CNS complications	4 (1.4)	2 (1.4)
Wound infection	0 (0.0)	0 (0.0)
Failure to rescue	2 (0.7)	2 (1.4)
Mortality	5 (1.8)	5 (3.5)

The most common NSO in Time 1 was UTI (5.43%), which increased slightly to 2.7% in Time 2. Metabolic derangement (2.90%) and pneumonia (2.50%) were the second most frequent NSOs in Time 1. Metabolic derangement increased to 7.8% in Time 2 while pneumonia dropped to 1.4%. Both sepsis and DVT increased from Time 1 to Time 2, 1.09% to 1.4% and 0.36% to 1.4% respectively. There were no instances of

pressure ulcers in Time 1 but 0.7% in Time 2. The remaining NSOs decreased or had no occurrence. Again, additional data will allow for further examination of the pattern between Time 1 and Time 2.

3.3.4 Segmented Time-series Analysis

We used a segmented time series analysis to estimate whether the probability of an NSO occurring changed after 09/01/2017. Data across all patients were aggregated by admission date to give a total NSO count for each day of the observation period (15/09/2016 to 27/02/2017; 228 total days). Using these data, we used Poisson regression to model the influence of time on NSO count. Time was represented using linear splines with a single break at day 178 (corresponding to 09/01/2017). Model coefficients are reported with 95% confidence intervals, and model predicted values are plotted with the raw data and a corresponding LOESS best fit line. Autocorrelation was assessed by examination of a correlogram of the model's residuals.

Based on the Poisson regression, the estimated NSO count on day 1 (obtained by exponentiating the respective regression coefficient) was 0.83 (95% CI 0.64 to 1.07). Over the first time period, from day 1 to day 178, the NSO count increased by 0.66% (95% CI 0.47 to 0.86) per day. This was in contrast to the second time period, from day 178 on, when the NSO count decreased by 0.88% (95% CI 1.22 to 0.53) per day. The model estimated increase and subsequent decrease in NSO counts across the two respective periods (before and after the introduction of the Framework) are displayed on Figure 3.3.1.

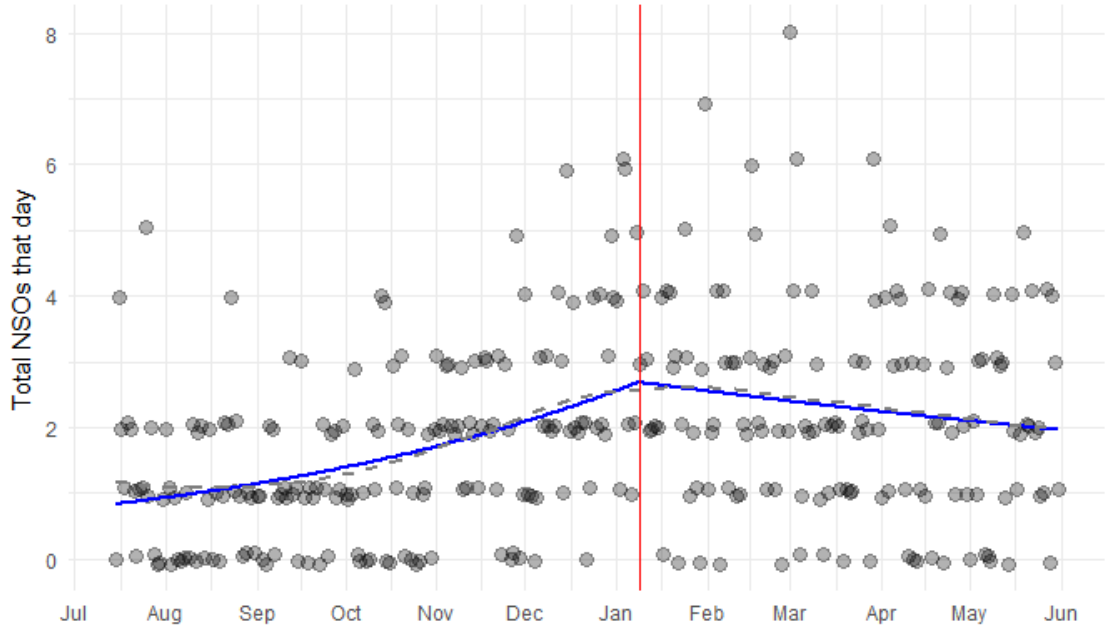

Figure 3.3.1: Segmented time series Poisson regression results

The points reflect the total NSO count (y-axis) for each day of observation (x-axis). The red line marks 09/01/2017, when the Framework was introduced. The blue line follows the predicted NSO counts from the segmented time series Poisson regression, while the grey line shows the LOESS fit to the data. As the graph above shows the occurrence of NSOs increased across the period of time and then began decreasing on January 9th. However, without additional data it is difficult to determine whether or not this pattern will continue and with the short time frame it may be attributed to seasonal variations, and therefore, at this time, should be viewed with caution.

3.3.4.1 Model Assumptions

There was no evidence of overdispertion (NSO count mean = 1.91, sd = 2.29; F-test p = 0.29), and estimates from a negative binomial regression (not reported) were in line with those of the Poisson regression reported here. There was also no evidence of autocorrelation in the residuals over time (figure 3.3.2).

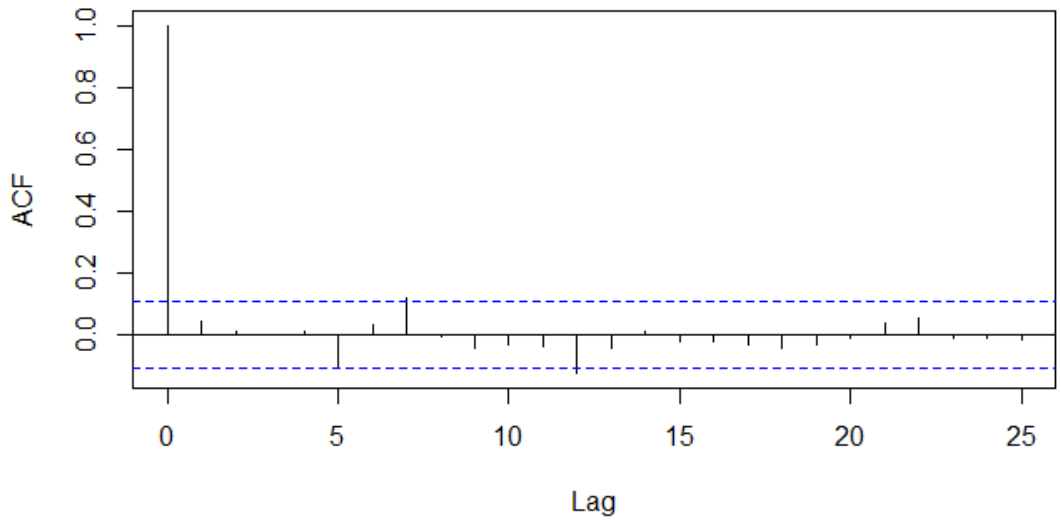

Figure 3.3.2: Correlogram to assess autocorrelation

3.3.5 Patient-level NSO Risk

We also used logistic regression models to estimate the associations between admission date and NSO occurrence at the patient level. The expected non-linear relationship between time and NSO occurrence (indicated by the results above) was modelled using restricted cublic splines (5 knots). The key results were the unadjusted and covariate adjusted non-linear associations between day of admission and the log odds of an NSO, which are shown in the plots below.

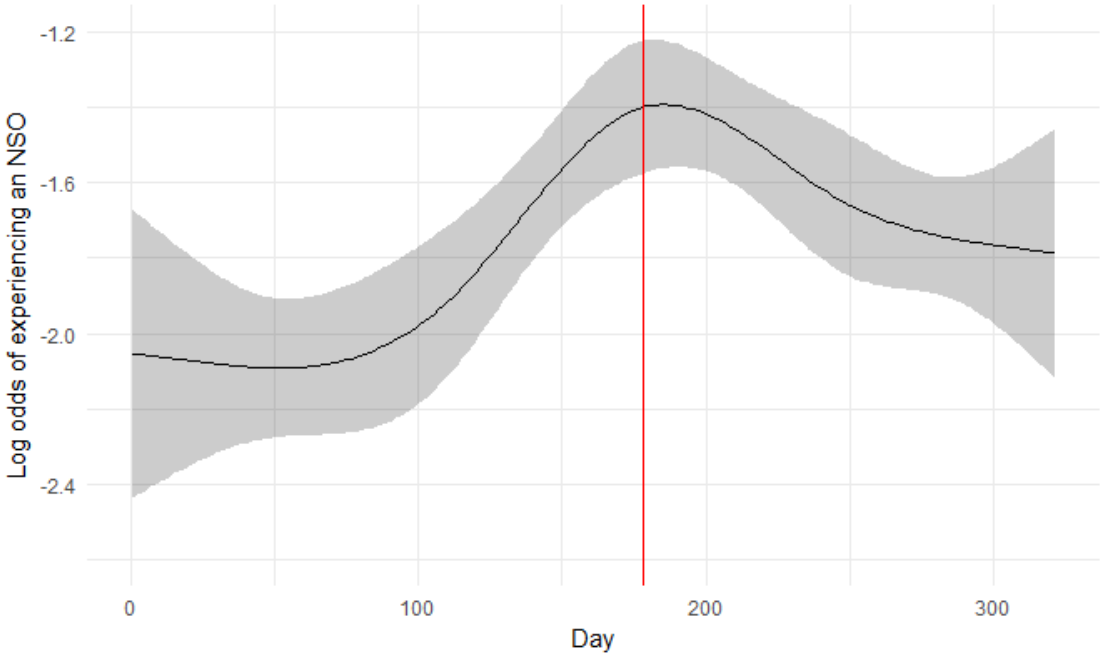

Figure 3.3.3. Unadjusted relationship between day of admission and log odds of an NSO.

Like the segmented time series analysis, we can see that the log odds of an NSO increases until January 2017 (day 170), after which the log odds of an NSO starts to decline considerably (Figure 3.3.3). The nature of this relationship is still apparent after covariate adjustment (Figure 3.3.4).

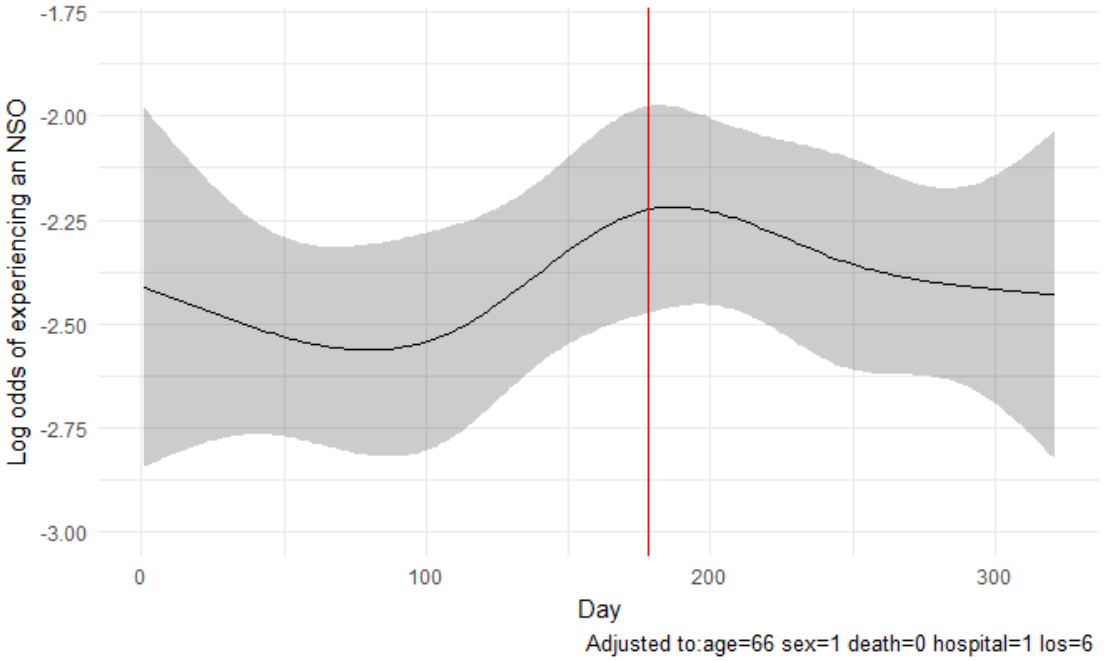

Figure 3.3.4. Adjusted relationship between admission day and log odds of an NSO.

3.3.6 Conclusion

It is apparent that nursing sensitive outcome measures can be identified in the HIPE data and this is a useful resource for measuring these outcomes. However, as the three hospitals vary greatly in profile (level, teaching status, location, patient demographics and staffing), the HIPE data cannot be used to make comparison between hospitals and should only be used for comparisons within hospitals. The time series analysis shows that the count of NSO increased per day by 0.66% in Time 1 but decreased by 0.88% in Time 2. Additionally, the regression shows that the odds of developing an NSO began to decline in Time 2, which was also apparent after adjusting for case-mix. However, without additional data and over a longer timeframe it is difficult to say whether this trend is due to the implementation of the *Framework* or a naturally occurring pattern due to seasonal variations for example. Therefore, while the data looks promising, it should, at this time, still be treated with caution.

3.4 Cross-sectional staff survey – pilot wards

Staff across the six study wards, including clinical nurse managers, staff nurses and healthcare assistants, were asked to complete a survey in Time 1 and Time 2 of the study. Data was also collected at a transitional time-point between Time 1 and Time 2. This is referred to as “Transition” throughout this section of the report and was undertaken at the time-point as the adjustments to staffing were being made. The demographic profile of the respondents is outlined in Table 3.4.1. This describes all staff that responded in one, two or three time-points of data collection. The majority of staff were RNs and had completed degree level education. The majority were working in full-time posts, were female and had been working on average for approximately 12 years as a nurse. Respondents had an average of 5.67 years of experience working on their current ward. Staff also provided information on the type of shift last worked. This data is presented in Tables 3.4.2, 3.4.3 and 3.4.4 for Time 1, Transition and Time 2 time-points.

Table: 3.4.1: Profile of respondents combined across all data collection time periods (all sites).

Characteristic	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1 (n = 24)	Ward 2 (n = 37)	Ward 3 (n = 37)	Total (n = 98)	Ward 22 (n = 26)	Ward 23 (n = 25)	Total (n = 51)	Ward 31 (n = 27)	(n = 176)
Job Title, n (%)									
CNM	1 (4.2)	0 (0.0)	1 (2.7)	2 (2.0)	3 (11.5)	2 (8.0)	5 (9.8)	2 (7.4)	9 (5.1)
RN	21 (87.5)	28 (75.7)	29 (22.3)	78 (79.6)	17 (65.4)	15 (60.0)	32 (62.7)	20 (74.1)	130 (73.9)
HCA	2 (5.4)	9 (24.3)	9 (18.9)	18 (18.4)	6 (23.1)	8 (32.0)	14 (27.5)	5 (18.5)	37 (21.0)
Nursing Qualifications, n (%)									
RN only									
Registered nurse – hospital cert.	2 (9.1)	2 (7.1)	1 (3.3)	5 (6.3)	0 (0.0)	1 (6.3)	1 (2.8)	1 (4.2)	7 (5.0)
Registered nurse – diploma	1 (4.5)	3 (10.0)	3 (10.0)	7 (8.8)	6 (30.0)	2 (12.5)	8 (22.2)	1 (4.2)	16 (11.4)
Registered nurse – degree	17 (77.3)	17 (60.0)	18 (60.0)	52 (65.0)	13 (65.0)	9 (58.3)	22 (61.1)	16 (66.7)	90 (64.3)
Post-graduate certificate	1 (4.5)	1 (3.6)	1 (3.3)	3 (3.8)	0 (0.0)	1 (6.3)	1 (2.8)	1 (4.2)	5 (3.6)
Post-graduate diploma	1 (4.5)	5 (17.9)	2 (6.7)	8 (10.0)	1 (5.0)	3 (18.8)	4 (11.1)	2 (8.3)	14 (10.0)
Masters in Nursing	0 (0.0)	0 (0.0)	5 (16.7)	5 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	3 (12.5)	8 (5.7)
Educational Qualification, n (%)									
No Formal Education	1 (4.3)	0 (0.0)	5 (14.7)	6 (6.5)	2 (8.3)	0 (0.0)	2 (4.3)	0 (0.0)	8 (4.9)
Junior Cert./Intermediate Cert.	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.5)	1 (2.2)	0 (0.0)	1 (0.6)
Leaving Certificate (or equivalent)	5 (21.7)	11 (31.4)	9 (26.5)	25 (27.2)	6 (25.0)	6 (27.3)	12 (26.1)	4 (16.0)	41 (25.2)
Vocational/Technical Qualification	2 (8.7)	5 (14.3)	1 (2.9)	8 (8.7)	2 (8.3)	6 (27.3)	8 (17.4)	2 (8.0)	18 (11.0)
Certificate (Third-level)	0 (0.0)	1 (2.9)	2 (5.9)	3 (3.3)	0 (0.0)	3 (13.6)	3 (6.5)	1 (4.0)	7 (4.3)
Diploma (Third-level)	1 (4.3)	4 (11.4)	2 (5.9)	7 (7.6)	6 (25.0)	1 (4.5)	7 (15.2)	1 (4.0)	15 (9.2)
Bachelor's Degree	14 (60.9)	14 (40.0)	12 (35.3)	40 (43.5)	8 (33.3)	2 (22.7)	13 (28.3)	16 (64.0)	69 (42.3)
Master's Degree	0 (0.0)	0 (0.0)	3 (8.8)	3 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.0)	4 (2.5)
Doctoral Degree (e.g. PhD)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Working Contract, n (%)									
Full-time	23 (95.8)	34 (94.4)	31 (83.8)	88 (90.7)	25 (96.2)	24 (100.0)	49 (98.0)	29 (100.0)	166 (94.3)
Part-time	0 (0.0)	2 (5.6)	5 (13.5)	7 (7.2)	1 (3.8)	0 (0.0)	1 (2.0)	0 (0.0)	8 (4.5)
Agency	0 (0.0)	0 (0.0)	1 (2.7)	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)
Other	1 (4.2)	0 (0.0)	0 (0.0)	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)

Gender, n (%)									
Female	22 (91.7)	30 (83.3)	33 (98.2)	85 (87.6)	25 (96.2)	22 (91.7)	47 (94.0)	24 (82.8)	156 (88.6)
Male	2 (8.3)	6 (16.7)	4 (10.8)	12 (12.4)	1 (3.8)	2 (8.3)	3 (6.0)	5 (17.5)	20 (11.4)
Years as a nurse/HCA mean (SD)									
As Nurse/HCA	9.34 (9.37)	9.64 (7.24)	9.48 (8.22)	9.51 (8.06)	12.84 (8.85)	13.38 (9.50)	13.08 (9.04)	18.77 (8.80)	12.00 (9.06)
Current Hospital	7.03 (6.27)	5.30 (6.01)	4.64 (6.61)	5.49 (6.28)	7.11 (6.20)	5.25 (3.33)	6.31 (5.20)	10.35 (6.70)	6.58 (6.31)
Current Ward	6.46 (6.21)	4.47 (5.19)	4.10 (6.35)	4.83 (5.89)	5.39 (5.12)	4.32 (2.50)	4.94 (4.20)	9.57 (6.70)	5.67 (5.89)
Agency	0.11 (0.40)	0.03 (0.08)	0.00 (0.00)	0.05 (0.26)	0.29 (0.79)	1.92 (3.65)	.99 (2.54)	1.54 (3.68)	0.65 (2.21)

Table: 3.4.2: Profile of respondents' shift type for Hospital 1

Shift type	**Time 1**				**Transition**				**Time 2**			
	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Day Shift (8 hours)	0 (0)	0 (0)	0 (0)	0 (0)	1 (10.0)	0 (0)	1 (6.3)	2 (5.9)	1 (12.5)	1 (3.3)	1 (3.8)	3 (4.7)
Day Shift (12 Hours)	15 (78.9)	10 (66.7)	10 (66.7)	35 (72.9)	9 (90.0)	7 (87.5)	14 (87.5)	30 (88.2)	6 (75.0)	24 (80.0)	16 (61.5)	46 (71.9)
Night shift (12 hours)	3 (15.8)	4 (26.7)	3 (20.0)	10 (20.8)	0 (0)	0 (0)	1 (6.3)	1 (2.9)	1 (12.5)	5 (16.7)	8 (30.8)	14 (21.9)
Other	1 (5.3)	1 (6.7)	1 (6.7)	3 (6.3)	0 (0)	1 (12.5)	0 (0)	1 (2.9)	0 (0.0)	0 (0.0)	1 (3.8)	1 (1.6)

Table: 3.4.3: Profile of respondents' last shift worked for Hospital 2

Last shift worked, n (%)	**Time 1**			**Transition**			**Time 2**		
	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total (n = 22)	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Day Shift (8 hours)	1 (6.3)	1 (7.1)	2 (6.7)	1 (9.1)	0 (0)	1 (4.5)	1 (6.3)	1 (7.1)	2 (6.7)
Day Shift (12 Hours)	12 (75.0)	9 (64.3)	21 (70.0)	8 (72.7)	9 (90.0)	17 (81.0)	11 (68.8)	8 (57.1)	19 (63.3)
Night shift (12 hours)	3 (18.8)	4 (28.6)	7 (23.3)	2 (18.2)	1 (10.0)	3 (14.3)	4 (25.0)	5 (37.5)	9 (30.0)
Other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0.0)	0 (0.0)	0 (0.0)

Table: 3.4.4: Profile of respondents' last shift worked for Hospital 3

Last shift worked, n (%)	**Time 1**	**Transition**	**Time 2**
	Ward 31 (n = 22)	Ward 31 (n = 23)	Ward 31 (n = 20)
Day Shift (8 hours)	1 (4.8)	2 (8.7)	1 (5.6)
Day Shift (12 Hours)	17 (81.0)	19 (82.6)	9 (50.0)
Night shift (12 hours)	3 (14.3)	2 (8.7)	8 (44.4)
Other	0 (0)	0 (0)	0 (0.0)

Table: 3.4.5: Profile of respondents' shift type overall

Overall

Last shift worked, n (%)	**Time 1** (n = 101)	**Transition** (n = 79)	**Time 2** (n = 116)
Day Shift (8 hours)	3 (3.0)	5 (6.4)	6 (5.4)
Day Shift (12 Hours)	73 (73.7)	66 (84.6)	74 (66.1)
Night shift (12 hours)	20 (20.2)	6 (7.7)	31 (27.7)
Other	3 (3.0)	1 (1.3)	1 (0.9)

3.4.1 Nursing Staff-to-Patient Ratios

The nursing staff-to-patient ratio was derived from a single item that asked respondents to report the numbers of staff giving direct patient care (specifically 'RNs' and 'other nursing care staff') and the numbers of patients on the ward on the last shift they worked. This measure has been widely used in previous cross-sectional studies of nurse staffing. Administrative data from *TrendCare* for the time period of the study was used to establish the validity of ratios reported in surveys for both day and night shifts.

The mean number of patients per nursing staff (including RNs and HCAs) is presented below in Tables 3.4.1.1 and 3.4.1.2 and 3.4.1.2 respectively. Given potential differences between day and night shift ratios, ratios for the day shift only are also reported in Table 3.4.1.1 and 3.4.1.2 and 3.4.1.2; it was not possible to examine the night shift alone due to the relatively small sample sizes. In Time 1, the greatest number of patients per staff was recorded in Ward 1 while the lowest staff-to-patient ratios were reported in Hospital 2. The figures suggest a lower number of patients per staff member in the transition period and Time 2 particularly in wards with the highest ratios in Time 1. Differences of at least one patient per staff on day shifts are reported on Wards 1, 2, and 3 between Time 1 and Time 2, and Ward 31 between Time 1 and Transition, although this difference was less pronounced at Time 2. In the Transition and Time 2, staff also provided data on the number of RNs and HCAs on their most recent shift, along with the patients they were individually responsible for. Therefore, it was possible to calculate the number of patients per registered RN. This data is presented for all shifts and as well as day shifts only in Table 3.4.1.4.

Table: 3.4.1.1: Nurse to patient ratios for Hospital 1

	Time 1				Transition				Time 2			
Ratios, mean (SD)	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Number of patients per total nursing staff (RN + HCA only)	7.32 (2.23)	5.51 (1.33)	5.47 (1.34)	6.18 (1.91)	4.53 (0.79)	3.93 (0.61)	3.49 (0.99)	3.89 (0.94)	6.35 (2.12)	4.47 (1.36)	4.00 (1.22)	4.54 (1.60)
Number of patients per total nursing staff (incl. student interns)	-	-	-	-	-	-	-	-	5.32 (1.38)	4.20 (1.57)	3.67 (1.36)	4.15 (1.54)
Number of patients per total nursing staff (RN + HCA) for day shift	6.80 (2.00)	5.19 (1.37)	4.97 (0.78)	5.76 (1.71)	4.53 (0.79)	3.93 (0.61)	3.31 (0.74)	3.82 (0.88)	5.64 (0.82)	3.94 (0.73)	3.47 (0.33)	4.54 (1.60)
Patients per RN on all shifts (RN responses only)	-	-	-	-	6.46 (1.38)	5.40 (1.07)	5.31 (1.62)	5.65 (1.46)	8.38 (1.63)	6.04 (1.80)	5.03 (1.29)	6.01 (1.93)
Patients per RN on day shift only	-	-	-	-	6.34 (1.21)	5.40 (1.07)	4.93 (1.43)	5.46 (1.38)	8.03 (1.06)	5.37 (1.25)	4.59 (0.44)	5.56 (1.55)

Table: 3.4.1.2: Nurse patient ratio for Hospital 2

Ratios, mean (SD)	Time 1			Transition			Time 2		
	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total n = 22	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Number of patients per total nursing staff (RN + HCA only)	4.62 (1.90)	3.84 (0.57)	4.28 (1.50)	4.48 (1.63)	3.53 (0.57)	4.01 (1.29)	4.09 (1.20)	4.10 (0.76)	4.10 (1.00)
Number of patients per total nursing staff (incl. student interns)	-	-	-	-	-	-	4.33 (1.11)	3.65 (1.00)	3.98 (1.09)
Number of patients per total nursing staff for day shift (RN+HCA only)	4.00 (1.08)	3.69 (0.38)	3.86 (0.84)	3.87 (0.65)	3.38 (0.28)	3.62 (0.55)	3.75 (1.10)	3.60 (0.40)	3.68 (0.85)
Patients per RN on all shifts	-	-	-	6.15 (1.52)	4.69 (2.15)	5.12 (1.95)	5.91 (0.97)	5.41 (2.33)	5.65 (1.79)
Patients per RN on day shift only	-	-	-	5.62 (1.23)	4.06 (0.42)	4.84 (1.20)	5.69 (1.11)	4.31 (0.58)	4.96 (1.10)

Table: 3.4.1.3: Nurse patient ratio for Hospital 3

Ratios, mean (SD)	Time 1 Ward 31 (n = 22)	Transition Ward 31 (n = 23)	Time 2 Ward 31 (n = 20)
Number of patients per total nursing staff (RN + HCA only)	5.07 (1.34)	4.23 (1.63)	4.84 (2.87)
Number of patients per total nursing staff (incl. student interns)	-	-	4.87 (2.96)
Number of patients per total nursing staff for day shift	4.78 (4.83)	3.75 (0.53)	3.37 (0.94)
Patients per RN on all shifts (RN responses only)	-	5.39 (1.44)	6.47 (2.95)
Patients per RN on day shift only	-	5.02 (0.60)	4.67 (1.59)

Table: 3.4.1.4: Nurse patient ratio overall

Ratios, mean (SD)	Time 1 (n = 101)	Transition (n = 79)	Time 2 (n = 116)
Number of patients per total nursing staff (RN + HCA only)	5.32 (1.86)	4.02 (1.26)	4.47 (1.75)
Number of patients per total nursing staff (incl. student interns)	-	-	4.22 (1.76)
Number of patients per total nursing staff for day shift	4.89 (1.51)	3.75 (0.71)	3.85 (0.94)
Patients per RN on all shifts	-	5.52 (1.57)	5.99 (2.07)
Patients per RN on day shift only	-	5.19 (1.18)	5.31 (1.46)
Patients individual responsible for	-	-	10.57 (7.89)

3.4.2. Nursing Work Index

The Practice Environment Scale of the Nursing Work Index was used to evaluate qualities of the work environment. It includes five subscales: Staffing and Resource Adequacy; Collegial Nurse–Doctor Relations; Nurse Manager Ability, Leadership, and Support of Nurses; Nurse Participation in Hospital Affairs; and Nursing Foundations for Quality of Care. The items were scored on a scale of 1 to 4 where 1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree. Higher scores are indicative of positive ratings of the environment. This section of the surveys are only completed by registered nurses and thus the responses below only included those from this cohort. The mean of each subscale is reported below at hospital and ward level for each time-point in Tables 3.4.2.1, 3.4.2.2, 3.4.2.3, 3.4.2.4.

Overall, the highest ratings were given for Nursing Foundations for Quality Care and Collegial Nurse-Doctor Relations in all phases of research. The lowest ratings were reported for the Staffing and Resource Adequacy subscale in Time 1. This was particularly the case for Wards 1, 2, 3 and 22. Ratings of Staffing and Resource Adequacy increased from Time 1 to Transition and Time 1 to Time 2, especially on wards 1, 2 and 3 in Hospital 1; these received uplifts in staff over the course of the study.

Table: 3.4.2.1: Nursing Work Index for Hospital 1

	Time 1				Transition				Time 2			
RNs Only	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Staffing and Resource Adequacy	1.57 (0.58)	1.70 (0.43)	1.88 (0.38)	1.70 (0.50)	2.39 (0.52)	2.66 (0.46)	2.90 (0.41)	2.71 (0.52)	2.31 (0.76)	2.78 (0.59)	2.86 (0.51)	2.72 (0.62)
Collegial Nurse-Doctor Relations	2.85 (0.23)	2.64 (0.43)	2.75 (0.49)	2.76 (0.35)	2.83 (0.47)	2.83 (0.25)	3.08 (0.57)	2.94 (0.47)	3.15 (0.34)	2.97 (0.39)	2.98 (0.51)	3.01 (0.43)
Nurse Manager Ability, Leadership and Support	2.73 (0.44)	2.73 (0.41)	2.52 (0.56)	2.67 (0.47)	2.78 (0.29)	2.73 (0.30)	3.07 (0.57)	2.88 (0.45)	2.76 (0.30)	2.86 (0.53)	2.77 (0.62)	2.80 (0.53)
Nurse Participation in Hospital Affairs	2.28 (0.44)	2.43 (0.52)	2.56 (0.51)	2.40 (0.48)	2.43 (0.51)	2.50 (0.38)	3.03 (0.54)	2.71 (0.56)	2.48 (0.50)	2.71 (0.38)	2.91 (0.43)	2.75 (0.44)
Nursing Foundations for Quality of Care	2.72 (0.45)	2.81 (0.14)	2.83 (0.25)	2.77 (0.33)	2.76 (0.32)	2.94 (0.13)	3.08 (0.36)	2.95 (0.32)	2.77 (0.38)	3.00 (0.42)	3.02 (0.50)	2.97 (0.45)

Table: 3.4.2.2: Nursing Work Index for Hospital 2

	Time 1			Transition			Time 2		
NWI, mean (sd)	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total (n = 22)	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Staffing and Resource Adequacy	1.38 (0.34)	1.98 (0.63)	1.68 (0.58)	1.44 (0.32)	1.69 (0.46)	1.56 (0.40)	1.89 (0.67)	2.11 (0.70)	2.00 (0.68)
Collegial Nurse-Doctor Relations	2.10 (0.50)	2.87 (0.48)	2.48 (0.62)	2.34 (0.63)	3.00 (0.40)	2.64 (0.64)	2.70 (0.46)	2.76 (0.45)	2.73 (0.44)
Nurse Manager Ability, Leadership and Support	2.52 (0.38)	2.50 (0.29)	2.51 (0.33)	2.37 (0.27)	2.38 (0.60)	2.37 (0.46)	2.31 (0.59)	2.65 (0.41)	2.48 (0.53)
Nurse Participation in Hospital Affairs	1.94 (0.40)	2.22 (0.51)	2.08 (0.47)	1.98 (0.51)	2.42 (0.71)	2.21 (0.65)	2.30 (0.54)	2.57 (0.46)	2.44 (0.51)
Nursing Foundations for Quality of Care	2.50 (0.36)	2.75 (0.40)	2.63 (0.39)	2.41 (0.62)	2.81 (0.53)	2.61 (0.59)	2.55 (0.59)	2.97 (0.27)	2.76 (0.50)

Table: 3.4.2.3: Nursing Work Index, for Hospital 3

	Time 1 Ward 31 (n = 22)	**Transition** Ward 31 (n = 23)	**Time 2** Ward 31 (n = 20)
Staffing and Resource Adequacy	2.25 (0.49)	2.26 (0.50)	1.95 (0.77)
Collegial Nurse-Doctor Relations	3.08 (0.25)	2.98 (0.38)	2.94 (0.33)
Nurse Manager Ability, Leadership and Support	2.40 (0.42)	2.08 (0.74)	2.30 (0.68)
Nurse Participation in Hospital Affairs	2.69 (0.23)	2.25 (0.62)	2.39 (0.61)
Nursing Foundations for Quality of Care	2.96 (0.10)	2.73 (0.43)	2.77 (0.31)

Table: 3.4.2.4: Nursing Work Index Overall

	Time 1 (n = 101)	**Transition** (n = 79)	**Time 2** (n = 116)
Staffing and Resource Adequacy	1.78 (0.55)	2.28 (0.67)	2.40 (0.75)
Collegial Nurse-Doctor Relations	2.74 (0.47)	2.88 (0.50)	2.93 (0.43)
Nurse Manager Ability, Leadership and Support	2.58 (0.43)	2.51 (0.65)	2.63 (0.59)
Nurse Participation in Hospital Affairs	2.36 (0.49)	2.44 (0.64)	2.61 (0.51)
Nursing Foundations for Quality of Care	2.76 (0.34)	2.80 (0.45)	2.88 (0.45)

3.4.3 Time Availability and Quality of Care

Single item measures were used to assess staff perceptions (RNs and HCAs) of time available to deliver care, additional time required to deliver care and the quality of care delivered on the last shift worked. Responses to these items at the three time-points are detailed in Tables 3.4.3.1, 3.4.3.2, 3.4.3.3, 3.4.3.4. In Time 1, 34.7% of staff felt they had less time than usual to deliver care on the last shift while in Time 2, this reduced to 25.4%.

The majority of staff reported that they required additional time to provide patient care in all phases, with the majority of staff reporting that they required an additional 15 to 30 minutes. However, there was an increase of 11.2% of staff reporting they did not require any additional time to provide patient care in Time 2.

A single item measured staffs' perception of the quality of care delivered on their most recent shift. Responses to this item are detailed in Tables 3.4.3.1, 3.4.3.2, 3.4.3.3, 3.4.3.4. In Time 1, 62.9% reported that the care delivered on their ward was 'good' or 'excellent' with a similar 66.1% reporting the same in Time 2. While quality of care ratings were similar in Time 2 at the overall sample level, differences can be observed at ward level. There was a particular increase in respondents stating the quality of care was good or excellent in Wards 1, 2 and 22; however, Ward 31 had a large decrease in those perceiving quality of care as good or excellent on their last shift.

Additional items on the quality of care were measured in Time 2; these are new items included in this phase of the research, therefore, at this stage, no data is available to compare with Time 1 and Transition phases of research.

Table: 3.4.3.1: Quality of care for Hospital 1

Quality of care, n (%)	Time 1				Transition				Time 2			
	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Time to deliver care												
Less time than usual	8 (42.1)	3 (20.0)	7 (50.0)	18 (37.5)	3 (30.0)	1 (12.5)	2 (14.3)	6 (18.8)	4 (44.4)	2 (7.1)	7 (26.9)	13 (20.6)
About the same amount of time	9 (47.4)	10 (66.7)	6 (42.9)	25 (52.1)	6 (60.0)	4 (50.0)	9 (64.3)	19 (59.4)	5 (55.6)	20 (71.4)	14 (53.8)	39 (61.9)
More time than usual	2 (10.5)	2 (13.3)	1 (7.1)	5 (10.4)	1 (10.0)	3 (37.5)	3 (21.4)	7 (21.9)	0 (0.0)	6 (21.4)	5 (19.2)	11 (17.5)
Additional time needed												
No more time needed	1 (5.3)	1 (6.7)	0 (0)	2 (4.3)	0 (0)	1 (12.5)	3 (21.4)	4 (12.5)	0 (0.0)	5 (17.9)	7 (28.0)	12 (19.4)
Less than 15 minutes	0 (0)	1 (6.7)	1 (8.3)	2 (4.3)	1 (10.0)	2 (25.0)	3 (21.4)	6 (18.8)	1 (11.1)	3 (10.7)	2 (8.0)	6 (9.7)
15 to 30 minutes	4 (21.1)	1 (6.7)	5 (41.7)	10 (21.7)	3 (30.0)	1 (12.5)	3 (21.4)	7 (21.9)	2 (22.2)	10 (35.7)	9 (35.0)	21 (33.9)
31 to 45 minutes	2 (10.5)	3 (20.0)	0 (0)	5 (10.9)	2 (20.0)	1 (12.5)	1 (7.1)	4 (12.5)	1 (11.1)	2 (7.1)	1 (4.0)	4 (6.5)
46 to 60 minutes	3 (15.8)	2 (13.3)	3 (25.0)	8 (17.4)	2 (20.0)	1 (12.5)	4 (28.6)	7 (21.9)	1 (11.1)	6 (21.4)	4 (16.0)	11 (17.7)
Greater than 60 minutes	9 (47.4)	7 (46.7)	3 (25.0)	19 (41.3)	2 (20.0)	2 (25.0)	0 (0)	4 (12.5)	4 (44.4)	2 (7.1)	2 (8.0)	8 (12.9)
Quality of care												
Poor	2 (11.1)	0 (0)	1 (6.7)	3 (6.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0.0)	1 (3.3)	0 (0.0)	1 (1.6)
Fair	7 (38.9)	6 (40.0)	3 (20.0)	16 (33.3)	1 (11.1)	1 (12.5)	2 (14.3)	4 (12.9)	2 (25.0)	8 (26.7)	7 (26.9)	17 (26.6)
Good	9 (50.0)	8 (53.3)	9 (60.0)	26 (54.2)	6 (66.7)	7 (87.5)	10 (71.4)	23 (74.2)	5 (62.5)	14 (46.7)	11 (42.3)	30 (46.9)
Excellent	0 (0)	1 (6.7)	2 (13.3)	3 (6.3)	2 (22.2)	0 (0)	2 (14.3)	4 (12.9)	1 (12.5)	7 (23.3)	8 (30.8)	16 (25.0)
Grade of patient safety												
Failing	-	-	-	-	-	-	-	-	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Poor	-	-	-	-	-	-	-	-	1 (11.1)	1 (3.3)	1 (3.8)	3 (4.6)

Acceptable	-	-	-	-	-	-	-	-	3 (33.3)	15 (50.0)	6 (23.1)	24 (36.9)
Very good	-	-	-	-	-	-	-	-	4 (44.4)	10 (33.3)	14 (53.8)	28 (43.1)
Excellent	-	-	-	-	-	-	-	-	1 (11.1)	4 (13.3)	5 (19.2)	10 (15.4)
Quality of care, last 6 months												
Deteriorated	-	-	-	-	-	-	-	-	1 (12.5)	2 (6.9)	4 (15.4)	7 (11.1)
Remained the same	-	-	-	-	-	-	-	-	3 (37.5)	10 (34.5)	15 (57.7)	28 (44.4)
Improved	-	-	-	-	-	-	-	-	4 (50.0)	17 (58.6)	7 (26.9)	28 (44.4)

Table: 3.4.3.2: Quality of care for Hospital 2

Quality of care, n (%)	**Time 1**			**Transition**			**Time 2**		
	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total (n = 22)	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Time to deliver care									
Less time than usual	10 (62.5)	4 (30.8)	14 (48.3)	3 (27.3)	2 (20.0)	5 (23.8)	3 (18.8)	2 (13.3)	5 (16.1)
About the same amount of time	5 (31.3)	8 (61.5)	13 (44.8)	4 (36.4)	7 (70.0)	11 (52.4)	8 (50.0)	11 (73.3)	19 (61.3)
More time than usual	1 (6.3)	1 (7.7)	2 (6.9)	4 (36.4)	1 (10.0)	5 (23.8)	5 (31.3)	2 (13.3)	7 (22.6)
Additional time needed									
No more time needed	0 (0)	0 (0)	0 (0)	0 (0)	1 (11.1)	1 (5.0)	0 (0.0)	1 (7.1)	4 (13.3)
Less than 15 minutes	0 (0)	0 (0)	0 (0)	1 (9.1)	0 (0)	1 (5.0)	1 (11.1)	2 (14.3)	3 (10.0)
15 to 30 minutes	5 (31.3)	3 (23.1)	8 (27.6)	2 (18.2)	2 (22.2)	4 (20.0)	2 (22.2)	7 (50.0)	11 (36.7)
31 to 45 minutes	2 (12.5)	4 (30.8)	6 (20.7)	3 (27.3)	3 (33.3)	6 (30.0)	1 (11.1)	0 (0.0)	3 (10.0)
46 to 60 minutes	2 (12.5)	2 (15.4)	4 (13.8)	1 (9.1)	1 (11.1)	2 (10.0)	1 (11.1)	1 (7.1)	2 (6.7)
Greater than 60 minutes	7 (43.8)	4 (30.8)	11 (37.9)	4 (36.4)	2 (22.2)	6 (30.0)	4 (44.4)	5 (26.3)	7 (23.3)
Quality of care									
Poor	3 (18.8)	0 (0)	3 (10.3)	2 (18.2)	0 (0)	2 (9.5)	0 (0.0)	1 (6.7)	1 (3.2)
Fair	5 (31.3)	2 (15.4)	7 (24.1)	4 (36.4)	4 (40.0)	8 (38.1)	5 (31.3)	1 (6.7)	6 (19.4)
Good	7 (43.8)	10 (76.9)	17 (58.6)	4 (36.4)	4 (40.0)	8 (38.1)	6 (37.5)	11 (73.3)	17 (54.8)

Excellent	1 (6.3)	1 (7.7)	2 (6.9)	1 (9.1)	2 (20.0)	3 (14.3)	5 (31.3)	2 (13.3)	7 (22.6)
Grade of patient safety									
Failing	-	-	-	-	-	-	2 (12.5)	0 (0.0)	2 (6.5)
Poor	-	-	-	-	-	-	3 (18.8)	2 (13.3)	5 (16.1)
Acceptable	-	-	-	-	-	-	8 (50.0)	2 (13.3)	10 (32.3)
Very good	-	-	-	-	-	-	3 (18.8)	7 (46.7)	10 (32.3)
Excellent	-	-	-	-	-	-	0 (0.0)	4 (26.7)	4 (12.9)
Quality of care, last 6 months									
Deteriorated	-	-	-	-	-	-	7 (43.8)	2 (13.3)	9 (29.0)
Remained the same	-	-	-	-	-	-	9 (56.3)	11 (73.3)	20 (64.5)
Improved	-	-	-	-	-	-	0 (0.0)	2 (13.3)	2 (6.5)

Table: 3.4.3.3: Quality of care for Hospital 3

Quality of care, n (%)	**Time 1** Ward 31 (n = 22)	**Transition** Ward 31 (n = 23)	**Time 2** Ward 31 (n = 20)
Time to deliver care			
Less time than usual	2 (9.5)	6 (26.1)	11 (55.0)
About the same amount of time	9 (42.9)	9 (39.1)	4 (20.0)
More time than usual	10 (47.6)	8 (34.8)	5 (25.0)
Additional time needed			
No more time needed	1 (5.0)	0 (0)	0 (0.0)
Less than 15 minutes	0 (0)	0 (0)	1 (5.3)
15 to 30 minutes	11 (55.0)	13 (59.1)	8 (42.1)
31 to 45 minutes	4 (20.0)	4 (18.2)	4 (21.1)
46 to 60 minutes	2 (10.0)	3 (13.6)	1 (5.3)
Greater than 60 minutes	2 (10.0)	2 (9.1)	5 (26.3)
Quality of care			

Poor	0 (0)	2 (8.7)	1 (5.0)
Fair	7 (31.8)	10 (43.5)	13 (65.0)
Good	14 (63.6)	11 (47.8)	5 (25.0)
Excellent	1 (4.5)	0 (0)	1 (5.0)
Grade of patient safety			
Failing	-	-	2 (10.0)
Poor	-	-	4 (20.0)
Acceptable	-	-	12 (60.0)
Very good	-	-	2 (10.0)
Excellent	-	-	0 (0.0)
Quality of care, last 6 months			
Deteriorated	-	-	7 (36.8)
Remained the same	-	-	12 (63.2)
Improved	-	-	0 (0.0)

Table: 3.4.3.4: Quality of care overall total for Hospitals 1, 2 and 3

Quality of care, n (%)	**Time 1** (n = 101)	**Transition** (n = 79)	**Time 2** (n = 116)
Time to deliver care			
Less time than usual	34 (34.7)	17 (22.4)	29 (25.4)
About the same amount of time	47 (48.0)	39 (51.3)	62 (54.4)
More time than usual	17 (17.3)	20 (26.3)	23 (20.2)
Additional time needed			
No more time needed	3 (3.2)	5 (6.8)	16 (14.4)
Less than 15 minutes	2 (2.1)	7 (9.5)	10 (9.0)
15 to 30 minutes	29 (30.5)	24 (32.4)	40 (36.0)
31 to 45 minutes	15 (15.8)	14 (18.9)	11 (9.9)
46 to 60 minutes	14 (14.7)	12 (16.2)	14 (12.6)
Greater than 60 minutes	32 (33.7)	12 (16.2)	20 (18.0)

Quality of care			
Poor	6 (6.1)	4 (5.3)	3 (2.6)
Fair	30 (30.3)	22 (29.3)	36 (31.3)
Good	57 (57.6)	42 (56.0)	52 (45.2)
Excellent	6 (6.1)	7 (9.3)	24 (20.9)
Grade of patient safety			
Failing	-	-	4 (3.4)
Poor	-	-	12 (10.3)
Acceptable	-	-	46 (39.7)
Very good	-	-	40 (34.5)
Excellent	-	-	14 (12.1)
Quality of care, last 6 months			
Deteriorated	-	-	23 (20.4)
Remained the same	-	-	60 (53.1)
Improved	-	-	30 (26.5)

3.4.4 Care Left Undone and Delayed

The descriptive statistics of care left undone (CLU) and care delayed (CD) are derived from respondents with registered nurse qualification only (including CNMs) as many of these tasks are specific to the RN role. Nurses were asked to identify care activities which had been necessary but left undone and/or delayed on their most recent shift due to lack of time.

Across all phases of the research, the items of care most frequently reported as undone were comfort/talk with patients and educating patients and/or family. The items least frequently left undone were pain management and undertaking treatments/procedures. The mean number of items of care undone and the number of shifts where at least one item of care was left undone is reported in Table 3.4.4.1, 3.4.4.2, 3.4.4.3 and 3.4.4.4, at both hospital and ward level. In Time 1, 75.6% of nurses reported that at least one necessary item of care was left undone due to lack of time on their last shift while 61.9% reported the same in the Transition phase, which further dropped to 31.8% in Time 2. Overall, an average of 2.51 care activities were left undone per shift in Time 1 while 1.94 activities, on average, were left undone at Transition and 0.75 undone at Time 2. Figures indicate a downward trend in the mean number of care activities being left undone across Wards 1, 2, 3, 22 and 23, while Ward 31 saw a slight increase at Time 2 compared to Time 1.

Across all phases, the most common items of care delayed were recording/updating documentation, comfort/talk with patients, physical support, vital signs observation, adequate patient surveillance and administering medications. Pain management was the least frequently delayed task. The mean number of items of care delayed and the number of shifts where at least one item of care was delayed is reported in Table 3.4.4.1, 3.4.4.2, 3.4.4.3 and 3.4.4.4, at hospital and ward level. In Time 1, 93.3% of staff reported at least one care task was delayed on their last shift while, 88.9% and 84.1% reported the same at Transition and Time 2 respectively. Overall, an average of 5.43 activities per shift were reported as delayed in Time 1 while 4.17 were reported as delayed in at Transition which had a slight increase to 4.92 at Time 2.

A single item also assessed if staff meal breaks had been missed or delayed due to lack of time. In Time 1, 50.0% of RNs reported missed meal breaks, while 48.9% reported delayed meal breaks. There was a substantial decrease in the proportion of staff reporting missed meal breaks at Time 2 (22.7%) while delayed meal breaks remained similar (47.7%) at Time 2.

Table: 3.4.4.1: Care left undone and care delayed for Hospital 1

Only for RNs CLUEs	Time 1				Transition				Time 2			
	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Number of activities undone, mean (SD)	2.94 (2.39)	2.80 (1.74)	1.92 (2.39)	2.61 (2.17)	4.75 (3.15)	2.00 (2.56)	1.00 (1.35)	2.36 (2.75)	0.89 (1.54)	0.24 (0.62)	0.35 (0.75)	0.40 (0.90)
Shifts with at least one item undone, n (%)	15 (83.3)	13 (86.7)	9 (69.2)	37 (80.4)	7 (87.5)	6 (75.0)	6 (50.0)	19 (67.9)	3 (33.3)	3 (14.3)	4 (20.0)	10 (20.0)
Number of activities delayed, mean (SD)	6.06 (4.09)	3.67 (2.58)	4.76 (3.06)	4.98 (3.47)	5.00 (4.11)	3.63 (3.46)	1.50 (1.78)	3.11 (3.33)	4.78 (2.05)	3.29 (3.30)	3.20 (4.01)	3.52 (3.42)
Shifts with at least one item delayed, n (%)	1 (100.0)	12 (80.0)	12 (92.3)	42 (91.3)	7 (87.5)	7 (87.5)	8 (66.7)	22 (78.6)	9 (100.0)	16 (76.2)	12 (60.0)	37 (74.0)
Meal break missed, n (%)	14 (77.8)	9 (60.0)	3 (23.1)	26 (56.5)	7 (87.5)	2 (25.0)	4 (33.3)	13 (46.4)	2 (22.2)	2 (9.5)	4 (20.0)	8 (16.0)
Meal break delayed, n (%)	11 (61.1)	5 (33.3)	8 (8.9)	24 (52.2)	3 (37.5)	2 (25.0)	3 (25.0)	8 (28.6)	4 (44.4)	4 (20.0)	10 (50.0)	22 (44.0)

Table: 3.4.4.2: Care left undone and care delayed for Hospital 2

Only for RNs CLUEs	Time 1			Transition			Time 2		
	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total (n = 22)	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Number of activities undone, mean (SD)	3.50 (2.50)	2.00 (2.22)	2.75 (2.44)	1.88 (2.30)	2.38 (1.92)	2.13 (2.06)	0.36 (0.50)	0.91 (1.38)	0.64 (0.90)
Shifts with at least one item undone, n (%)	11 (91.7)	6 (50.0)	17 (70.8)	4 (50.0)	6 (75.0)	10 (62.5)	4 (36.4)	4 (36.4)	8 (28.6)
Number of activities delayed, mean (SD)	6.92 (3.70)	4.91 (3.45)	5.83 (3.19)	5.63 (2.92)	3.75 (2.87)	4.69 (2.96)	7.27 (4.84)	4.27 (3.20)	5.77 (4.29)
Shifts with at least one item delayed, n (%)	11 (91.7)	12 (100.0)	23 (95.8)	8 (100.0)	7 (87.5)	15 (93.8)	11 (100.0)	10 (90.9)	21 (95.5)

Meal break missed, n (%)	9 (75.0)	7 (58.3)	16 (66.7)	7 (87.5)	7 (87.5)	14 (87.5)	6 (54.5)	5 (45.5)	11 (50.0)
Meal break delayed, n (%)	5 (41.7)	9 (75.0)	14 (58.3)	3 (37.5)	6 (75.0)	9 (56.3)	4 (36.4)	2 (18.2)	6 (27.3)

Table: 3.4.4.3: Care left undone and care delayed for Hospital 3

CLUEs	**Time 1** Ward 31 (n = 22)	**Transition** Ward 31 (n = 23)	**Time 2** Ward 31 (n = 20)
Number of activities undone, mean (SD)	2.00 (1.92)	1.16 (1.71)	2.19 (2.64)
Shifts with at least one item undone, n (%)	14 (70.0)	10 (52.6)	10 (35.7)
Number of activities delayed, mean (SD)	6.15 (3.98)	5.32 (3.00)	8.13 (3.16)
Shifts with at least one item delayed, n (%)	19 (95.0)	19 (100.0)	16 (100.0)
Meal break missed, n (%)	3 (15.0)	1 (5.3)	1 (6.3)
Meal break delayed, n (%)	6 (30.0)	6 (31.6)	14 (87.5)

Table: 3.4.4.4: Care left undone and care delayed overall total

CLUEs	**Time 1** (n = 101)	**Transition** (n = 79)	**Time 2** (n = 116)
Number of activities undone, mean (SD)	2.51 (2.18)	1.94 (2.33)	0.75 (1.54)
Shifts with at least one item undone, n (%)	68 (75.6)	39 (61.9)	28 (31.8)
Number of activities delayed, mean (SD)	5.43 (3.51)	4.17 (3.25)	4.92 (3.99)
Shifts with at least one item delayed, n (%)	84 (93.3)	56 (88.9)	74 (84.1)
Meal break missed, n (%)	45 (50.0)	28 (44.4)	20 (22.7)
Meal break delayed, n (%)	44 (48.9)	23 (36.5)	42 (47.7)

3.4.5 Job Satisfaction and Intention to Leave

The respondents' level of job satisfaction by ward, ranging from very dissatisfied to very satisfied, in all time-points of the research is outlined in Tables 3.4.5.1, 3.4.5.2, 3.4.5.3, 3.4.5.4. In Time 1, the highest levels of job dissatisfaction were reported in Wards 1, 22 and 23. Approximately one quarter of respondents in the remaining wards reported some level of job dissatisfaction while staff in Hospital 3 reported the highest levels of job satisfaction. In Time 2, there was an increase in the number of staff expressing levels of job satisfaction in Wards 1, 2, 3, and 23. In Ward 31 there are more instances of job dissatisfaction in Time 2. Overall, the level of job satisfaction was higher at Transition and Time 2 time-points (i.e. following the introduction of the recommendations in the *Framework*) when compared to Time 1. For example, in Hospital 1, which received the majority of the staffing uplifts, overall levels of job satisfaction increased from 56.3% in Time 1 to 86.1% in Time 2; Hospital 2 increased from 23.3% of staff satisfied in their current job in Time 1 to 46.7% in Time 2; however, Hospital 3 recorded a drop in levels of job satisfaction from 90.0% in Time 1 to 50.0% in Time 2. This ward underwent a number of changes during the timeframe of the research, including a change in ward leadership and a change in patient profile; in particular a change in patient profile which required an increase in one-to-one specialling.

The respondents' intention to leave is reported for all Phases in Tables 3.4.5.1, 3.4.5.2, 3.4.5.3, 3.4.5.4. In Time 1, a large proportion of staff in Ward 1 (Hospital 1) and Ward 22 and 23 (Hospital 2) reported that they would probably or definitely leave their current employment. However, overall, the prevalence of intention to leave was lower at Transition and Time 2 when compared to Time 1. An additional question asked respondents to state their reason for selecting probably/definitely will leave. Of those, that made this selection and gave a reason for leaving, 52.8% stated that this was due to current levels of job dissatisfaction.

Table: 3.4.5.1: Job satisfaction and intention to leave for Hospital 1

Job Satisfaction and Intention to leave, n (%)	Time 1				Transition				Time 2			
	Ward 1 (n = 19)	Ward 2 (n = 15)	Ward 3 (n = 15)	Total (n = 49)	Ward 1 (n = 10)	Ward 2 (n = 8)	Ward 3 (n = 16)	Total (n = 34)	Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Satisfaction with current job												
Very dissatisfied	2 (10.5)	0 (0)	0 (0)	2 (4.2)	1 (10.0)	0 (0)	1 (6.7)	2 (6.1)	1 (11.1)	0 (0.0)	0 (0.0)	1 (1.5)
Dissatisfied	11 (57.9)	4 (26.7)	4 (26.7)	19 (39.6)	1 (10.0)	1 (12.5)	1 (6.7)	3 (9.1)	0 (0.0)	4 (13.3)	4 (15.4)	8 (12.3)
Satisfied	6 (31.6)	10 (66.7)	10 (71.4)	26 (54.2)	6 (60.0)	7 (87.5)	10 (66.7)	23 (69.7)	7 (77.8)	22 (73.3)	18 (69.2)	47 (72.3)
Very satisfied	0 (0)	1 (6.7)	0 (0)	1 (2.1)	2 (20.0)	0 (0)	3 (20.0)	5 (15.2)	1 (11.1)	4 (13.3)	4 (15.4)	9 (13.8)
Satisfaction with being a nurse/HCA												
Very dissatisfied	-	-	-	-	-	-	-	-	1 (11.1)	0 (0.0)	0 (0.0)	1 (1.5)
Dissatisfied	-	-	-	-	-	-	-	-	2 (22.2)	4 (13.3)	3 (11.5)	9 (13.8)
Satisfied	-	-	-	-	-	-	-	-	4 (44.4)	19 (63.3)	10 (38.5)	33 (50.8)
Very satisfied	-	-	-	-	-	-	-	-	2 (22.2)	7 (23.3)	13 (50.0)	22 (33.8)
Recommend ward to colleague												
Definitely no	-	-	-	-	-	-	-	-	0 (0.0)	1 (3.3)	3 (11.5)	4 (6.2)
Probably no	-	-	-	-	-	-	-	-	1 (11.1)	6 (20.0)	5 (19.2)	12 (18.5)
Probably yes	-	-	-	-	-	-	-	-	7 (77.8)	16 (53.3)	11 (42.3)	34 (52.3)
Definitely yes	-	-	-	-	-	-	-	-	1 (11.1)	7 (23.3)	7 (26.9)	15 (23.1)
Recommend ward to family/friends												
Definitely no	-	-	-	-	-	-	-	-	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Probably no	-	-	-	-	-	-	-	-	1 (11.1)	4 (13.3)	3 (12.0)	8 (12.5)
Probably yes	-	-	-	-	-	-	-	-	6 (66.7)	13 (43.3)	10 (40.0)	29 (45.3)
Definitely yes	-	-	-	-	-	-	-	-	2 (22.2)	13 (43.3)	12 (48.0)	27 (42.2)
Feelings about future in hospital												

Definitely will leave	3 (15.8)	1 (6.7)	4 (26.7)	8 (16.7)	1 (10.0)	1 (14.3)	3 (21.4)	5 (16.1)	4 (44.4)	4 (13.8)	1 (3.8)	9 (14.1)
Probably will leave	10 (52.6)	5 (33.3)	2 (13.3)	17 (35.4)	3 (30.0)	3 (42.9)	5 (35.7)	11 (35.5)	1 (11.1)	10 (34.5)	9 (34.6)	20 (31.3)
Probably will not leave	5 (26.3)	8 (53.3)	6 (40.0)	19 (39.6)	3 (30.0)	3 (42.9)	3 (21.4)	9 (29.0)	4 (44.4)	10 (34.5)	13 (50.0)	27 (42.2)
Definitely will not leave	1 (5.3)	1 (6.7)	2 (13.3)	4 (8.3)	3 (30.0)	0 (0)	3 (21.4)	6 (19.4)	0 (0.0)	5 (17.24)	3 (11.5)	8 (12.5)
Reason is job dissatisfaction	-	-	-	-	-	-	-	-	3 (60.0)	6 (42.9)	6 (60.0)	15 (51.7)

Table: 3.4.5.2: Job satisfaction and intention to leave for Hospital 2

Job Satisfaction and Intention to leave	**Time 1**			**Transition**			**Time 2**		
	Ward 22 (n = 16)	Ward 23 (n = 14)	Total (n = 30)	Ward 22 (n = 11)	Ward 23 (n = 11)	Total (n = 22)	Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Satisfaction with current job									
Very dissatisfied	7 (43.8)	4 (28.6)	11 (36.7)	1 (9.1)	1 (10.0)	2 (9.5)	4 (26.7)	0 (0.0)	4 (13.3)
Dissatisfied	7 (43.8)	5 (35.7)	12 (40.0)	8 (72.7)	5 (50.0)	13 (61.9)	6 (40.0)	6 (40.0)	12 (40.0)
Satisfied	2 (12.5)	5 (35.7)	7 (23.3)	2 (18.2)	4 (40.0)	6 (28.6)	5 (33.3)	7 (46.7)	12 (40.0)
Very satisfied	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0.0)	2 (13.3)	2 (6.7)
Satisfaction with being a nurse									
Very dissatisfied	-	-	-	-	-	-	1 (6.3)	1 (6.7)	2 (6.5)
Dissatisfied	-	-	-	-	-	-	3 (18.8)	3 (20.0)	6 (19.4)
Satisfied	-	-	-	-	-	-	4 (25.0)	8 (53.3)	12 (38.7)
Very satisfied	-	-	-	-	-	-	8 (50.0)	3 (20.0)	11 (35.5)
Recommend ward to colleague									
Definitely no	-	-	-	-	-	-	5 (31.3)	1 (6.7)	6 (19.4)
Probably no	-	-	-	-	-	-	6 (37.5)	4 (26.7)	10 (32.3)
Probably yes	-	-	-	-	-	-	5 (31.3)	4 (40.0)	11 (35.5)
Definitely yes	-	-	-	-	-	-	0 (0.0)	4 (26.7)	4 (12.9)
Recommend ward to family/friends									

Definitely no	-	-	-	-	-	-	3 (18.8)	0 (0.0)	3 (9.7)
Probably no	-	-	-	-	-	-	4 (25.0)	0 (0.0)	4 (12.9)
Probably yes	-	-	-	-	-	-	8 (50.0)	7 (46.7)	15 (48.4)
Definitely yes	-	-	-	-	-	-	1 (6.3)	8 (53.3)	9 (29.0)
Feelings about future in hospital									
Definitely will leave	4 (25.0)	1 (7.1)	5 (16.7)	3 (27.3)	1 (11.1)	4 (20.0)	3 (18.3)	1 (6.7)	4 (12.9)
Probably will leave	9 (56.3)	7 (50.0)	16 (53.3)	6 (54.5)	1 (11.1)	7 (35.0)	7 (43.8)	5 (33.3)	12 (38.7)
Probably will not leave	3 (18.8)	4 (28.6)	7 (23.3)	2 (18.2)	6 (66.7)	8 (40.0)	5 (31.3)	8 (53.3)	13 (41.9)
Definitely will not leave	0 (0)	2 (14.3)	2 (6.7)	0 (0)	1 (11.1)	1 (5.0)	1 (6.3)	1 (6.7)	2 (6.5)
Reason is job dissatisfaction							6 (60.0)	3 (50.0)	9 (56.3)

Table: 3.4.5.3: Job satisfaction and intention to leave for Hospital 3

Job Satisfaction and Intention to leave	**Time 1**	**Transition**	**Time 2**
	Ward 31 (n = 22)	Ward 31 (n = 23)	Ward 31 (n = 20)
Satisfaction with current job			
Very dissatisfied	0 (0)	1 (4.5)	2 (10.0)
Dissatisfied	2 (10.0)	5 (22.7)	8 (40.0)
Satisfied	17 (85.0)	14 (63.6)	9 (45.0)
Very satisfied	1 (5.0)	2 (9.1)	1 (5.0)
Satisfaction with being a nurse			
Very dissatisfied	-	-	1 (5.0)
Dissatisfied	-	-	2 (10.0)
Satisfied	-	-	13 (65.0)
Very satisfied	-	-	4 (20.0)
Recommend ward to colleague			
Definitely no	-	-	3 (15.0)
Probably no	-	-	9 (45.0)

Probably yes	-	-	7 (35.0)
Definitely yes	-	-	1 (5.0)
Recommend ward to family/friends			
Definitely no	-	-	1 (5.0)
Probably no	-	-	5 (25.0)
Probably yes	-	-	10 (50.0)
Definitely yes	-	-	4 (20.0)
Feelings about future in hospital			
Definitely will leave	0 (0)	0 (0)	0 (0.0)
Probably will leave	5 (25.0)	6 (28.6)	8 (42.1)
Probably will not leave	7 (35.0)	10 (47.6)	8 (42.1)
Definitely will not leave	8 (40.0)	5 (23.8)	3 (15.8)
Reason is job dissatisfaction	-	-	4 (50.0)

Table: 3.4.5.4: Job satisfaction and intention to leave overall total

Job Satisfaction and Intention to leave	**Time 1** (n = 101)	**Transition** (n = 79)	**Time 2** (n = 116)
Satisfaction with current job			
Very dissatisfied	13 (13.3)	5 (6.6)	7 (6.1)
Dissatisfied	33 (33.7)	21 (27.6)	28 (24.3)
Satisfied	50 (51.0)	43 (56.6)	68 (59.1)
Very satisfied	2 (2.0)	7 (9.2)	12 (10.4)
Satisfaction with being a nurse			
Very dissatisfied	-	-	4 (3.4)
Dissatisfied	-	-	17 (14.7)
Satisfied	-	-	58 (50.0)
Very satisfied	-	-	37 (31.9)
Recommend ward to colleague			

Definitely no	-	-	13 (11.2)
Probably no	-	-	31 (26.7)
Probably yes	-	-	52 (44.8)
Definitely yes	-	-	20 (17.2)
Recommend ward to family/friends			
Definitely no	-	-	4 (3.5)
Probably no	-	-	17 (14.8)
Probably yes	-	-	54 (47.0)
Definitely yes	-	-	40 (34.8)
Feelings about future in hospital			
Definitely will leave	13 (13.3)	9 (12.5)	13 (11.4)
Probably will leave	38 (38.8)	24 (33.3)	40 (35.1)
Probably will not leave	33 (33.7)	27 (37.5)	48 (42.1)
Definitely will not leave	14 (14.3)	12 (16.7)	13 (11.4)
Reason is job dissatisfaction	-	-	28 (52.8)

3.4.6 Burnout[10]

The human services version of the Maslach Burnout Inventory (HS-MBI; Maslach & Jackson 1996) was used to measure burnout. This is a 22-item survey with a 7-point scale (scores range from 0 to 6, see table 3.4.6.1 below). Individual items on the HS-MBI are used to create three subscales measuring three areas associated with burnout: emotional exhaustion, depersonalisation and personal accomplishment. The score on the subscale can then be compared to the overall scale to determine the level of burnout. This survey was added at Time 2 and as such comparisons cannot be made to previous time points. As can be seen, overall, staff scored relatively low on emotional exhaustion (once a month – a few times a month) and depersonalisation (few times a year – once a month) and relatively high on personal accomplishment (once a week – few times a week). Higher scores on the emotional exhaustion and depersonalisation subscales indicate negative outcomes; higher scores on the personal accomplishment subscale indicate better outcomes.

Table: 3.4.6.1: Maslach burnout inventory scale

0	1	2	3	4	5	6
Never	A few times a year or less	Once a month or less	A few times a month	Once a week	A few times a week	Everyday

Table: 3.4.7.2: Maslach burnout inventory scores for Hospital 1

	Time 1	**Transition**	**Time 2**			
			Ward 1 (n = 9)	Ward 2 (n = 30)	Ward 3 (n = 26)	Total (n = 65)
Emotional Exhaustion	-	-	2.88 (1.47)	2.37 (1.31)	2.22 (1.29)	2.38 (1.32)
Depersonalisation	-	-	1.81 (1.05)	1.19 (1.03)	1.21 (1.04)	1.29 (1.04)
Personal Accomplishment	-	-	3.86 (1.24)	4.45 (0.75)	4.44 (0.81)	4.37 (0.87)

Table: 3.4.7.3: Maslach burnout inventory scores for Hospital 2

MBI	**Time 1**	**Transition**	**Time 2**		
			Ward 22 (n = 16)	Ward 23 (n = 15)	Total (n = 31)
Emotional Exhaustion	-	-	3.44 (1.26)	2.96 (1.67)	3.21 (1.46)
Depersonalisation	-	-	1.46 (1.37)	1.58 (1.38)	1.52 (1.35)
Personal Accomplishment	-	-	4.13 (1.19)	4.77 (0.78)	4.45 (1.05)

Table: 3.4.7.4: Maslach burnout inventory scores for Hospital 3

MBI	**Time 1**	**Transition**	**Time 2** Ward 31 (n = 20)
Emotional Exhaustion	-	-	2.77 (1.27)
Depersonalisation	-	-	0.92 (0.98)
Personal Accomplishment	-	-	4.11 (0.98)

[10] Further research is on-going in relation to staff burnout and comparative data over time will be available in subsequent phases of the research

Table: 3.4.7.5: Maslach burnout inventory scores overall

MBI	Time 1	Transition	Time 2 (n = 116)
Emotional Exhaustion	-	-	2.67 (1.39)
Depersonalisation	-	-	1.29 (1.13)
Personal Accomplishment	-	-	4.34 (0.93)

3.4.7 Conclusion

Overall, 296 surveys were completed by staff across the three time periods. The majority of respondents were RNs with degree level education and had worked for an average of 12 years as a nurse or HCA.

Across both phases of data collection, it has been possible to gain insight into factors affecting nursing work on the study wards. There are a number of trends in the data when the time periods are compared. The number of patients per nursing staff member was observed to be reducing at Transition and this trend continued in Time 2. Measures of the nursing work environment also showed more favourable results at transition and Time 2 for a number of wards when compared to Time 1. Of particular relevance was an increase in ratings of Staffing and Resource Adequacy in Time 2. There were also improvements in staff perceptions of collegiality between doctors and nurses, nurse manager ability, leadership and support, nurse participation in hospital affairs and the ability to apply nursing foundations for the quality of care in two of the three sites; these reflected the stabilisation of staffing in these areas.

The perception that staff felt they had less time to deliver care fell from Time 1 to Time 2 with a subsequent increase in staff reporting they did not require any additional time to provide patient care in Time 2 when compared to Time 1. Staff perceptions of the quality of care delivered, overall in the six wards remained stable between the two time periods; however, wards with a positive variation in staffing at Time 2 reported a substantial increase in respondents rating the quality of care delivered as either good or excellent. In particular, 44% of respondents in Hospital 1, which received the greatest uplift, reported that the quality of care had improved in the previous six months.

Across all phases of the research, the items of care most frequently reported as undone were comfort/talk with patients and educating patients and/or family. The items least frequently left undone were pain management and undertaking treatments/procedures. In Time 1, 75.6% of nurses reported that at least one necessary item of care was left undone due to lack of time on their last shift; this dropped to 31.8% in Time 2. Similarly, the mean number of items left undone also dropped substantially over the time period with an average of 2.51 care activities reported left undone per shift in Time 1 falling to 0.75 undone at Time 2.

Across all phases, the most common items of care delayed were recording/updating documentation, comfort/talk with patients, physical support, vital signs observation,

adequate patient surveillance and administering medications. Pain management was the least frequently delayed task. In comparison to care left undone, care delayed showed less of a decline; however, overall, the trend was downwards. In Time 1, 93.3% of staff reported at least one care task was delayed on their last shift whereas 84.1% reported one or more tasks delayed in Time 2. The mean number of care items delayed per shift also fell in Time 2 (4.92) compared to Time 1 (5.43). Missed meal breaks for staff also fell proportionally over the two time periods, with 50% or RNs reporting a missed meal break in Time 1, this reduced to 22.7% in Time 2.

Job satisfaction and intention to leave remained relatively similar at the overall level but demonstrate some differences at ward level. Both varied across wards, with high prevalence of dissatisfaction and intention to leave reported in Wards 1, 22 and 23 in Time 1. Intention to leave showed a more complex picture with variation across wards and sites. However, overall, the prevalence of intention to leave was lower at Transition and Time 2 time-points (i.e. following the introduction of the recommendations in the *Framework*) when compared to Time 1.

This phase of the research also measured burnout; however, as this measure was not included in the original pilot, comparisons are not available at this stage. Future rounds of data collection will collect data on this variable allowing comparisons to be made of time and measured in relation to variations in staffing. Overall, staff scored relatively low on emotional exhaustion and depersonalisation and relatively high on personal accomplishment. Higher scores on the emotional exhaustion and depersonalisation subscales indicate negative outcomes; higher scores on the personal accomplishment subscale indicate better outcomes.

3.5 Economic Analysis

The economic effect of the implementing the recommendations in the *Framework, i.e. the uplift,* is measured using three outcomes:

- cost of the uplift
- agency staff usage
- nurse sensitive outcomes

Standard techniques are employed to estimate the cost of the additional staff using Department of Health salary scales. Whereby, the median value on the salary scale is used and adjusted for PRSI and pension (see Table 3.6.1).

With regards to agency staff usage both RNs and HCAs are considered. Here the monthly averages before and after the intervention are compared. These changes are then valued in monetary terms. Agency staff are valued using average hourly cost of agency (RNs and HCAs respectively) per ward (see Table 3.6.2). These costs were collected from the individual hospitals.

Table 3.5.1: Staff Costs (Based in the Consolidated Salary Scales (Department of Health 2017)

Basis of Calculation	Basic	Premia (20%)	Earnings	PRSI (10.75%)	Annual Cost
Nurse (Staff)	34,666[1]	6,933	41,599	4,472	46,071
Health Care Assistant (Band 3)	30,107[1]	6,021	36,128	3,884	40,012

[1]Mid-Point of Health Sector Consolidated Salary Scales Salary Scale (Department of Health 2017_ based on pre April 2017 Landsdowne Road Agreement (LRA)

Table 3.5.2: Average hourly RN and HCA agency costs

	RNs Average Hourly Cost €	HCAs Average Hourly Cost €
Ward 1	41.39	32.57
Ward 2	49.55	36.15
Ward 3	50.58	33.56
Ward 22	37.97	29.63
Ward 23	37.97	29.63
Ward 31	40.94	24.46

3.5.1 Cost of Uplift in Staffing

Table 3.5.3 details the *uplift* in WTEs for RN and HCA. Four wards received an *uplift* with mixture of RN and HCAs in two, one ward received an RN uplift only and the fourth received an additional HCA only. Applying the annual costs provided by Department of Health (Table 3.5.1 - €46,071 for RNs and €40,012 for HCAs) the annual and monthly cost of the uplift is estimated for each ward and presented on Table 3.5.3.

The uplift in Ward 1 (4.5 RNs and 4.5 HCAs) cost €387,374 annually. For Ward 2, the uplift (12.3 RNs) cost €566,673 annually. In addition, the Department of Health reported that when calculating the 80/20 RN to HCA skill mix, it became apparent that Ward 2 had more HCAs than required. Therefore, 0.4 of their substantive HCAs was converted to RN. Representing a net cost of €2,424 annually (€202 monthly). So the total uplift for Ward 2 cost €569,097. The uplift in Ward 3 (7.4 RNs and 4.1 HCAs), cost €504,975 annually. Ward 31 had an uplift of 3.5 HCAs only, costing €140,042 annually (Wards 22 and 23 did not receive an uplift).

Therefore, the total cost of implementing the uplift is €1,601,487 across all wards annually. The Department of Health indicated that 61% of the uplift would be funded with direct investment by Department of Health, €954,893 (€79,574 monthly). The remainder of the uplift (7 RNs and 8.1 HCA) would be funded through converting agency to FTEs. Using salary costs provided this amounts to €646,594 annually (€53,883 monthly), representing 41% of the total investment required (Table 3.5.3).

3.5.2 Agency Costs

The effect on agency hours, following the implementation of the staffing uplift, was varied across the wards (see Table 3.5.4). In Hospital 1 and Hospital 3, agency hours provided by RNs decreased in Time 2 compared to Time 1 with a slight increase noted in Time 2 in the provision of agency hours by RNs in Hospital 2[11].

With regards to HCA agency hours, five wards decreased HCA hours (ranging from -45% to -95%). In the remaining ward HCA agency hours increased to 5.2%. To estimate the cost savings associated with these changes the hours avoided (or gained) are multiplied by the average cost per hour for agency RNs and HCAs respectively (see Table 3.5.2 for costs employed per ward).

With regards to RN agency there was a monthly reduction in agency spend (€5,671) across the wards. While, the monthly reduction in agency spend associated with reduction in HCA agency hours across the wards was €76,809. The combined reduction in agency spend following the implementation of the recommendations in the *Framework* is €82,480 on average, per month.

3.5.3 Net monthly cost of uplift

Table 3.5.5 presents the monthly net cost of the uplift to the Department of Health when agency savings are considered. Overall, the monthly cost of implementing the uplift in nursing staff required (€79,574) was less than the agency savings realised (€82,480). Therefore, in implementing the recommendations of the *Framework,* there is a net monthly saving (€2,905) to the Department of Health across the six pilot wards.

[11] Hospital 2 were not funded for an uplift in staff as part of the implementation of the *Framework.*

Table 3.5.3: Cost of Implementation

	TOTAL APPROVED FOR UPLIFT				FUNDED BY DOH				FUNDED BY CONVERTING AGENCY			
	RNs	**HCAs**	**TOTAL**	**€[2]**	**RNs**	**HCAs**	**TOTAL**	**€[2]**	**RNs**	**HCAs**	**TOTAL**	**€[2]**
Ward 1	4.5	4.5	9	387,374	4.5	2.5	7	307,350	0	2	2	80,024
Ward 2	12.7	-0.4	12.3	569,097	8.4[1]	-0.4[1]	8	370,992	4.3	0	4.3	198,105
Ward 3	7.4	4.1	11.5	504,975	4.7	0	4.7	216,534	2.7	4.1	6.8	288,441
Ward 22			0	-			0	-			0	-
Ward 23			0	-			0	-				-
Ward 31	0	3.5	3.5	140,042	0	1.5	1.5	60,018	0	2	2	80,024
Total			**36.3**	**1,601,487**	**17.6**	**3.6**	**21.2**	**954,893**	**7**	**8.1**	**15.1**	**646,594**
Monthly				*133,457*			*79,574*					*53,883*

[1] Ward 1 had 0.4 more HCAs than required (as per 80/20-skill mix). Therefore, 0.4 of their substantive HCA's was converted to RN.
[2] As per Table 3.6.1

Table 3.5.4: Agency Hours estimated costs and savings for monthly average

	RNs -Average Hours per Month					HCA - Average Hours per Month					
	Time 1	Time 2	Change Hours	Average Cost/ hr[1]	Cost	Time 1	Time 2	Change Hours	Average Cost/hr[1]	Cost	**TOTAL**
Ward 1	94.46	5.38	- 89.08	41.39	- 3,686.44	62.85	3.50	- 59.35	32.57	- 1,933.28	- 5,619.73
Ward 2	59.35	7.31	- 52.04	49.55	- 2,578.42	499.43	23.20	- 476.23	36.15	- 17,213.81	- 19,792.23
Ward 3	62.38	36.07	- 26.31	50.58	- 1,330.87	1,148.09	105.09	- 1,043.01	33.56	- 35,003.34	- 36,334.21
Ward 2	214.61	254.06	39.45	37.97	1,497.83	998.68	525.49	- 473.19	29.63	- 14,020.63	- 12,522.81
Ward 23	56.46	92.26	35.80	37.97	1,359.33	908.38	499.98	- 408.40	29.63	- 12,100.89	- 10,741.57
Ward 31	51.39	28.63	- 22.76	40.94	- 931.93	27.14	168.74	141.60	24.46	3,462.97	2,531.04
Total					- 5,670.51					- 76,808.98	- 82,479.50

[1] As per Table 3.5.2

Table 3.5.5: Total economic cost and savings for DoH

	Agency Costs	Cost of Uplift in place to DOH[1] / Month	Total Direct Investment Required by DOH / Month
Ward 1	-5,619.73	25,612.50	19,992.77
Ward 2	-19,792.23	30,916.00	11,123.77
Ward 3	-36,334.21	18,044.50	-18,289.71
Ward 22	-12,522.81	-	-12,522.81
Ward 23	-10,741.57	-	- 10,741.57
Ward 31	2,531.04	5,001.50	7,532.54
Total	-82,479.50	79,574.42	-2,905.00

[1] Represents direct cost to Department of Health only

3.5.4 Estimating cost of Nursing Sensitive Outcomes

To consider the overall effectiveness of the uplift in staffing, in line with previous literature (Twigg et al 2013), the impact on patient outcomes should be considered; specifically the impact of nursing sensitive outcomes (outlined in section 3.3.1) on costs of in-patient stays. This section estimates the financial impact of NSOs on inpatient case-mix cost per case. The analysis presented here is an update on the results presented in the Pilot Project Report (Drennan *et al.* 2017b) as it: 1) contains more observations (sample size increases from 2,014 to 5,544) and; 2) includes additional variables on complexity, admission type and patient characteristics. These developments improve the statistical fit of the model meaning that the model now explains a greater proportion of the variation in in-patient case-mix cost per case. Despite these advancements, the analysis is still only estimating the average impact of any NSO on inpatient case-mix cost per case. It is envisaged that as a more in-depth analysis of the data is performed, the model will be developed further with a view to disaggregating and differentiating between the 14 types of NSOs. These cost estimates can then be used, in conjunction with the statistical analysis, to estimate the budget impact of the implementation of the recommendations in the *Framework* on NSOs.

With the data that is available, the associated cost of nurse sensitive outcomes were estimated using data on Diagnostic Related Groups (DRGs) and the presence of an NSO collected from the six wards for 5,544 patients from July 2016 to October 2017. Amongst the sample, average in-patient length of stay was 9.9 days (standard deviation 13.8) and 16% of patients had a nursing sensitive outcome identified through an analysis of the HIPE data. Furthermore, of the DRGs allocated, 84% indicated a minor complexity; 11% an intermediate complexity and 35% a major complexity. Of the sample 84% related to emergency admissions. Additionally, 41% of the observations relate to the time period prior to the implementation of the recommendations in the *Framework* (Time 1) and 59% post the implementation (Time 2).

As the Ready Reckoner for DRG was not publically available, the Health Pricing Office mapped the DRGs collected from the sites (version 6) onto DRG version 8 and supplied the relevant inpatient case-mix cost per case (i.e. episode of care) for each patient on behalf of the researchers. The average inpatient case-mix cost per case was €7,659 (standard deviation €9,804) (see table 3.5.6 for descriptive statistics on the sample).

Table 3.5.6 Summary Statistics of Sample

Variable	Mean / Frequency	Std. Dev.	Min	Max
Age	62.37	19.56	16	103
Male	0.50	0.50	0	1
Emergency Admission	0.84	0.37	0	1
Length of Stay (days)	9.90	13.79	1	219
Any NSO	0.16	0.37	0	1
Minor complexity[1]	0.52	0.50	0	1
Intermediate Complexity[1]	0.11	0.32	0	1

Major Complexity[1]	0.36	0.48	0	1
No Complexity[1]	0.01	0.11	0	1
Pre-implementation	0.41	0.49	0	1
Inpatient case-mix € / case	7,658.61	9,803.56	249	168,892

[1] From DRG assigned. If description included MAJC = major complexity, MINC = minor complexity, INTC = intermediate complexity, if description did not include MAJC, MINC or INTC = no complexity.

To estimate the impact of a nurse sensitive outcome on in-patient case-mix cost per case, an ordinary least squares regression was performed using Stata version 14. Controlling for age, gender, admission type, complexity, length of stay and time period, the presence of a nurse sensitive outcome increased the average inpatient case-mix cost per case by €2,397 (p=0.00) holding all else constant. This estimated impact of nurse sensitive outcomes on inpatient case-mix cost per case can be used to estimate the cost of nurse sensitive outcomes avoided.

The regression results (Table 3.5.7) also reveal a positive relationship between length of stay and cost, for each additional night in hospital, costs increase by €484 (p=0.00), holding everything else constant. The results also reveal a negative relationship between age and cost, for each additional year of age costs decrease by €69 (p=0.00), holding everything else constant. A male patient increases costs by €486 (p=0.01), relative to a female patient, holding everything else constant. Emergency admissions, compared to non-emergency, decreases costs by €3,497 (p=0.00), holding everything else constant. Finally, if the assigned DRG accounts for an associated major or minor complication, compared to no complication, it decreases costs respectively holding all else constant (p=0.00). The regression indicates there is no statistically significant difference in inpatient case-mix cost per case in the two time periods.

Table 3.5.7 Results Ordinary Least Squares Regression Analysis

Independent Variables	Coefficient		Std. Err.
Length of Stay	483.85	*	6.82
Any NSO	2,396.72	*	263.61
Age	-69.15	*	4.72
Male	486.30	**	177.37
Emergency Admission	-3,497.24	*	245.11
Major Complexity	-4,253.51	*	814.04
Minor Complexity	-4,731.62	*	800.71
Intermediate Complexity	817.31		836.41
Pre-uplift	-16.72		179.84
Constant	13,355.86		832.60
No of observations 5,544			
Prob > F = 0.0000			
R-squared = 0.5502			

* Indicates statistical significance at 1% level
** Indicates statistical significance at 5% level
Base categories: No NSO; Female; non-emergency admission; no complexity; post uplift.

Given the skewed distribution of the dependent variable, in-patient case-mix cost per case (Figure 3.5.1), a second regression model was estimated using inpatient case-

mix cost per case logged as the dependent variable (Figure 3.5.2). Here again, to estimate the impact of a nurse sensitive outcome on inpatient case-mix cost per case, an ordinary least squares regression was performed using Stata version 14. Controlling for age, gender, admission type, complexity, length of stay, and time period, the presence of a nurse sensitive outcome increased the average inpatient case-mix cost per case by 16% (p=0.00) holding all else constant. This estimated impact of nurse sensitive outcomes on inpatient case-mix cost per case can be used to estimate the cost of nurse sensitive outcomes avoided.

The regression results (Table 3.5.7) also reveal a positive relationship between length of stay and cost, for each additional night in hospital, costs increase by 3% (p=0.00), holding everything else constant. The results also reveal a negative relationship between age and cost, for each additional year of age costs decrease by 0.3% (p=0.00), holding everything else constant. A male patient increases costs by 6% (p=0.01), relative to a female patient, holding everything else constant. Emergency admissions, compared to non-emergency, decreases costs by 60% (p=0.00), holding everything else constant. Finally, if the assigned DRG accounts for an associated minor complication, compared to no complication, it decreases costs by 45% (p=0.00) or intermediate complexity it increases costs by 31% (p=0.00), holding all else constant. The regression indicates there is no statistically significant difference in inpatient case-mix cost per case between pre and post uplift time periods.

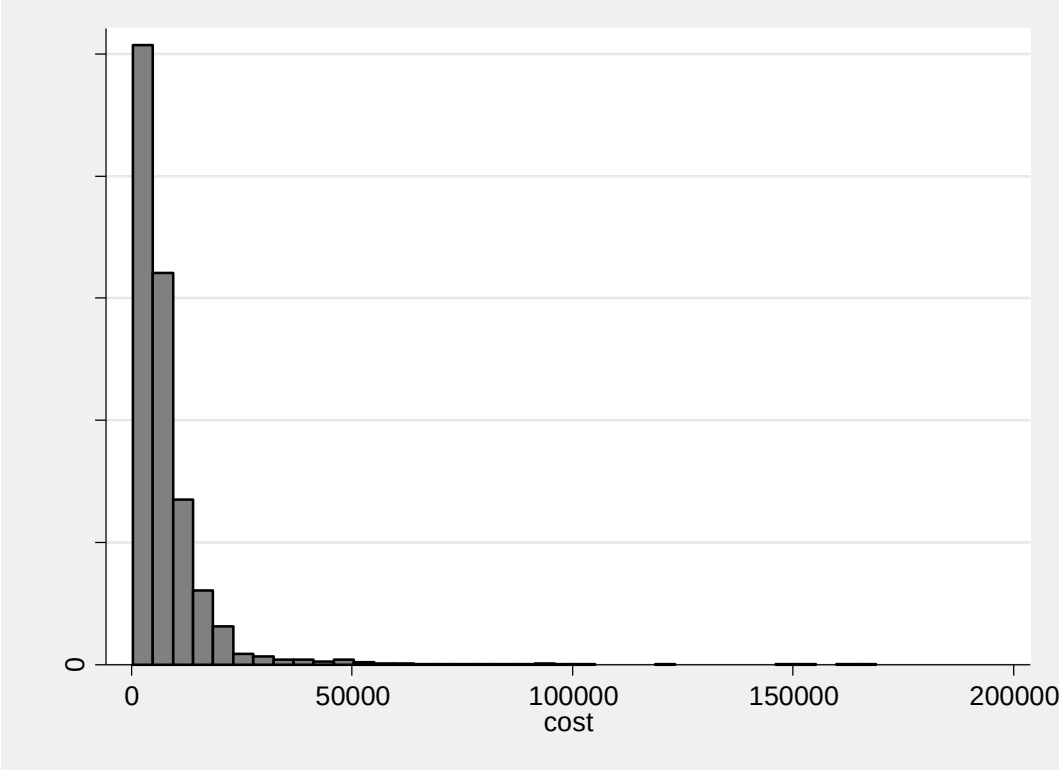

Figure 3.5.1 Histogram patient casemix cost per case

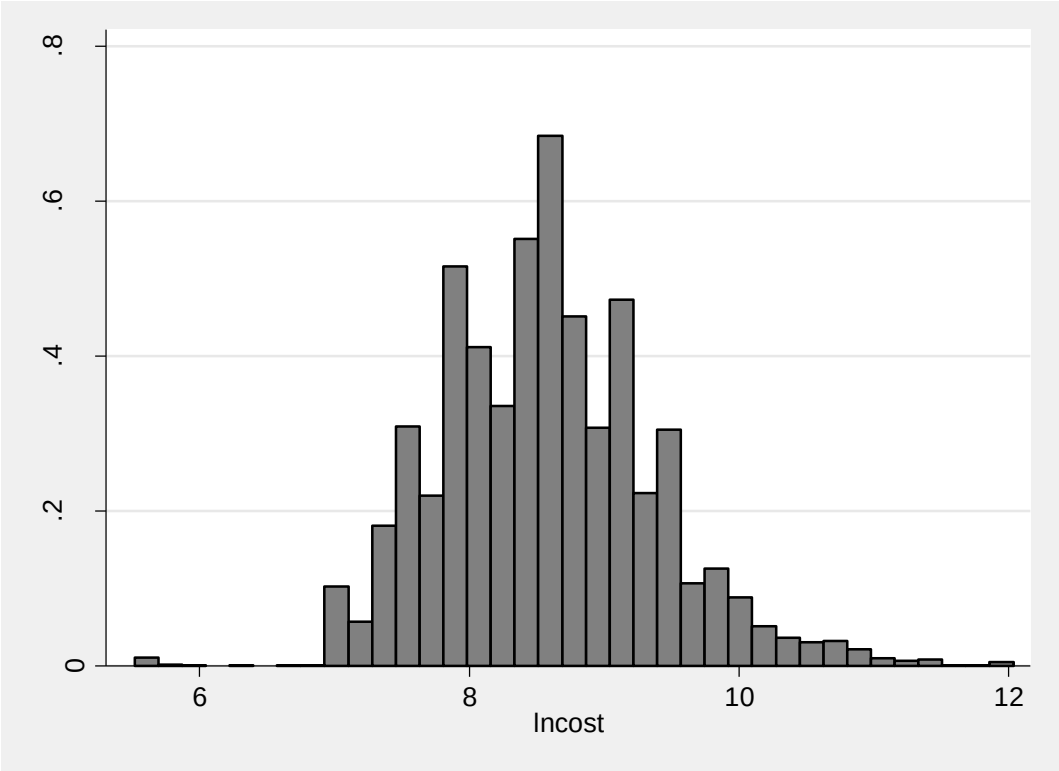

Figure 3.5.2 Histogram patient casemix cost per case logged

Table 3.5.7 Results Ordinary Least Squares Regression Analysis

Independent Variables	Coefficient		Std. Err.
Length of Stay	0.03	*	0.00
Any NSO	0.16	*	0.02
Age	0.00	*	0.00
Male	0.06	*	0.02
Emergency Admission	-0.59	*	0.02
Major Complexity	-0.08		0.07
Minor Complexity	-0.45	*	0.07
Intermediate Complexity	0.31	*	0.07
Pre-uplift	-0.01		0.02
Constant	9.14		0.07
No of observations 5,544			
Prob > F = 0.0000			
R-squared = 0.5015			

* Indicates statistical significance at 1% level
** Indicates statistical significance at 5% level
Base categories: No NSO; Female; non-emergency admission; no complexity; post uplift.

3.6 Cross-sectional Patient Survey

3.6.1 Patient Satisfaction

In order to evaluate the patients' experience of care, patients completed items from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS). Many of these items required patients to respond on a scale of 1-4, frequently 1 = Never, 2 = Sometimes, 3 = Usually, 4 = Always. Some of the items on the HCAHPS can be combined to form a composite measure of a concept, for example, nurse communication. The analysis below presents descriptive results of five composite variables, 4 single items and 3 overall rating measures of patient satisfaction. Some observations are made between study wards. However, the small samples contributing to some ward averages and additional variations in features between study wards need to be borne in mind when in interpreting the observations. It is of note that data the reported here covers Time 1 and the transition phase of the pilot; further data collection for Time 2 is on-going each of the research sites as part of the longitudinal programme of research.

3.6.2 Rates and Methods of Completion

Patient satisfaction data is based on 125 complete surveys received in Time I and 79 complete surveys in Transition. Across both time-points 243 surveys were distributed. Patients were given the option to complete surveys on the day they were administered or to take them home and return via a stamped addressed envelope. Fifty-nine surveys were taken for later completion and return by post. 20 of these (33.9%) were returned. Overall, 184 (75.7%) surveys were completed on the day. Ninety-one (49.5%) of these surveys were completed verbally with the researcher notating patient answers. Currently in Time 2, all patients are being presented with a survey at the point of discharge.

3.6.3 Patient Demographics

Participants were patients who had at least one overnight stay on the study wards before completion of the questionnaire and were forecast to be discharged on the day of or shortly after the distribution of the survey. The demographic profile of participants is described in Table 3.6.1 for Time 1. Sixty-nine males and 55 females participated in Time 1 of the study. The mean age of patients was approximately 65 while they had an average ward stay of approximately 11 days before completing the survey (count includes first and last day of stay). Approximately 27% of patients had no formal education while 34.1% had greater than Leaving Certificate education. Just over 65% of patients rated their overall health at the centre of the continuum as fair/good. Approximately 12% rated their health as poor/very poor and 22.5% rated their health as very good/excellent.

The demographic profile of patients in the Transition phase is presented in Table 3.6.2. Forty-four males and 34 females participated in Transition phase of the study. The average age of patients was approximately 64 and the average length of ward stay was approximately 11 days before completing the survey. Approximately 55% of patients had greater than Leaving Certificate education while 25% had no formal education. A large proportion of patients (59%) rated their health as good/very good.

Table 3.6.1: Demographic profile of patient respondents in Time 1 by ward and hospital

Characteristic	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1 n = 24	Ward 2 n = 18	Ward 3 n = 17	Total n = 59	Ward 21 n = 36	Ward 22 n = 17	Total n = 53	Ward 23 n = 13	n = 125
Age, mean (SD)	53.43 (17.04)	71.18 (10.13)	58.4 (18.71)	60.53 (17.21)	67.28 (17.52)	66.93 (16.78)	67.18 (17.14)	79.08 (14.64)	65.49 (17.74)
Length of ward stay, mean (SD)	6.50 (5.86)	12.28 (8.34)	8.94 (9.67)	8.97 (8.11)	8.83 (7.03)	10.41 (14.77)	9.34 (10.05)	26.25 (27.05)	10.80 (12.84)
Gender, n (%)									
Male	18 (75.0)	9 (50.0)	8 (47.1)	35 (59.3)	19 (52.8)	10 (62.5)	29 (55.8)	5 (38.5)	69 (55.6)
Female	6 (25.0)	9 (50.0)	9 (52.9)	24 (40.7)	17 (47.2)	6 (37.5)	23 (44.2)	8 (61.5)	55 (44.4)
Educational Attainment, n (%)									
No Formal Education	3 (12.5)	4 (22.2)	0 (0)	7 (11.9)	11 (31.4)	9 (56.3)	20 (39.2)	6 (46.2)	33 (26.8)
Junior /Intermediate Certificate	6 (25.0)	4 (22.2)	4 (23.5)	14 (23.7)	6 (17.1)	2 (12.5)	8 (15.7)	1 (7.7)	23 (18.7)
Leaving Certificate	3 (12.5)	3 (16.7)	5 (29.4)	11 (18.6)	9 (25.7)	1 (6.3)	10 (19.6)	4 (30.8)	25 (20.3)
Vocational/Technical Qualification	2 (8.3)	3 (16.7)	6 (35.3)	11 (18.6)	6 (17.1)	0 (0)	6 (11.8)	0 (0)	17 (13.8)
Certificate (Third-level)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6.3)	1 (2.0)	0 (0)	1 (0.8)
Diploma (Third-level)	2 (8.3)	1 (5.6)	1 (5.9)	4 (6.8)	1 (2.9)	2 (12.5)	3 (5.9)	0 (0)	7 (5.7)
Bachelor's Degree	7 (29.2)	3 (16.7)	1 (5.9)	11 (18.6)	2 (5.7)	1 (6.3)	3 (5.9)	1 (7.7)	15 (12.2)
Master's Degree	1 (4.2)	0 (0)	0 (0)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.8)
Doctoral Degree (e.g. PhD)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7.7)	1 (0.8)
Overall Health, n (%)									
Very Poor	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.8)	0 (0)	1 (1.9)	0 (0)	1 (0.8)
Poor	0 (0)	6 (33.3)	0 (0)	6 (10.2)	3 (8.3)	2 (12.5)	5 (9.6)	3 (23.1)	14 (11.3)
Fair	4 (16.7)	5 (27.8)	2 (11.8)	11 (18.6)	13 (36.1)	6 (37.5)	19 (36.5)	3 (23.1)	33 (26.6)
Good	11 (45.8)	5 (27.8)	9 (52.9)	25 (42.4)	14 (38.9)	5 (31.3)	19 (36.5)	4 (30.8)	48 (38.7)
Very good	8 (33.3)	0 (0)	6 (35.3)	14 (23.7)	4 (11.1)	3 (18.8)	7 (13.5)	2 (15.4)	23 (18.5)
Excellent	1 (4.2)	2 (11.1)	0 (0)	3 (5.1)	1 (2.8)	0 (0)	1 (1.9)	1 (7.7)	5 (4.0)

Table 3.6.2: Demographic profile of patient respondents in Transition phase by ward and hospital

Characteristic	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1 n = 17	Ward 2 n = 12	Ward 3 n = 9	Total n = 38	Ward 21 n = 19	Ward 22 n = 12	Total n = 31	Ward 31 n = 10	n = 79
Age, mean (SD)	64.75 (17.82)	59.90 (20.35)	50.44 (12.10)	59.69 (17.86)	64.50 (14.10)	62.09 (17.53)	63.59 (15.23)	78.50 (12.18)	63.76 (17.13)
Length of ward stay, mean (SD)	15.06 (17.31)	8.33 (5.37)	7.11 (8.20)	11.05 (12.89)	6.26 (4.07)	10.33 (13.28)	7.84 (8.87)	20.0 (13.65)	10.92 (12.04)
Gender, n (%)									
Male	10 (58.8)	5 (45.5)	6 (66.7)	21 (56.8)	12 (63.2)	7 (58.3)	19 (61.3)	4 (40.0)	44 (56.4)
Female	7 (41.2)	6 (54.5)	3 (33.3)	16 (43.2)	7 (36.8)	5 (41.7)	12 (38.7)	6 (60.0)	34 (43.6)
Educational Attainment, n (%)									
No Formal Education	6 (35.3)	4 (36.4)	0 (0)	10 (27.0)	5 (26.3)	3 (27.3)	8 (26.7)	1 (11.1)	19 (25.0)
Junior /Intermediate Certificate	3 (17.6)	2 (18.2)	2 (22.2)	7 (18.9)	3 (15.8)	3 (27.3)	6 (20.0)	2 (22.2)	15 (19.7)
Leaving Certificate	3 (17.6)	1 (9.1)	0 (0)	4 (10.8)	1 (5.3)	0 (0)	1 (3.33)	2 (22.2)	7 (9.2)
Vocational/Technical Qualification	2 (11.8)	0 (0)	2 (22.2)	4 (10.8)	1 (5.3)	2 (18.2)	3 (10.0)	2 (22.2)	9 (11.8)
Certificate (Third-level)	1 (5.9)	0 (0)	1 (11.1)	2 (5.4)	2 (10.5)	2 (18.2)	4 (13.3)	1 (11.1)	7 (9.2)
Diploma (Third-level)	1 (5.9)	1 (9.1)	0 (0)	2 (5.4)	4 (21.1)	0 (0)	4 (13.3)	1 (11.1)	7 (9.2)
Bachelor's Degree	0 (0)	2 (18.2)	2 (22.2)	4 (10.8)	2 (10.5)	1 (9.1)	3 (10.0)	0 (0)	7 (9.2)
Master's Degree	1 (5.9)	1 (9.1)	1 (11.1)	3 (8.1)	1 (5.3)	0 (0)	1 (3.3)	0 (0)	4 (5.3)
Doctoral Degree (e.g. PhD)	0 (0)	0 (0)	1 (11.1)	1 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.3)
Overall Health, n (%)									
Very Poor	0 (0)	1 (9.1)	0 (0)	1 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.3)
Poor	2 (11.8)	1 (9.1)	0 (0)	3 (8.1)	1 (5.3)	1 (8.3)	2 (6.5)	0 (0)	5 (6.4)
Fair	3 (17.6)	5 (45.5)	1 (11.1)	9 (24.3)	3 (15.8)	1 (8.3)	4 (12.9)	5 (50.0)	18 (23.1)
Good	4 (23.5)	2 (18.2)	1 (11.1)	7 (18.9)	7 (36.8)	5 (41.7)	12 (38.7)	4 (40.0)	23 (29.5)
Very good	7 (41.2)	2 (18.2)	5 (55.6)	14 (37.8)	5 (26.3)	3 (25.0)	8 (25.8)	1 (10.0)	23 (29.5)
Excellent	1 (5.9)	0 (0)	2 (22.2)	3 (8.1)	3 (15.8)	2 (16.7)	5 (16.1)	0 (0)	8 (10.3)

3.6.4 Nurse Communication

The mean score of 3 items on the HCAHPS was used to create a composite measure of nurse communication which is reported by hospital and ward in table 3.6.3. These items asked patients how often did nurses treat you with courtesy and respect, listen carefully to you and explain things in a way you could understand. On a scale of 1-4, overall averages of 3.74 and 3.81, in Time 1 and Transition respectively, indicate that nurse communication was rated as usually to always effective. While Ward 31 had the lowest nurse communications rating in Time 1, ratings appear greater in Transition. It should be noted that a majority of patients responded with the highest value of four on each item, with only small numbers providing more negative responses on nurse communication.

3.6.5 Nurse Responsiveness

Nurse responsiveness is a composite measure derived from two questions. These questions asked if patients pressing the call button and needing assistance to the bathroom or with a bedpan received assistance as soon as they wanted it. Forty-nine patients and 31 patients required assistance with both of these care items during their stay, in Time 1 and Transition respectively. Ratings, outlined in Table 3.6.3, are largely positive. In Time 1, nurse responsiveness was rated highest on Ward 1 and lowest in Ward 31. From Time 1 to Transition, Ward 1 demonstrates a downward trend to a level similar to other wards while the trend in Wards 22, 23 and 31 suggests a potential increase in nurse responsiveness. It should be noted that the samples contributing to ward means for nurse-responsiveness are small on some wards.

3.6.6 Pain Management

Ninety patients required pain management in Time 1 while 60 required pain management in Transition. These patients were asked how often their pain was well controlled and how often nursing staff did everything they could to help with pain. The mean of these two items was used to calculate a score for overall pain management. Again, a majority of patients rated pain management with the highest value possible. In Time 1, pain management was rated very positively in Ward 3, in both wards in Hospital 2 and in Ward 31 (Table 3.6.3). Lower ratings were observed in Ward 1 and Ward 2. In the Transition phase, wards 1 and 2 had more positive ratings of pain management, in line with other wards.

3.6.7 Communication about medication

Patients who received new medication during their hospital stay were asked how often nursing staff told them what the new medication was for and described possible side effects in a way they could understand. Eighty-one patients received new medication in Time 1 while 51 received new medication in Transition phase. In

Time 1, communication about medication was the least positively evaluated composite variable as can be seen in Table 3.6.3. An average score of approximately three suggested that patients usually but not always received adequate communication about medication.

3.6.8 Care Transition

Three items asked patients if nurses took personal preferences into account when making decisions about healthcare following discharge, if patients had a good understanding of management of health and if patients understood the purpose for taking medications when leaving the hospital. Patients could choose one of four responses options: 1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree. With regards to medications, there was a fifth option which patients could select if they did not receive medication on leaving the hospital. These patients were excluded from the analysis. Overall, 89 patients provided data on care transition in Time 1 and 62 in the Transition phase. Ratings of care transition were quite positive and largely similar from Time 1 to Transition phase.

Table 3.6.3: Composite measures of patient experience by ward and hospital in Time 1 and Transition (mean (SD))

	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1	Ward 2	Ward 3	Total	Ward 22	Ward 23	Total	Ward 31	
Nurse Communication									
Time 1	3.85 (0.29)	3.69 (0.48)	3.92 (0.19)	3.82 (0.35)	3.76 (0.41)	3.69 (0.42)	3.74 (0.41)	3.42 (0.94)	3.74 (0.47)
Transition phase	3.88 (0.26)	3.64 (0.66)	3.81 (0.24)	3.78 (0.43)	3.79 (0.36)	4.0 (0)	3.87 (0.30)	3.70 (0.48)	3.81 (0.39)
Nurse Responsiveness									
Time 1	4.00 (0.00)	3.50 (0.55)	3.50 (0.67)	3.58 (0.58)	3.32 (0.58)	3.43 (0.61)	3.35 (0.58)	3.17 (0.82)	3.42 (0.62)
Transition phase	3.78 (0.36)	3.50 (1.00)	-	3.61 (0.66)	3.75 (0.27)	3.63 (0.48)	3.70 (0.35)	3.50 (0.65)	3.61 (0.56)
Pain Management									
Time 1	3.55 (0.62)	3.32 (0.87)	3.87 (0.30)	3.58 (0.65)	3.81 (0.33)	3.86 (0.23)	3.83 (0.30)	3.88 (0.23)	3.69 (0.54)
Transition phase	3.79 (0.32)	3.78 (0.36)	3.64 (0.63)	3.75 (0.41)	3.81 (0.31)	3.79 (0.39)	3.80 (0.33)	3.64 (0.56)	3.76 (0.40)
Communication about medication									
Time 1	3.19 (0.95)	2.91 (1.04)	3.18 (1.06)	3.08 (1.00)	3.05 (0.87)	2.58 (0.85)	2.88 (0.88)	2.36 (0.94)	2.93 (0.95)
Transition phase	3.46 (0.78)	2.31 (0.96)	2.63 (1.11)	2.94 (1.01)	3.25 (0.63)	3.07 (0.79)	3.20 (0.67)	3.13 (0.75)	3.07 (0.85)
Care Transition									
Time 1	3.46 (0.47)	3.07 (0.66)	3.79 (0.35)	3.38 (0.59)	3.41 (0.46)	3.62 (0.47)	3.48 (0.47)	3.57 (0.65)	3.45 (0.54)
Transition phase	3.48 (0.49)	3.30 (0.42)	3.44 (0.66)	3.42 (0.49)	3.46 (0.56)	3.57 (0.37)	3.49 (0.50)	3.21 (0.25)	3.42 (0.48)

Note: averages are not reported where the sample of patients providing relevant data < 4.

3.6.9 The hospital environment

Patients rated if their environment was clean and quiet from 1 = Never, 2 = Sometimes, 3 = Usually, 4 = Always. The results, presented in Table 3.6.4, generally convey that approximately 75% rated their room as always clean. The figures suggest a small upward trend in cleanliness of room from Time 1 to Transition phase. A lower amount of patients rated the room as always quiet at night. Ratings follow a downward trend from Time 1 to Transition phase in wards 2 and 3; that is, fewer patients rate their room as always quiet. An increase in the proportion of patients rating the room as always quiet at night is suggested by figures from Ward 31.

3.6.10 Discharge Information

As specified by the HCAHPS, patients moving to another health care facility were not included in calculations relating to discharge information. Just over 80% of patients had discussed with staff about having the care they needed when leaving hospital in Time 1 which was similar to the 76.9% of patients who had this discussion in Transition phase. Approximately one third received information in writing about what symptoms and health problems to look out for after leaving the hospital in Time 1 (see Table 3.5.4) while 40% received written information in the Transition phase. While these prevalence rates are low, it should be noted that some patients had not yet left the hospital on completion of their survey and may have received this information subsequently.

3.6.11 Satisfaction with nursing care

An item was used to assess overall satisfaction with nursing care. Participants could respond on a Likert scale from 1 to 5 where 1= Very dissatisfied and 5 = Very Satisfied. Nearly all patients were satisfied or very satisfied with nursing care (Table 3.6.5). Patients on all wards, excluding Ward 1 and Ward 2, were satisfied/very satisfied in Time 1. There appears to be a slight increase in satisfaction with nursing care on Wards 1 and 2 from Time 1 to Transition phase, though the small sample sizes need to borne in mind.

3.6.12 Hospital rating and recommendation

Participants were asked to rate the hospital on a scale from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible. Ratings of the hospital were predominantly positive but evidenced some variability as can be seen below in Table 3.6.5. Overall, it appears that a greater number of patients gave ratings of 9/10 to the hospital in Transition phase than Time 1. The trajectory is generally upward for Hospital 1 and 2 while it is downward for Hospital 3. Participants were also asked if they would recommend the hospital to friends and family. Patients chose one of four

responses: 1 = Definitely no, 2 = Probably no, 3 = Probably yes, 4 = Definitely yes. As can be seen in Table 3.6.5, the majority of participants, often 100%, responded with a yes answer. However, in many cases this was a probably yes answer. Ratings were largely similar in both phases.

Table 3.6.4: Single items of Patient Satisfaction by Ward and Hospital, n (%)

	Hospital 1				Hospital 2			Hospital 3	Overall total
	Ward 1	Ward 2	Ward 3	Total	Ward 22	Ward 23	Total	Ward 31	Total
Room was always clean									
Time 1	14 (60.9)	9 (50.0)	14 (82.4)	37 (63.8)	29 (80.6)	14 (82.4)	43 (81.1)	11 (84.6)	91 (73.4)
Transition phase	13 (76.5)	8 (72.7)	8 (88.9)	29 (78.4)	17 (89.5)	8 (72.7)	25 (83.3)	9 (90.0)	63 (81.8)
Room always quiet at night									
Time 1	9 (37.5)	6 (33.3)	8 (53.3)	23 (40.4)	14 (38.9)	8 (47.1)	22 (41.5)	4 (30.8)	49 (39.8)
Transition phase	7 (41.2)	3 (25.0)	2 (22.2)	12 (31.6)	8 (42.1)	4 (36.4)	12 (40.0)	5 (50.0)	29 (37.2)
Staff discussed care after leaving hospital									
Time 1	18 (81.8)	11 (68.8)	10 (83.3)	39 (78.0)	23 (85.2)	14 (93.3)	37 (88.1)	8 (72.7)	84 (81.6)
Transition phase	11 (73.3)	11 (91.7)	6 (75.0)	28 (80.0)	10 (62.5)	7 (77.8)	17 (68.0)	5 (100.0)	50 (76.9)
Received information in writing about care after leaving hospital									
Time 1	4 (28.6)	5 (38.5)	4 (57.1)	13 (38.2)	7 (33.3)	3 (30.0)	10 (32.3)	2 (20.0)	25 (33.3)
Transition phase	5 (33.3)	3 (33.3)	4 (66.7)	12 (40.0)	6 (40.0)	4 (57.1)	10 (45.5)	-	22 (40.0)

Note: figures are not reported where the sample of patients providing relevant data < 4.

Table 3.6.5: Overall ratings of Patient Satisfaction by Ward and Hospital, n (%)

		Hospital 1				Hospital 2			Hospital 3	Overall total
		Ward 1	Ward 2	Ward 3	Total	Ward 22	Ward 23	Total	Ward 31	Total
Satisfaction with Nursing Care										
Very satisfied	Time 1	16 (66.7)	13 (72.2)	15 (88.2)	44 (74.6)	19 (52.8)	11 (64.7)	30 (56.6)	9 (69.2)	83 (66.4)
	Transition	13 (76.5)	8 (72.7)	7 (77.8)	28 (75.7)	16 (84.2)	10 (83.3)	26 (83.9)	5 (50.0)	59 (75.6)
Satisfied or Very satisfied	Time	23 (95.8)	15 (83.3)	17 (100.0)	55 (93.2)	36 (100.0)	17 (100.0)	53 (100.0)	13 (100.0)	121 (96.8)
	Transition	17 (100.0)	10 (90.9)	9 (100.0)	36 (97.3)	19 (100.0)	12 (100.0)	31 (100.0)	8 (80.0)	75 (96.2)
Patients with hospital rating of 9/10										
	Time 1	11 (45.8)	7 (38.9)	14 (82.4)	32 (54.2)	15 (41.7)	11 (68.8)	26 (50.0)	10 (76.9)	68 (54.8)
	Transition	11(64.7)	7 (58.3)	7 (77.8)	25 (65.8)	11 (57.9)	11 (91.7)	22 (71.0)	6 (60.0)	53 (67.1)
Patients recommend hospital to family and friends										
Definitely Yes	Time 1	15 (62.5)	12 (66.7)	15 (88.2)	42 (71.2)	21 (58.3)	10 (58.8)	31 (58.5)	10 (76.9)	83 (66.4)
	Transition	11 (64.7)	7 (58.3)	7 (77.8)	25 (65.8)	12 (63.2)	9 (75.0)	21 (67.7)	5 (50.0)	51 (64.6)
Probably or Definitely Yes	Time 1	23 (95.8)	15 (83.3)	17 (100.0)	65 (93.2)	35 (97.2)	17 (100.0)	52 (98.1)	12 (92.3)	119 (95.2)
	Transition	16 (94.1)	10 (83.3)	8 (88.9)	34 (89.5)	19 (100.0)	12 (100.0)	31 (100.0)	10 (100.0)	75 (94.9)

3.6.13 Conclusion

Overall, 184 patients participated in the patient satisfaction survey across wards, with a large proportion of these surveys completed on the day and verbally with the researcher. The evaluation reflects high patient satisfaction. The mean scores on the composite variables nurse communication, nurse responsiveness, pain management, communication about medication and care transition were all 3 or greater on a scale of 1-4 indicating positive evaluations. Communication about medication was rated the lowest.

Data was examined for potential trends between Time 1 and Transition. Large differences were not observed overall. However, some trends were observed at ward level including an increase in nurse communication in Ward 31 which was previously rated lowest of all wards, an increase in pain management ratings in Wards 1 and 2 in line with other wards, upwards trends in communication about medication on most wards except for Ward 1 and 2 where downward trends are observed in Transition.

Overall, patients were largely satisfied with nursing care. Patients on the wards as part of the Pilot were highly satisfied with nursing care in Time 1 and at Transition. In relation to overall hospital ratings, most patients would recommend the hospital to their family and friends. However a large proportion would 'probably' rather than 'definitely' recommend the hospitals. It is observed that a slightly greater percentage of patients rated the hospital with a 9/10 in Transition.

In both timeframes, approximately three quarters of patients felt the hospital environment was always clean though only just under 40% found the room was always quiet at night. Similarly in relation to discharge, talking to patients about care after leaving the hospital was prevalent but information in writing was less so.

Overall, the findings from patient satisfaction surveys, particularly in relation to nursing care, were largely positive in Time 1 and Transition. Though largely positive, the responses also evidenced some variability. This suggests that these measures have the potential to capture aspects of patient experience and identify differences in patient satisfaction with larger sample sizes. Further data collection from patients on the Pilot wards is currently on-going.

3.7 Implementation science - evidence-based assessment of the adoption and implementation of the framework in practice

3.7.1 Introduction

The success or otherwise of the implementation of a complex intervention can be determined by both objective and subjective measures. This section of the report, using implementation science methods, draws upon the data collected as part of the research process, as well as meeting notes, observations and interviews with key stakeholders. The use of implementation science methods, in particular Normalisation Process Theory (NPT), will be outlined as the structure used to

provide an evidence-based assessment of the adoption and implementation of the *Framework* in practice.

It has been highlighted that many research findings are never implemented in practice. In ensuring successful implementation of an initiative, such as the implementation of the *Framework*, there are a number of questions that need to be answered:

1. Is implementing the recommendations in the *Framework* feasible within a given setting?
2. Are the recommendations in the *Framework* acceptable to clinicians, patients, and the healthcare system in which they are situated?
3. What are the costs associated with the innovation?
4. Can the recommendations be sustained over time?
5. What levels of quality are needed to ensure good outcomes?

Further consideration will require an understanding of the workability of the *Framework*, that is its clinical effectiveness and cost and how it will integrate into existing systems within the healthcare system as well as its impact on patient, nursing and organisational outcomes (May 2006).

3.7.2 Model for Implementation - Normalisation Process Theory

The aim of the recommendations in the *Framework* is for them to become implemented and 'normalised' into practice. Normalisation is defined as 'the embedding of a technique, technology or organizational change as a routine and taken-for-granted element of clinical practice' (May 2006); in other words, the routine embedding of a complex intervention into healthcare work. There are a number of advantages of using Normalisation Process Theory (NPT) in measuring the implementation of the recommendations in practice: firstly, NPT concentrates on the practitioners who will use the recommendations of the *Framework* everyday in their practice; secondly, we will be able to identify factors that acted as facilitators or barriers to the implementation of this complex intervention, and; thirdly, the model will allow us to identify the probability of the *Framework* becoming routinely embedded in clinical practice (May *et al.* 2007). The Normalisation Process Model will allow the research team to evaluate the implementation of the complex intervention through both measuring the outcomes and effectiveness of the intervention but also examining the processes that resulted in the observed outcomes. That is, the ability to identify the processes that resulted in the complex intervention being 'made *workable* and *integrated* in everyday practice' (May *et al.* 2007: 3).

In a systematic review of the literature using Normalisation Process Theory as a framework, May and colleagues (2014) identified a number of factors that are associated with the normalisation of a complex intervention in practice; these are drawn upon to identify how the recommendations relating to nurse staffing and skill-mix have been implemented:

- The capability of nurses to operationalise the recommendations is related to the intrinsic workability and integration of nursing work and skill-mix within the clinical environment.

- As identified in research, the recommendations are more likely to be implemented and normalised when nursing staff can make them workable in practice, and when practitioners can integrate them into their day-to-day work.

- The recommendations will be disposed to normalisation when they are seen to differ from existing practices and they are internalized and accepted by existing practitioners.

- The recommendations will be disposed to normalisation when it is associated with an emergent community of practice, and when members of that community of practice enrol each other into group processes that specify their engagement with it.

- The recommendations will be disposed to normalisation when it is associated with improvements in clinical practice, and practitioners are able to integrate the application of that knowledge into their clinical practice.

- The recommendations will be disposed to normalisation when disruption around professional roles is minimised and intra- and inter- professional collaborations are built up around the recommendations.

Furthermore, context is central in understanding how to implement the recommendations of the *Framework* into practice. The research reported here examined the context in which nursing work carried out. To implement the recommendations on a national level, it will be necessary to understand the context of the institutional setting, the stakeholders and their interactions. Context plays a central role in implementation research. Context can include the social, cultural, economic, political, legal, and physical environment, as well as the institutional setting, comprising various stakeholders and their interactions, and the demographic and epidemiological conditions. The structure of the health systems (for example, the roles played by governments, non-governmental organisations, other private providers, and citizens) is particularly important for implementation research on health.

3.7.3 Using the Normalization Process Model as a Framework to measure the implementation of the recommendations in practice.

There are four constructs underlying normalization theory that were used to provide an evidence-based assessment of the adoption and implementation of the framework in practice:

1. Interactional workability – this factor took into account the interaction between nurses and the extent to which they communicated the requirements related to patient care outlined in the *Framework*.

2. Relational integration – the extent to which staff trusted and valued the recommendations made in the *Framework.*
3. Skill-set workability – the extent to which the *Framework* was under the control of nursing staff.
4. Contextual integration – the extent to which the pilot sites had the capacity to use and normalize the intervention.

The application of these four constructs in practice are outlined below:

- *Interactional workability* – a number of interactions were evident between the various groups involved in the implementation. It was evident that those at executive level (director and assistant of director of nursing and CNM levels) perceived the pilot as extremely worthwhile and had 'changed the way' they thought about decisions related to staffing and workforce planning. There was a sense that following the introduction of a systematic approach to determining the nursing workforce in the clinical area that it would be difficult to go back to using traditional or legacy approaches to determining the requirements for safe nurse staffing.
- *Relational Integration* – This measured the extent to which staff trusted and valued the recommendations that were implemented in the pilot sites. The recommendations in the *Framework* were strongly based on evidence reviews related to best practice on nurse staffing and skill-mix. The basing of the recommendations on existing knowledge was central to facilitating their integration in practice; in addition, feeding back data and evidence in real-time, both through the *TrendCare* system and from the research team was important in making adjustments to the project as it occurred as well as enabling staff to identify and interpret the outcomes that were relevant to the care provided. Accountability for each phase of the initiative was also a key factor in its success with key stakeholders aware of their roles and responsibilities through each stage of the implementation of the recommendations. Confidence, another key component of normalization and implementation, was also evident. Senior leaders in the clinical area were of the view that the data they were receiving from *TrendCare*, as well as the feedback from the research component of the research, matched their clinical judgement; this led to a level of confidence in the data that was being collected and was central in informing decision making. There was a sense that, although in some instances, the implementation was in a transitional Phase, the staffing and skill-mix adjustments matched the requirements in the clinical area.
- *Skill-Set Workability* – this component of the Normalisation Process Model explores the extent to which the implementation of the *Framework* was under the control of nursing staff; this was assessed under the constructs of allocation and performance. Allocation refers to the performance of tasks and the individuals/groups responsible for the implementation. As outlined above, the process of implementing the recommendations were systematic and involved key stakeholders at each stage of the process. Personnel and financial resources were made available by the Department of Health; these were essential to the implementation of the recommendations in the *Framework*. Responsibility for recruiting staff and adjusting skill-mix was also allocated leading to, as highlighted in interviews with staff, a sense of

ownership of the project. The second component of skill-set, workability, refers to performance. This refers to the ability of the healthcare setting, in which the research is being undertaken, to organise and implement the complex intervention as part of their day-to-day activities. There were a number of elements identified in the performance of the three pilot sites that related to different phases of the project. All three sites put in place Local Pilot Planning and Implementation Teams; these consisted of key stakeholders relevant to the implementation of the Taskforce recommendations and consisted of representatives from the clinical areas, nursing management, finance, HR and IT services, staff representative bodies, the Department of Health and the HSE and the research team. The involvement of key stakeholders in the teams was conducive to the successful integration and monitoring of the implementation of the recommendations. The regular meetings were also central to identifying problems as they occurred as well as providing a forum for reporting on the progress of the initiative. One area that arose both in the data and from interviews with key members of staff was support around the implementation and on-going rollout of the *TrendCare* system. There was a sense that there was, in the beginning, a steep learning curve associated with the staffing allocation and skill-mix software. Senior staff in the clinical settings reported that they would like to have more support and training on the *TrendCare* system; however, there was general agreement that it was an invaluable tool in assisting with staff planning and outcomes. Staff nurses in particular perceived that the system was time consuming and, at times cumbersome.

- *Contextual Integration* – This refers to the extent to which the pilot sites had the capacity to use and normalize the intervention. There are two components of contextual integration: execution and realisation. Execution refers to the resources related to the practicalities of implementing the initiative. It is evident that the implementation of a patient acuity and workload management system will have associated costs; however, as future research is rolled out, the savings in terms of the stabilisation of the nursing workforce and the reduction in agency usage, should reflect the benefit of a software based workload management system. Realisation refers to the responsibility for the ownership of the complex intervention. It is evident as the systems become embedded within an organisation, the responsibility for implementation and decision making will pass from the Department of Health to key decision makers at healthcare provider level. This will require negotiations around the current systems in place and what resources are required to ensure the initiative is successful in practice.

Overall, it was evident within the pilot wards that a period of normalisation of the recommendations is beginning to occur; the challenge is to ensure that de-normalization does not follow the rollout and implementation of the *Framework*. The following section outlines further initiatives that can be undertaken to ensure the continued ‘normalisation’ of the recommendations in clinical settings.

3.7.4 Implementation and Normalisation – Future Strategies

1. Stakeholder Involvement in the Research Process - The research team, led by UCC who are undertaking a programme of research into safe nurse staffing and skill-mix are currently working closely with policy makers in the Department of Health and leaders in the Health Service Executive to feedback the results of the programme and to identify best practice on how these results are used to influence policy and the application of outcomes from the research in practice. In addition, and, most importantly, the team, including the Department of Health, the HSE and the research team are working closely with nurse leaders in clinical practice on facilitating the interpretation of the data and how this data can be used to enable decision-making at ward and hospital level. This approach is being used to engage leaders in healthcare on how the tools used in this initiative can be part of the cultural change to embed the principles of safe staffing into clinical practice. The partnership approach between key stakeholders is facilitating the literacy on the science underlying decisions related to safe nurse staffing; this is resulting in innovative approaches being integrated into clinical practice. In relation to the Department of Health, the HSE and healthcare provider level, there are strong structures in place in the form of taskforce steering groups to further facilitate this component of implementation. This will allow for the rollout of a staged implementation as the evidence base in Ireland on safe nurse staffing is expanding as well as providing guidance on the adaptations and modifications that need to be made over time.

2. **Organisational Implementation** – it has been highlighted that when implementation of evidence is facilitated at all levels of an organisation, there are greater levels of success (Aarons *et al.* 2015). Therefore, it is recommended that the Department of Health, the HSE and the research team continue to work closely with key stakeholders at all levels from policy forums to those in clinical practice. To enable successful implementation, clinical practitioners must include all healthcare disciplines that have direct and indirect contact with nurse staffing.

3. **Patient Implementation -** The patient survey component of the research identified the value of the patient voice in exploring the association between nurse staffing and the patient experience of nursing care. It is therefore recommended that future research on nurse staffing include the patient voice both quantitatively and qualitatively. In addition, the introduction in Ireland of a National Patient Experience Survey (see http://www.patientexperience.ie) provides an opportunity for the relationship between nurse staffing and patient satisfaction with nursing care to be measured at a national level. The results of which can be used to identify aspects of the patent experience that are needed to provide higher quality care.

4. Using Implementation Science

The recommendations outlined in the *Framework* and implemented in the pilot sites are, by definition, a complex intervention, which is defined by May *et al.* (2007: 2) as:

> … a deliberately initiated attempt to introduce new, or modify existing, patterns of collective action in health care. Deliberate initiation means that an intervention is: institutionally sanctioned; formally or informally defined; consciously planned; and intended to lead to a changed outcome. Initiators of

> a complex intervention may seek to change the ways that people think, act and organize themselves in health care, or they may seek to initiate a process with the intention of creating a new outcome.

The results of this study demonstrate that the introduction of NHPPD, a complex intervention, as the approach to determining nurse staffing levels in the Irish health system will require a period of adaptation as well as exploring the feasibility and sustainability of the introduction of the recommendations outlined in the *Framework*. Adaption refers to the possibility of the approach used to determining staffing levels in the clinical area evolving over time as more evidence becomes available. Feasibility will explore the probability of the intervention succeeding and sustainability will demonstrate how well the intervention can be maintained over time. Effective sustainability will ensure that the recommendations outlined by the Taskforce on Safe Staffing and Skill-Mix are integrated into healthcare practice nationally.

To this end a number of steps, based on best evidence, are recommended to facilitate the translation of research findings into the healthcare system to improve safe nurse staffing and skill-mix; the model of this is based on May's Normalisation Process Theory (NPT). In particular, collective action – the partnership approach to the implementation was key in ensuring this complex intervention was successfully rolled-out. The involvement of stakeholders at all levels from policy to practice was a strategic decision that resulted in the successful integration of the initiative in the pilot sites. In addition, in presenting an organised and dynamic intervention there was a sense among stakeholders that this was a national project that had the support of a number of key participants. It was evident that there were both co-operative and executive attributes in place; co-operative attributes resulted in implementing the recommendations form the Taskforce through a period of negotiation and agreement. Executive actions were also evident in the structures put in place, these included steering groups at a number of levels including those based in each of the three pilot sites. Moreover, it is essential that, at all levels, the key stakeholders involved in the application of the recommendations in clinical practice are involved in the implementation processed.

Section 4
Discussion, Conclusions and Recommendations

4.1 Introduction

A number of research studies have demonstrated an association with poor nurse staffing levels and adverse patient outcomes. In addition, low staffing levels have also been associated with outcomes related to nursing staff such as low levels of job satisfaction, high staff turnover and missed or delayed care. This programme of research is building on the international evidence and the outcomes and recommendations from the Irish arm of the RN4Cast survey (Scott *et al.* 2010); in addition, it has been a number of years since the last extensive study on the nursing workforce in Ireland and there have been a number of changes at societal, economic and policy levels. There is also a need to take into consideration the design of health services in Ireland and how they relate to the provision of nurse staffing and skill-mix in medical, surgical and specialist settings.

The aim of the research outlined in this report was to continue to evaluate the implementation of the recommendations from the *Taskforce* for safe nurse staffing and skill-mix. Internationally, the research approach outlined here is relatively unique. The research team, using multiple approaches and collecting data longitudinally from a variety of sources, measured the impact of implementing the recommendations of the *Framework* on nurse-sensitive patient outcomes measures, staff outcome measures and organisational factors as well as measuring the economic impact. In addition, using implementation science methodology, the research team provided an evidence-based assessment of the adoption and implementation of the *Framework* in practice.

This section of the report discusses the results of the study in relation to the extent to which nurse sensitive patient outcome measures, adverse patient outcomes and safety CLUEs, the patient experience, nurse outcomes and the organisational/ward environment factors changed as a consequence of the introduction the recommendations in the *Framework.* This stage of the research has collected longitudinal data from administrative databases (*TrendCare* and HIPE) over two time periods: pre and post the implementation of the recommendations and cross-sectional data at three time points from nursing and HCA staff. The final part of this section reports on the cost implications arising from the pilot introduction of the *Framework* as well as examining the implementation processes/measures in the context of recommendations for a national rollout.

4.2 Implementation of NHPPD

The introduction of NHPPD, based on the systematic measurement of patient acuity and dependency measures, resulted in the identification of a need for staffing uplift in four of the six wards involved in the pilot; that is NHPPD identified a variance in actual and required NHPPD. The three wards involved in the pilot in Hospital 1, in particular, required staffing uplifts ranging from 8.0 WTE to 12.7 WTE. The literature

has identified NHPPD as a comprehensive approach to determining staffing need as it takes into account patient acuity and dependency in providing care rather than solely depending on staff numbers, patient to nurse ratios or historical staffing levels. The effect of the introduction of this approach has been to stabilise the nursing workforce in these wards and, as outlined above, resulted in a number of improved outcomes in a number of key areas. One aspect of the uplift was the time required to put the extra staff in place; however, this process is now nearing completion and it is evident that this is having a further impact on the outcomes that occurred between Time 1 (prior to the implementation of the recommendations in the *Framework*) and Time 2 (following the implementation of the recommendations in the *Framework*) that that measured in the original pilot research (Drennan *et al.* 2017b).

4.3 Outcomes Related to NHPPD, Shift Variance, Skill mix, Agency Use, One-to-One Specialling and Absenteeism

Of the six pilot wards, four wards (1, 2, 3 and 31), based on the assessment of their actual and required NHPPD, received an uplift of staff; this included both RNs and HCAs; this, in some cases resulted in a noticeable change in staffing in each of the pilot wards. The overall outcome of introducing NHPPD as the approach to determining nurse staffing requirements in each of the pilot sites was to that of creating stability in terms of skill mix, one-to-one specialling and, in particular, a substantial reduction in the use of agency staff This stabilisation not only occurred in the wards that received an uplift in staff but also in Hospital 2 that did not adjust their WTE complement. What occurred in this site was that nursing leadership were using the data collected through *TrendCare* to make decisions on the utilisation and deployment of staff. The deficits identified in actual and required NHPPD between Time 1 and Time 2 are now reducing as the recruitment and integration of new staff continued. It is important to note that a consequence of introducing new staff to the pilot wards, time is required to supervise and integrate these new members into the workforce; a consequence of this is that the proportion of nursing hours available for clinical may be reduced during this process. However, as staff become fully integrated, supervision hours are converted to clinical hours. When total available HPPD are examined between Time 1 and Time 2, four (2, 3, 22 and 23) out of the six pilot sites, had a positive variance, indicating that they reached stability in their nursing workforce. One pilot ward (31) had a very slight negative variance; however, this needs to be treated with caution as this ward did not reach the threshold of 95% actualisation in the completion of data entry in *TrendCare*; while there is still value in their data, the results from this site, at this stage, need to be treated with caution. The other ward (Ward 1) had a relatively substantial change in their patient related acuity and dependency measures between Time 1 and Time 2 of the study. The consequence of this is that a re-evaluation of the staffing complement in this ward may be required. In this case, using a systematic measurement system, such as *TrendCare*, in a continuous and iterative process allows the required staffing complement to be adjusted as required and this is of benefit to patients, nursing staff and management.

The *Framework* document outlined a number of ward categories based on NHPPD. Based on the data observed in Time 2, generally each of the pilot sites matched the categories in which it was hypothesised that they would be situated. For example,

Ward 3, a highly complex specialist surgical unit was, based on its calculated NHPPD, to be in category B. This in effect validated the assessment undertaken of patient acuity and dependency and resulted in the levels of staffing required to staff a unit of this kind.

It was also evident that the introduction of the recommendation in the *Framework* on the supervisory status of the CNM 2 was increasing the proportion of time allocated to the CNM2 to fulfil this role. In the majority of the wards, the proportion of time allocated to supernumerary status increased from between 5% to 30%; no wards recorded a decrease, with one ward remaining stable. In a number of wards (wards 2, 3, and 22), based on the NHPPD available, they now have the potential for 100% of the CNM 2 role available for supervisory support; that is, total hours available demonstrates that the CNM2 role is available for 100% supervisory support. The consequence of matching staffing requirements with patient acuity and dependency by not including the CNM2 grade in this calculation is increasing the time available to undertake a 100% supervisory role. Previous research has identified that the introduction of fully supervisory posts in clinical practice was associated with improved patient satisfaction with nursing care (Bender et al. 2012), a reduction in falls, pressure ulcers and increased job satisfaction of staff (Burritt et. al., 2007). The recommendation that 100% of the role of the CNM 2 should be at supervisory level is a central recommendation in the *Framework*, while it is difficult at this to disaggregate this element of the implementation on the outcomes overall, future statistical modelling will attempt to measure the impact of the supervisory role of the CNM2 on outcomes. It is of note that in the wards that received the greatest amendments in staffing, respondents' ratings of nurse manager's ability, leadership and support increased from Time 1 to Time 2.

The *Framework* outlined recommendations for skill mix in medical and surgical settings with the ideal skill mix identified as 80% RN to 20% HCA. The results regarding skill-mix are showing stabilisation when compared to the previous results in 2017 (Drennan *et al.* 2017b). When rosters were examined, it was identified that the majority of wards exceeded, or are close to, the *Framework's* recommended 80:20 split. In comparing the two measures (shift and rosters), it is of note that the clinical skill-mix is currently being affected by the number of hours being provided to clinical supervision of new staff; this accounts, to an extent, for the mismatch between the two measures reported. As the workforce further stabilises and new staff become integrated, it is expected that the variation in skill-mix between at shift-level and rostered will reduce over time. Previous research has demonstrated that a higher proportion of registered nurses on wards is associated with a significantly lower rates of death (Estabrooks et al., 2005, Shekelle, 2013) and failure to rescue (Blegen et al., 2011), lower rates of pneumonia (Cho et al., 2003) and surgical site infection (McGillis Hall et al., 2004) and lower post-operative sepsis (Blegen et al., 2011).

One of the most significant adjustments as a result of the implementation of the recommendations in the *Framework* was the reduction in agency usage on the wards where the recommendations in the *Framework* were implemented. In some cases there were substantial reductions with a 95% reduction noted in Ward 1, a 95% reduction in Ward 2, and a 87% reduction in Ward 3; these three wards

received targeted staffing uplifts. For example, in Time 1 one ward provided approximately a third of its nursing hours through agency, by Time 2 this had reduced to approximately four percent. It is of note that, although two wards in Hospital 2, did not receive an uplift in staff, there was also a reduction in levels of agency usage when both Time 1 and Time 2 of the study are compared. The reductions were not as great as those wards that received a staffing uplift (29% reduction in Ward 22; 36% in Ward 23); however, through the data collection process, nursing management in this site, in partnership with the Department of Health and the HSE, undertook a review of agency usage and put into place a number of targeted actions, including the implementation of an enhanced care team, to reduce these wards relatively high use of agency staff. This outcome demonstrated the value of using the data available for decision making. It is evident that as the stabilisation of staff continues, further reductions in agency usage are likely to occur which should have a positive impact on continuity of care as well as economic savings.

In Time 1 of the study a relatively high proportion of nursing hours were provided by one-to-one specialling. Overall, in the pilot wards that received a change in staffing, the level of one-to-one specialling in two wards reduced substantially with percentage decreases ranging from approximately 74% to 88% (one ward had very low levels of one-to-one specialling at baseline and Time 2). Two wards in Hospital 2, which had high levels of one-to-one specialling in Time 1, remained generally at the same level in Time 2. The decrease in one-to-one specialling in Time 2 was also associated with the decrease in agency usage in this phase. It is evident that using a systematic approach to determining staffing has led to a reduction in one-to-one specialling; that is, wards that are better staffed, regardless of patient acuity and dependency, require fewer hours dedicated to one-to-one specialling as staff have increased time available for patient surveillance. The increase in one-to-one specialling in Ward 31 is reflective of the increase in patient acuity and dependency over the course of the study and further analysis of the nursing workforce in this area is ongoing.

Absenteeism, in particular sickness absence, may be an indicator of increased workloads or a poor working environment. Overall absenteeism decreased from Time 1 through to Time 2 in the majority of wards included in the intervention. In relation to sickness absence, the picture was somewhat mixed. In Hospital 1,which received the greatest uplift in staff, sickness absence reduced from 5.2% in Time 1 to 4.2% in Time 2; this is below the national absence rate for nurses (HSE 2016 see https://www.hse.ie/eng/staff/resources/our-workforce/absenteeism-report-dec-2016.pdf). In Hospital 2, the sickness absence rose from 3.0% in Time 1 to 4.7% in Time 2; however, both of these figures remained below national rates. Finally, Hospital 3, the sickness absence also increased from 2.2% in Time 1 to 4.7% in Time 2. All three hospitals' levels of sickness absence fluctuated over the time period of the study with Hospital 1's rate falling below the national average in Time 2. Sickness absence fluctuates according to the time of year, with higher rates recorded in the winter months; therefore, at this stage, the results need treated with caution as further trend analysis is on-going.

Although not directly within the remit of the implementation of the recommendations within the *Framework*, it is of note that bed occupancy rates in the pilot wards ranged from 89.73% to 101.11% in time 1 and from 87.8% to 105.3% in Time 3; these rates were all above the OECD average for acute bed occupancy at 77.3% and, in the case of Hospital 1 and 2, the national average bed occupancy rate of 93.8% (OECD 2016). These high bed occupancy rates have implications for nursing work and occupancy data is beneficial in planning the nursing resource required to care for patients on wards that have high levels of turnover.

4.4 Nursing Sensitive Outcome Indicators

Following on from the research on the introduction of NHPPD in Australia (Twigg 2006), this research study also explored the extent to which nurse sensitive outcomes changed as a result of the introduction of the recommendations in the *Framework*. We compared HIPE data from Time 1 with Time 2 of the study. Patient demographic and admission data from both phases were comparable. The profile of patients was reflective of the Model designation of the three hospitals in the pilot. Using a segmented time series analysis we estimated whether the probability of an NSO occurring changed after the introduction of the recommendations in the *Framework* (January 2017). Over Time 1 (prior to the implementation of the recommendations in the *Framework*), the number of NSOs increased by 0.66% per day; this is compared to Time 2, where the number of NSOs decreased by 0.88%. Again, both unadjusted and adjusted (age, sex, mortality, hospital, length of stay) data demonstrated that the proportion of NSOs significantly declined in Time 2. It is of note that additional longitudinal data is required to determine whether or not this pattern will continue as it may be attributed to seasonal variations, and therefore should, at this time, be viewed with caution.

4.5 Nursing Work

The research also undertook, to date, three cross-sectional surveys of nursing staff in: Time 1 - before the introduction of the recommendations in the *framework*; Transition phase - during the implementation of the recommendations and; Time 3 – following the implementation of the recommendations. The aim of this stage of the research was to identify if change occurred prior to, during and following the introduction of the recommendations in the *Framework.*

The majority of respondents were RN, had completed degree level education and had worked as nurses for, on average, 12 years with approximately five and a half years of experience in their current clinical area. The vast majority of staff reported that they predominantly worked 12 hour shifts while on duty.

Across both phases of data collection, it has been possible to gain insight into factors affecting nursing work on the study wards. There are a number of trends in the data when the time periods are compared. The number of patients per nursing staff member was observed to be reducing at Transition and this trend continued in Time

2. Measures of the nursing work environment also showed more favourable results at transition and Time 2 for a number of wards when compared to Time 1. Of particular relevance was an increase in ratings of staffing and resource adequacy in Time 2. There were also improvements in staff perceptions of collegiality between doctors and nurses, nurse manager ability, leadership and support, nurse participation in hospital affairs and the ability to apply nursing foundations for the quality of care in two of the three sites; these reflected the stabilisation of staffing in these areas.

The perception that staff felt they had less time to deliver care fell from Time 1 to Time 2 with a subsequent increase in staff reporting they did not require any additional time to provide patient care in Time 2 when compared to Time 1. Staff perceptions of the quality of care delivered, overall in the six wards remained stable between the two time periods; however, wards with a positive variation in staffing at Time 2 reported a substantial increase in respondents rating the quality of care delivered as either good or excellent. In particular, 44% of respondents in Hospital 1, which received the greatest uplift in staffing, reported that the quality of care had improved in the previous six months.

Across all phases of the research, the items of care most frequently reported as undone were comfort/talk with patients and educating patients and/or family. The items least frequently left undone were pain management and undertaking treatments/procedures. In Time 1, 75.6% of nurses reported that at least one necessary item of care was left undone due to lack of time on their last shift; this fell substantially to 31.8% in Time 2. Similarly, the mean number of items left undone also dropped over the time period with an average of 2.51 care activities reported left undone per shift in Time 1 falling to 0.75 undone at Time 2.

Across all phases, the most common items of care delayed were recording/updating documentation, comfort/talk with patients, physical support, vital signs observation, adequate patient surveillance and administering medications. Pain management was the least frequently delayed task. In comparison to care left undone, care delayed showed less of a decline; however, overall, the trend was downwards. In Time 1, 93.3% of staff reported at least one care task was delayed on their last shift whereas 84.1% reported one or more tasks delayed in Time 2. The mean number of care items delayed per shift also fell in Time 2 (4.92) compared to Time 1 (5.43). Missed meal breaks for staff also fell proportionally over the two time periods, with 50% or RNs reporting a missed meal break in Time 1, this reduced to 22.7% in Time 2.

Job satisfaction and intention to leave remained relatively similar at the overall level but demonstrated differences at ward level. Generally, the prevalence of intention to leave was lower and job satisfaction higher at Transition and Time 2 time-points (i.e. following the introduction of the recommendations in the *Framework*) when compared to Time 1. In Hospital 1, there was a large increase in overall levels of job satisfaction which increased from 56.3% in Time 1 to 86.1% in Time 2. The picture related to intention to leave was more complex. Although, levels of intention to leave fell in Time 2 compared to Time 1, overall levels of intention to leave remain relatively high and this requires further analysis. An additional question asked respondents to state their reason for selecting probably/definitely will leave on the

survey. Of those, that made this selection and gave a reason for leaving, 52.8% stated that this was due to current levels of job dissatisfaction.

This phase of the research also measured burnout; however, as this measure was not included in the original pilot, comparisons are not available at this stage. Future rounds of data collection will collect data on this variable allowing comparisons to be made of time and measured in relation to variations in staffing. Overall, staff scored relatively low on emotional exhaustion and depersonalisation and relatively high on personal accomplishment. Higher scores on the emotional exhaustion and depersonalisation subscales indicate negative outcomes; higher scores on the personal accomplishment subscale indicate better outcomes.

4.6 Patient Satisfaction

Cohorts of patients were surveyed both in Time 1 (prior to the implementation of the recommendations in the *Framework)* and during the transition phase (following the implementation of the recommendations in the *Framework*); further data collection is on-going for Time 2. Levels of patient satisfaction with nursing care were high across both phases of research with very little change observed; however, there were some exceptions. Ward 31, which has relatively lower levels of satisfaction with nurse to patient communication improved in Transition, in addition, satisfaction with nursing care was higher on wards 1 and 2 during transition when compared to time 1 with a slightly higher proportion of patients overall rating their hospital experience at a 9 or 10 on a 10-point scale in transition.

4.7 Economic Analysis

The economic analysis of the introduction of the recommendations in the *Framework* explored three cost areas: agency staff usage, cost of the staff alterations and the cost of nursing sensitive outcomes that occurred over the course of the study.

Hospitals in the pilot were asked to provide their average hourly spend for agency RNs and HCAs. The majority of wards that received a change in staffing, demonstrated a substantial reduction in agency usage in time 2. This resulted in an average monthly saving of in agency costs. When staff recruitment is factored in, the net monthly cost of changes to staffing was less than the agency savings realised. Therefore, in implementing the alterations to staffing, there is a net monthly saving across the six pilot wards.

It was estimated that each individual NSO accrued by a patient costs approximately €2,397[12]. At the time of the study, it was evident that the proportion NSOs were decreasing by 0.88% per day; however, a longer period of data collection is required before an accurate comparison can be made in NSO costs between the various

[12] This is the average cost paid by the Health Pricing Office and may not reflect the real cost of the NSO.

phases of the study. In Australia, Twigg *et al.* (2013) measured NSOs[13] 22 months prior to, and 22 months following the implementation of NHPPD. The cost per NSO was calculated higher in Australia than in Ireland at AUD$10,074[14]. Similar to our initial data, following the introduction of NHPPD, which led to an increase in the proportion of hours provided by RNs, a total 1,202 NSOs were averted. The increase of nursing staff cost AUD$16,833,392, therefore the net intervention cost was AUD $9,690,926.The cost per life year gained was AUD$8907.

It is also identified that turnover can result in a number of negative costs for an organisation including the need for temporary cover for staff and the cost of recruitment and adaptation (Buchan 2010). In this study, it was identified that 52.1% of respondents in Time 1 reported that they would definitely or probably leave their employment; although this reduced to 45.5% in Time 2, it was still a substantial proportion of respondents. It should be noted that the turnover rate of nursing staff in Ireland is approximately 7.7% (HSE 2017); however, there is a lack of data on the cost to the health service of staff turnover in the State. However, Buchan (2010) reports that turnover costs can be estimated by taking into consideration the following factors: percentage of pay-bill; cost per patient day and cost saving of reduction in turnover. Using percentage of pay-bill as an example, and assuming a turnover of 7.7% and turnover costs of €8,000 per nurse, in an organisation which employs 500 nurses, this would be equivalent to turnover costs of €308,000 per annum (Buchan 2010).

4.9 Conclusion

It is evident from the data, that, as a result of the introduction of the recommendations outlined in the *Framework,* there is on-going stabilisation of the nursing workforce in Time 2 when compared to Time 1 of the study. This was identified in patient, nurse and organisational outcomes measured as part of the research. The collection of systematic data on the nursing workforce has allowed for the planning of the staffing complement related to patient need. As a consequence of measuring patient acuity and dependency and introducing NHPPD as the method for identifying appropriate nurse staffing, there was an increase in staffing numbers between Time 1 and Time 2 in those wards where a negative variance between NHPPD required and available was identified. As a consequence, skill-mix in the pilot sites following the implementation of the recommendations in the *Framework* is at, or reaching the recommended 80:20 ratio and, as a result, a higher proportion of RNs are now providing care than that which was evident in Time 1. One key finding was that there was a substantial reduction in the proportion agency staff used to provide care between Time 1 and Time 2 of the study; not only has this resulted in economic savings, it has contributed to stabilising the workforce with a reduction in the requirements for one-to-one specialling. There was also a general reduction in staff sick-leave in a majority of wards that received an alteration in nurse staffing. Initial analysis of HIPE data demonstrated a significant decline in nurse sensitive outcome indicators in Time 2 when compared to Time 1. It is of note that this result needs to be treated with caution due to the sample size and relatively short

[13] NSOs were based on the same taxonomy as used in this study.
[14] Approximately 7,000 Euros at 2013 rates.

timeframe; however, should this trend identified in this study, the introduction of NHPPD may be associated with the reduction in a number of adverse patient outcomes. Self-reported nurse to patient ratios improved in Time 2 compared to Time 1. In wards that received the greatest uplift in staff, there was a substantial improvement in all areas of nursing work, including an improvement in respondents' perceptions that the wards were adequately staffed and resourced. Staff also perceived that the working environment became less complex over the period of the study with an overall agreement that time available to deliver care increased in Time 2 compared to Time 1. Staff perceptions of the quality of care delivered as good or excellent also increased in Time 2 compared to Time 1, especially in wards where alterations to staffing were implemented. The proportion of care left undone and car delayed events also substantially reduced in Time 2 compared to Time 1. Levels of job satisfaction were proportionally higher in Time 2 when compared to Time 1. Levels of intention to leave also fell in Time 2 compared to Time 1; however, overall levels of intention to leave remain relatively high and this requires further analysis. Overall levels of patient satisfaction were high in both Time 1 and during Transition phases of the survey with some improvements noted in nurse to patient communication and overall satisfaction with nursing care as time progressed; data collection with a larger cohort of patients is on-going in this area. The results of this study to date demonstrate that the introduction of the recommendations from the *Framework* is determining that the right staff are in the right place and at the right time and is having a positive impact on patient, nursing and organisational outcomes. Further research with a larger sample, an addition of more wards (34 in total during the current phase of research) and over a longer period of time is ongoing to explore if these changes are sustained; however, the data presented in this report is showing that the implementation of the recommendations in the *Framework* are having a positive impact on patient care, nurse staffing and organisational outcomes.

4.10 Overall Conclusions

4.10.1 **Implementing a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements**

The results of this research demonstrated that Local and Regional Framework Recommendations 1 (a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements is applied consistently at ward, hospital and hospital group level) and 2 (the choice of systematic evidence based methods takes account of the multiple factors outlined in the framework) resulted in a number of outcomes when applied in the pilot sites. The research found that patient care needs differ and nurse staffing numbers, profile and skill-mix are key to ensuring safe, high quality care for patients. Furthermore, it was found that putting into place a systematic evidence based approach to determining nurse staffing and skill-mix (in this case NHPPD), resulted in the stabilisation of the nursing workforce over the period of the research. The use of this approach enabled, in association with clinical judgement, an informed decision-making process to be put in place. The evaluation also identified that NHPPD measured in the pilot study broadly matched the NHPPD ranges outlined in the *Framework* and resulted in a number of positive

outcomes, including a reduction in agency use by wards (in a number of areas, this was substantial), a reduction in care left undone events, and a reduction in adverse patient outcomes. In a number of sites, there were also substantial increases in staff perceptions that the wards were adequately staffed and resourced following the implementation of the recommendations in the *Framework.*

Conclusion: It is therefore concluded the introduction of a systematic, triangulated evidence based approach to determine nurse staffing and skill mix requirements when applied consistently at ward, hospital and hospital group level for determining nurse staffing and skill-mix needs in medical, surgical and specialist settings resulted in a number of positive outcomes at ward level; not least in increased perceptions that wards were adequately staffed and resourced and a substantial fall in agency use and care left undone events.

4.10.2 Governance and Oversight

The *Framework* recommended that: 'the process of setting and maintaining safe nurse staffing levels is collaborative and involves Clinical Nurse Managers, Senior Nurse Managers and Directors of Nursing with support from Human Resources Management, Quality and Safety, and Finance.' To ensure that this recommendation was fulfilled, each of the Pilot Sites put in place a Local Pilot Planning and Implementation Team. The research found that these structures were central to ensuring that the reallocation of staff and the staffing resources were put in place as the recommendations from the *Framework* were implemented.

Conclusion: The research concluded that the Local Pilot Implementation Teams introduced in the clinical sites as a result of recommendation 10 in the *Framework*, supported the successful implementation of the recommendations in the *Framework* at local and group levels. The partnership approach ensured that on-going monitoring and feedback was communicated to all key stakeholders involved in the implementation and that the interventions were enacted as outlined in the *Framework* document.

4.10.3 Enhanced Care

The research identified a larger than expected prevalence of one-to-one specialling across all three pilot sites when data was collected at Time 1 (baseline). However, as the workforce stabilised the requirement for one-to-one specialling reduced substantially. One-to-one specialling was reflective of different levels of patient dependency and the profile of the wards across all sites. It is acknowledged, in some cases, the prevalence of one-to-one specialling matched the NHPPD range for specialist wards; however, the extent of one-to-one specialling identified in non-specialist wards required extensive resources to match demand. Previous research suggests that many acute hospitals are not equipped with the skills and resources to provide quality one-to-one specialling to patients who require this level of care. To address this, active assessment and management of one-to-one care through a process of enhanced care should be considered.

Conclusion: The research concluded that a set of high-level key principles for enhanced care should be developed to facilitate the active management of patients that require specialling. To explicitly reflect this point; a more structured, patient-centred approach (enhanced care) to one-to-one specialling would significantly reduce costs, as well as improving the quality of care patients receive and enhance the patient experience. For these to be effective, high-level key principles need be put in place at an organisational level, taking local processes into account, whereby the roles and responsibilities of all staff engaged in one-to-one specialling be clearly identified. The research therefore concludes that consideration be given to amending the *Framework* to include these principles.

4.10.4 Supervisory Status of the CNM2

The *Taskforce* recommended that 100% of the CNM2 role and function should be allocated to a supervisory capacity. It further recommended that organisations invest in appropriate resource of CNM1s to support the role and function of the CNM2 and provide effective succession planning. The extent to which the CNM2s in the pilot sites reached the target of being 100% supervisory increased over the phases of the research. The research found that having these senior posts at supervisory level has had a number of positive outcomes for staff; in some sites, as the supervisory status of CNM2s increased, staff perceptions of the extent to which they were supported by nursing leadership also increased over time; however, there was variability in responses. In addition, as CNM2s are responsible for overseeing the overall quality of care delivered at ward level, the research found that there were overall improvements in the perceptions of staff of the quality of care delivered to patients. It is acknowledged that further research is required to measure the on-going impact of the supervisory status of the CNM2 role; this role is central in the provision of leadership at ward level.

Conclusion: The research identified that the recommendation in the *Framework* that 100% of the CNM2 role and function is in a supervisory capacity has a number of positive benefits and should continue to be implemented in the next stage of implementation of the recommendations in the *Framework*. In addition, the research team will continue to work closely with the CNM2 in interpreting the data collected as well as facilitating the use of this data for decision making at ward level.

4.10.4 Organisational Culture and Ward Environment

Assumption 3 in the *Framework* stated that the organisational environment, where patients receive and staff deliver care, has an impact on the ability to deliver safe effective care. The *Framework* also recommended (Recommendation 3) that the elements influencing a positive organisational culture and ward climate form an integral part of the approach to safe nurse staffing decisions. A number of issues related to the ward environment were identified in the evaluation; these included quality of care delivered, nurse participation in hospital affairs, nurse manager ability, leadership and support and staffing resources. Although, there was some variation, the implementation of the recommendations in the *Framework,* resulted in

improvement in a number of measures related to the ward environment, including, an increase in respondents' perceptions of staffing resources and adequacy, collegial nurse-doctor relations, nurse manager leadership and support, nurse participation in hospital affairs and nursing foundations for quality of care. In a number of wards, there were increases in staff ratings of the quality of care delivered following the implementation of the recommendations in the *Framework*.

Conclusion: The research identified that in a number of wards the introduction of the recommendations in the *Framework* has had a positive impact on the ward environment. This was particularly seen in a number of wards where, as a consequence of the implementation of the recommendations, there were reported increases in time available to deliver care and the quality of care delivered as well as improvements in perceptions that wards were staffed and resourced adequately. There are areas were further improvements can be made, therefore consideration should be given to introducing organisational practices similar to that recognised by the Magnet programme (Aiken *et al.* 2000); these would include active involvement in identifying and measuring nurse sensitive outcome indicators, active programmes of quality assurance and structures to actively promote the involvement of clinical nurses in the setting of hospital policies and governance.

4.10.5 Workforce Planning and Workload Management System

The introduction on a trial basis of a workforce planning and workload management system (*TrendCare*) for nursing was central in ensuring that a systematic approach to measure patient acuity and dependency and required nursing hours per patient day was used. This workforce planning and workload management system allowed the nursing resource to be calculated according to patient need rather than relying on a nurse to patient ratio estimates or historical staffing complements. The data collected through the *Trendcare* system was instrumental in facilitating decision making from both an operational and research perspective. In particular, it enabled decisions to be made on the staffing resource based on patient acuity and dependency as measured through the required NHPPD.

Conclusion: The implementation of a workforce planning and workload management system was key to measuring the variance between actual and required staffing and was instrumental in using a systematic approach to determining the nursing and HCA complement at ward level. The system used was capable of capturing all components of the recommendations in the *Framework* including: patient acuity measures, skill mix measures, workload management and patient allocation, calculation of NHPPD (required, actual and variance), agency use, one-to-one specialling, overtime and absenteeism. It was also key that the system integrated with organisational level patient information management systems; this will further enable the development of nursing intensity weight based costing relative to patient Diagnostic Related Groups.

4.10.6 Nurse Sensitive Outcomes/Tipping Points

The *Framework* recommended that patient safety *Tipping Points* at ward level be monitored and determined locally. The *Framework* further recommended that 'ward and organisation wide mechanisms be put in place, to measure and monitor, at a minimum, nurse sensitive outcome key performance indicators on patient falls, pressure ulcers, staff and patient experience.' While, in theory, it was identified that this data would have utility in exploring the relationship between nurse staffing and adverse outcomes such as slips, trips and falls, in practice this was difficult to achieve due to the variability in the quality of NIMS data received from the three sites. Issues identified included a lack of information relating to the time and date of the incident and contextual information associated with the cause of the adverse event. However, HIPE data was identified as being of utility in measuring the association between nurse staffing and nursing sensitive outcomes. Nationally the Office of the Nursing and Midwifery Services Director is implementing the Nursing & Midwifery Quality Care-Metrics to provide a systematic approach to the capture of nursing process key performance indicators known also a nursing metrics. The development of these will have utility in monitoring the association between nurse staffing and outcomes as they are incorporated at ward level.

Conclusion: HIPE data was central in measuring adverse events associated with nurse staffing. In addition, further work is on-going in relation to key performance indicators on patient falls, pressure ulcers and staff and patient experience; these can be monitored at ward level. They are currently measured as processes; however, the research team are developing approaches to measure these indicators as outcomes. In addition, staff turnover and absenteeism rates can also be used as indicators of the impact of the safe nurse staffing policy as highlighted in the *Framework*. This will allow decision making on nurse staffing to be based on a systematic approach that takes into consideration high quality data collected at ward level.

4.10.7 Care Left Undone Events (CLUEs)

The *Framework* recommended that a process to assess, escalate and respond to missed care events (referred to as "Safety CLUEs") is put in place at ward and organisational level to indicate the adequacy of the nurse staffing resource. This recommendation was implemented through incorporating the safety CLUES into the *TrendCare* system. Safety CLUEs are important in exploring the association between nurse staffing and missed or delayed care. The research found substantial reductions in both the proportion of staff reporting that they had missed one or more items of care on their last shift and the number of items of missed care following the implementation of the recommendations outlined in the *Framework*. This outcome indicated that staff had more time available to complete episodes of care resulting in a reduction of shifts where items of care were left undone.

Conclusion: The ability to measure missed care on a shift-by-shift basis allows for a process to be put in place that can assess, escalate and respond to missed care events; this will have the benefit of monitoring the association between the staffing

resource and the level of missed care occurring at ward level. The integration of measures of missed care into software based workload planning or workload systems at ward level will facilitate the monitoring and assessment of safety CLUEs as an indicator of the adequacy of the nursing resource.

4.10.8 Skill-Mix

The Framework recommended that 'that subject to a review of the education, role and function of nursing healthcare support worker roles, the nurse/healthcare assistant grade mix is 80%/20%, once a safe nurse staffing level exists.' The implementation of the recommendations in the *Framework*, resulted in the rostered workforce on the Pilot wards approximating a skill-mix of 80% RN to 20% HCA. Although, it is difficult to disaggregate the outcomes identified from this particular recommendation from the implementation of the other recommendations, previous research has shown that a skill-mix with a higher proportion of RNs results in enhanced patient, staff and organisational outcomes. This recommendation, when taken into consideration with the others that were implemented as part of the Pilot was associated with a number of outcomes including reduction in levels of missed care and nursing sensitive outcome measures and an increase in overall job satisfaction. In particular, as the nursing complement was put in place following a systematic review of staffing requirements, the use of agency staff, predominantly provided by HCAs, reduced as did the overall requirements for one-to-one specialling.

Conclusion: The recommended skill-mix was, when implemented with the other recommendations in the *Framework*, associated with a number of positive outcomes. The results from this study, in general, matched that of other research undertaken internationally that identified that a skill-mix with a higher proportion of RNs is associated with better patient and staff outcomes. It is of note that the recommendation related to skill-mix in the *Framework* should be subject to on-going review as roles and specialities develop.

4.10.9 Patient Experience

Assumption 4 in the *Framework* stated that 'positive patient … outcomes are important indicators of the safety and quality of nursing care.' As well as undertaking a number of proxy measures of patient care, a key approach in the study was the measurement of the patient experience. there are a number of ethical and practical issues related to this approach; however, results identified that across the phases of the study there were high levels of patient satisfaction with nursing care. During transition, as the recommendations were being implemented, there were relative gains in patients' perceptions of the quality of communication, pain management and information on medication. The introduction of a National Patient Experience Survey (NPES) in Ireland provides the opportunity for research at a national level of the association between nurse staffing and the patient experience.

Conclusion: Although there are ethical and methodological complexities, as outlined in the *Framework,* monitoring patient experience at ward and hospital level can

indicate areas for improvement (for example, provision of information on discharge) as well as reporting on patients' highly positive experiences of nursing care as identified in this research. The introduction of the National Patient Experience Survey also provides the opportunity to assess the quality of the patient experience at hospital level and further work is ongoing to measure the association between the patient experience and nurse staffing.

4.10.10 National Roll Out

The results of the research identified that the introduction of the recommendations in the *Framework* were suggestive of a number of positive outcomes at patient, nurse and organisational levels. The overall impact of the implementation of the *Framework* was to stabilise the nursing workforce in the pilot sites; this stabilisation subsequently impacted positively on a number of outcomes as highlighted in this report. This stabilisation, through the introduction of an evidence-based approach for determining nurse staffing and skill-mix, will, it is suggested on the results to date, have positive implications for the future recruitment and retention of the nursing workforce. In addition, the introduction of a systematic approach to determining safe staffing levels and the required skill-mix, backed up by a workload management system, will also facilitate the goal of stabilising the nursing workforce and enable the provision of high quality care, improvements in the economic value to patient care as costs associated with nursing sensitive outcomes and agency use are reduced.

Conclusion: The introduction of the recommendations in the *Framework* in a number of pilot sites resulted in the introduction, for the first time in Ireland, of a systematic evidenced based approach to determining nurse staffing and skill-mix. The overall outcomes from this research can be used to inform decisions relating to the further development and national roll-out of the recommendations outlined in the *Framework.*

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Notes